

Refleksi

Simbolik Ekspresi Nuklear Malaysia



NUKLEAR
MALAYSIA

2022
50



Refleksi

simbolik ekspresi Nuklear Malaysia

PENERBITAN
Habibah Adnan
Dr. Nur Aishah Zainal
Halit Alias

REKA LETAK
Zainodin Tunggal

PENDIGITALAN
Syahkhairul Sani

SEKALUNG BUDI

Bahagian Pengurusan Maklumat (BPM)
Bahagian Teknologi Perubatan (BTP)
Bahagian Teknologi Industri (BTI)
Bahagian Teknologi Pemprosesan Sinaran (BTS)
Bahagian Agroteknologi Biosains (BAB)
Bahagian Teknologi Sisa & Alam Sekitar (BAS)
Bahagian Kejuruteraan (BKJ)
Bahagian Keselamatan & Kesihatan sinaran (BKS)
Bahagian Sokongan Teknikal (BST)
Bahagian Perancangan & Hubungan Antarabangsa (BPA)
Bahagian Pengkomersilan Teknologi (BKT)
Bahagian Khidmat Pengurusan (BKP)
Bahagian Pembangunan Sumber Manusia (BSM)

Hak Cipta Terpelihara: Agensi Nuklear Malaysia (Nuklear Malaysia)

Bahan penerbitan ini tidak boleh dikeluarkan ulang, disimpan dalam sistem dapat kembali, atau disiarkan dalam apa-apa jua bentuk, sama ada secara elektronik, fotokopi, mekanik, rakaman atau lain-lain, sebelum mendapat izin bertulis daripada penerbit. Sidang Editor juga berhak melakukan penyuntingan ke atas tulisan yang diterima selagi tidak mengubah isinya. Bahan karya yang disiarkan tidak semestinya mencerminkan pendapat dan pendirian Agensi Nuklear Malaysia.

KANDUNGAN

Minggu Sains Negara (MSN)	6 - 13
Hari Inovasi & Kreativiti Nuklear Malaysia 2022 (HIKNM)	14 - 59
Pameran Jubli Emas 50 tahun	60 -103
Seminar R&D 2022	104-147
Selangor R&D & International Expo (SRIE) 2022	148-166
Pameran XVII GeoSea Langkawi	167-178
World Engineering, Science & Technology Congress (ESTCON)	179-182
Researcher-Industry Scientific Exchange (RISE) 2022	183-203

MUKA SURAT

PROLOG

Naskhah Refleksi menjadi rentetan terhadap elemen simbolik bagi mengekspresikan Agensi Nuklear Malaysia (Nuklear Malaysia) dalam bidang sains dan teknologi nuklear. Platform Refleksi adalah kompilasi rekaan grafik poster yang mencerminkan imej Nuklear Malaysia sebagai sebuah agensi yang menerajui penyelidikan, pengkomersialan dan inovasi (R&D&C&I). Menerusi kompilasi pengumpulan poster yang dilaksanakan, Refleksi menjadi cerminan terhadap pemerkasaan sains dan teknologi nuklear dalam mempertingkatkan kecemerlangan Nuklear Malaysia ke arah yang lebih mampan.

Matlamat dalam penghasilan naskhah Refleksi ini adalah untuk mencipta kecemerlangan baharu bagi memacu dan sekaligus memartabatkan penyelidikan sains dan teknologi nuklear dalam bentuk penerbitan kompilasi. Gabungan pelbagai rekaan grafik poster yang dimuatkan dalam penerbitan kompilasi ini berupaya untuk mencetus ekspresi terhadap transisi imej Nuklear Malaysia dengan lebih efisien.

Proses untuk menghasilkan penerbitan ini melibatkan pengumpulan koleksi poster daripada pelbagai pameran dalam skala yang besar khususnya dalam menyebarkan bidang penyelidikan sains dan teknologi nuklear kepada masyarakat. Entiti dalam pemilihan kompilasi poster adalah berdasarkan kepada penglibatan Nuklear Malaysia di dalam pameran yang jelas memberikan impak yang tinggi kepada agensi ini.

Oleh yang demikian, sejuta penghargaan diucapkan kepada semua yang terlibat dan sekaligus menjadi pendukung kepada penghasilan bagi penerbitan kompilasi Refleksi ini. Segala kebaikan yang diberikan daripada semua pihak dalam penerbitan Refleksi ini semoga akan diberikan ganjaran oleh-Nya.

Sekian, terima kasih
Sidang Editorial

Minggu Sains
Negara (MSN)
1 Jun-30 Julai

**PERTANDINGAN
MENULIS ESEI SAINS
DAN TEKNOLOGI
NUKLEAR
PERINGKAT KEBANGSAAN**

**1 Jun
- 30 Julai 2022**

**Sekolah Menengah Rendah
(Tingkatan 1-3)**

**Sekolah Menengah Atas
(Tingkatan 4-6)**

**Kategori Awam
(Umur 18 - 35 tahun)**

**Hadiah
Wang Tunai !!**

RM 1,500	Tempat Pertama
RM 1,000	Tempat Kedua
RM 700	Tempat Ketiga
RM 300	Tempat Keempat & Kelima
RM 2,000	Penyertaan Terbanyak (untuk sekolah sahaja)

**Imbas
kod QR
untuk borang
dan syarat
penyertaan**

Agensi Pelaksana:

NUKLEAR **AMELB** **PUSAT SAINS NEGARA** **"KEGUNAAN AMAN NUKLEAR"**

Rakan Strategik:

UMS **UTM**

Agensi Pelaksana

MINGGU SAINS NEGARA (MSN)

Pertandingan Melukis Poster Sains Peringkat Kebangsaan
1 Jun - 30 Julai 2022
Tema: "KEGUNAAN AMAN NUKLEAR"

Kategori:
Pelajar Sekolah Rendah (7 hingga 12 tahun)

Hadiah Wang Tunai !!

RM 500	Tempat Pertama
RM 300	Tempat Kedua
RM 200	Tempat Ketiga
RM 150	Tempat Keempat & Kelima
RM 1,000	Penyertaan Terbanyak (untuk sekolah sahaja)

Imbas kod QR untuk borang dan syarat penyertaan

Agensi Pelaksana: NUKLEAR, FELB, PUSAT SAINS NEGARA

Rakan Strategik: Kementerian Pendidikan Malaysia, Universiti Kebangsaan Malaysia, UMS, UTM, and others.

8

Refleksi

MINGGU SAINS NEGARA (MSN)

MINGGU SAINS NEGARA 2022
MERAKYATKAN SAINS MENSINKAN TEKNOLOGI
WWW.MINGGUSAINSNEGARA.COM

POCKET TALK
14 Jun 2022 (Selasa)

Dr. Azahari bin Kasbollah
"Perubatan Nuklear: Manfaat atau Mudarat?"
10.00 pagi - 11.00 pagi

Dr. Nor Azillah Fatimah binti Othman
"Radiasi dan Kita"
2.30 ptg - 3.30 ptg

MODERATOR
Nasaai bin Masngut

Agensi Pelaksana: NUKLEAR, FELB, PUSAT SAINS NEGARA

Rakan Strategik: Kementerian Pendidikan Malaysia, Universiti Kebangsaan Malaysia, UMS, UTM, and others.

9

Refleksi

MINGGU SAINS NEGARA (MSN)

MINGGU SAINS NEGARA 2022
MERAKYATKAN SAINS
MENGINSANKAN TEKNOLOGI
WWW.MINGGUSAINSNEGARA.COM

POCKET TALK
21 Jun 2022
(Selasa)

Dr. Hazmimi binti Kasim
"Halatuju Dasar Teknologi Nuklear Negara: Perlu ke?"
10 pagi - 11.00 pagi

Pn. Suzilawati binti Muhd Sarowi
"Forensik Nuklear, Tahukah Anda?"
2.30 ptg - 3.30 ptg

MODERATOR
Nasaai bin Masngut

Agensi Pelaksana:
NUKLEAR, FELB, PUSAT SAINS NEGARA

'KEGUNAAN AMAN NUKLEAR'

Rakan Strategik:
Universiti Kebangsaan Malaysia, Universiti Malaya, UMS, UTM, and others.

MINGGU SAINS NEGARA (MSN)

MINGGU SAINS NEGARA 2022
MERAKYATKAN SAINS
MENGINSANKAN TEKNOLOGI
WWW.MINGGUSAINSNEGARA.COM

BENGKEL KESELAMATAN KIMIA
22 Jun 2022
(Rabu)

Prof. Madya Ts. ChM. Dr. Darfizzi Derawi
UKM
ASAS PENGENALPASTIAN **HAZAD**,
PENAKSIRAN & KAWALAN RISIKO
10.00 pg - 11.00 pg

ChM. Nooradilah Abdullah
NUKLEAR MALAYSIA
KESELAMATAN **KIMIA**
DAN MAKMAL
11.00 pg - 12.00 tgh

Agensi Pelaksana:
NUKLEAR, FELB, PUSAT SAINS NEGARA

'KEGUNAAN AMAN NUKLEAR'

Rakan Strategik:
Universiti Kebangsaan Malaysia, Universiti Malaya, UMS, UTM, and others.

28-30 Jun 2022

Tempat: UKM

Anjuran:
Pusat Penyelidikan Teknologi Nuklear (NUKLEAR)

Maklumat Lanjut:
Ts. Chm. Dr. Syazwani Mohd Fadzi
03-8921 5929 syazwani@ukm.edu.my
Dr. Nurul Nafiqah Itam Sulaiman
03-8921 5470 nafiqah@ukm.edu

Hadiah Wang Tunai Ditawarkan

PERTANDINGAN DEBAT NUKLEAR Antara Varsiti

Tema:
"Nuklear Untuk Tujuan Keamanan"

Hadiah:
1st: RM 3000
2nd: RM 2000
3rd: RM 500

KEGUNAAN AMAN NUKLEAR

Rakan Strategik:

SIMPOSIUM REKTOR TRIGA PUSPATI (RTP)
29 Jun 2022 (Rabu)

"Demonstrasi Eksperimen S&T Nuklear"

Speaker	Topic	Time
Dr. Mark Dennis Usang	"OpenMC Monte Carlo Code - Menjejak Neutron"	10.00 pg - 10.30 pg
Dr. Mazleha Maskin	"Eksperimen Fizik Nuklear - ALARA Ooo La La"	11.00 pg - 11.30 pg
Pn. Khair'iah Yazid@Khalid	"Neutron Radiografi - Tulen atau Tiruan"	2.00 ptg - 2.30 ptg
Dr. Mohd Sabri Minhat	"Simulator RTP - Analog Masih Berbisa"	3.00 ptg - 3.30 ptg

Agen Pelaksana:
NUKLEAR, FELB, PUSAT SAINS NEGARA

Rakan Strategik:

Pameran HIKNM 2022 13-14 September 2022

PAMERAN HIKNM

INOVASI PENGURUSAN DATA KHIDMAT KEPAKARAN NUKLEAR MALAYSIA SECARA ATAS TALIAN MENGGUNAKAN PLATFORM TEKNOLOGI KM

Zuraide Zainudin, Siti Nurbaheyyah Hamdan, Zakaria Dris, Radhiah Jamalludin, Raja Jamal Raja Hedar, Mohamad Seluan Sulaiman dan Mohd Dzul Aiman Aslan

METODOLOGI

Selepas inovasi

Mula

Urus setia menghantar e-mel pautan BMKP kepada pegawai

Pegawai mengisi BMKP secara atas talian

Pegawai melihat semula maklumat dan membuat pembetulan sekiranya perlu

Pengurusan mengemaskini dan memantau BMKP secara atas talian

Urus setia mengimport data BMKP ke dalam format Excel

Urus setia membuat analisis menggunakan fungsi pivot Excel

Urus setia menyediakan laporan

Selesai

HASIL INOVASI

Data aktiviti khidmat kepakaran lengkap yang dikumpul di platform SPKMS diekspor ke dalam Excel untuk proses penajaman laporan

KELEBIHAN INOVASI

Elemen	Keterangan
Masa	• Menjadikan masa daripada 3 hari kepada 1 hari bagi penyediaan laporan berkala/tad-roc
Proses	• Meningkatkan keberkesanan dalam menyempurnakan tugas bagi proses penyediaan laporan dengan mengurangkan proses kerja sedia ada
Kaedah	• Mengurangkan kesilapan manusia (human error) semasa proses menyedia dan merekod data
Teknologi	• Menyediakan pangkalan data berpusat dalam persekitaran keselamatan ICT yang menjamin meningkatkan kelestarian disamping mengurangkan risiko kehilangan data
Penggunaan	• Dapat memenuhi keperluan dan ekspektasi pemegang taruh dalaman (pengurusan Nuklear Malaysia) dan luaran (agensi pusat) dengan lebih responsif, efektif dan efisien
Keselamatan	• Platform kolaborasi SP-KMS yang dilengkapi dengan perlindungan web melalui teknologi SSL (https) adalah selamat digunakan dalam melindungi data khidmat pakar daripada sebarang ancaman penggodaman siber

KESIMPULAN

1. Modul BMKP bagi merekod dan menyimpan data aktiviti khidmat kepakaran secara atas talian dalam portal SPKMS telah dibangunkan dengan tambahan fungsi baharu.
2. Inovasi ini dapat memberi manfaat kepada individu pegawai, pihak pengurusan dan urus setia (BSM) dalam pengurusan data, pemantauan dan pelaporan aktiviti khidmat kepakaran.
3. Kaedah baharu ini berjaya menambah minat individu pegawai untuk memberi input aktiviti khidmat kepakaran dengan lebih mudah.
4. Modul ini boleh diadaptasi sewajarnya untuk memenuhi keperluan pengurusan data dan menjadi sumber rujukan kepada jabatan/organisasi lain.

PAMERAN HIKNM

Theranostic Microparticles for Radio-Chemoembolization of Liver Cancer

Asseel HA, Wong YH, Wong EH, Azahari K, Yeong CH



Problem Statement: Chemoembolization and radioembolization are promising treatments for advanced stage liver cancer. However, the procedures are expensive and administered at separate occasions.

Current treatment: Chemoembolization (using Dox) Or Radioembolization (using Y-90)

Objective: To develop a novel biodegradable formulation containing both radioactive agent, Samarium-153 (^{153}Sm) and chemotherapy drug, Doxorubicin (Dox) for chemo-radioembolization of liver tumors.

Methodology: Non-radioactive $^{153}\text{SmAcAc}$ and Dox-loaded PHBV were synthesized using Water-in-Oil-in-Water solvent evaporation method. The microspheres were sent for neutron activation at Malaysian Nuclear Agency.

Results: $^{153}\text{SmDoxPHBV}$ Microspheres

Physicochemical properties:

- Biodegradable
- Diameter: $33.18 \pm 1.05 \mu\text{m}$
- Density: $1.75 \pm 0.14 \text{ g/cm}^3$
- Viscosity: 1.25 g/cm^3
- Specific activity: $5.86 \pm 0.02 \text{ GBq/g}$
- Dox content: $36.26 \pm 2.01 \text{ mg per g of microspheres}$
- Stable in saline & plasma
- Thermal stability up to 155°C

Mechanism of Action: In a single delivery system (one treatment) Targeted radiotherapy + chemotherapy + embolization (Radio-chemoembolization)

Theranostics: Beta radiation $E_\beta = 0.8 \text{ MeV}$, $t_{1/2} = 46.3 \text{ h}$, Gamma radiation $E_\gamma = 103 \text{ keV}$, Gamma imaging

Advantages:

- Synergistic effects (improve treatment efficacy)
- Theranostics (personalized treatment)
- Cheaper (locally produced)

Acknowledgment: This project is funded by MOSTI (FRGS/1/2019/SKK06/TAYLOR/02/3) and supported by the Malaysian Nuclear Agency. We would like to thank all the staff at MNA for their generous support.

HARI INOVASI & KREATIVITI NUKLEAR MALAYSIA 2022

PAMERAN HIKNM

PROGRAM AUDIT KESELAMATAN MAKMAL SECARA KENDIRI DAN NAZIRAN

Yii MW, Ruzalina B, Radhiah J, Norhayati A, Khaironie MT, John KS, Sofian I, Mohamad Azman CMI, Norshafarina I, Saroda I, Chal CK, Khakrol-Nizam M, Manisah S, Mohd-Zaid M, Munira SN, Nur-Khairunisa Z, Ros-Anita R dan Salmah M.

Jawatankuasa Audit (JKA) 2020/2021, JKSHE, Nuklear Malaysia

LATAR BELAKANG

- JKA di bawah JKSHE Nuklear Malaysia berperanan menjalankan audit dalaman di tempat kerja.
- Berpandukan dokumen eSHEMS, Akta 514, Akta 304 & akta lain yang berkaitan.
- Tempat kerja: Reaktor, Loji, Makmal, Bengkel & Kerja Lapangan
- Ahli JKA hanya 17 orang berbanding dengan 228 makmal perlu diaudit.
- Menghadkan pelaksanaan audit dalam setahun.
- Pandemik Covid-19 juga menyukarkan audit fizikal untuk dilaksanakan.

SISTEM PEMERIKSAAN KENDIRI DALAM TALIAN DIBANGUNKAN DI SharePoint NUKLEAR MALAYSIA

5 KRITERIA KESELAMATAN

- Perindungan Keselamatan dan Kesihatan Pekerja
- Keselamatan Tempat Kerja
- Bekuriti Kemudahan Makmal
- Keselamatan Kimia
- Keselamatan Biologi

ePEMERIKSAAN KENDIRI

3 OPSYEN PEMATUHAN

- Ya – Patuh
- Tidak – Tidak Patuh
- T/B – Tidak Berkenaan

79 KRITERIA SEMAKAN

KREATIVITI

- Pemeriksaan dilakukan sendiri dan berterusan.
- Hasil audit di SharePoint memudahkan proses analisa.
- Rujukan mudah di SharePoint oleh pengguna dan auditor pada bila-bila masa.
- Bilangan makmal diaudit meningkat.
- Pembelajaran kriteria keselamatan makmal secara berterusan.

KELEBIHAN PROGRAM

- Data audit disimpan secara dalam talian di SharePoint Nuklear Malaysia
- Makmal dapat dikenalpasti untuk pemantauan secara naziran
- Bilangan makmal diaudit meningkat berbanding cara konvensional
- Mudah melakukan usaha tambahbaik terhadap kriteria, isu-isu penting dan berulang

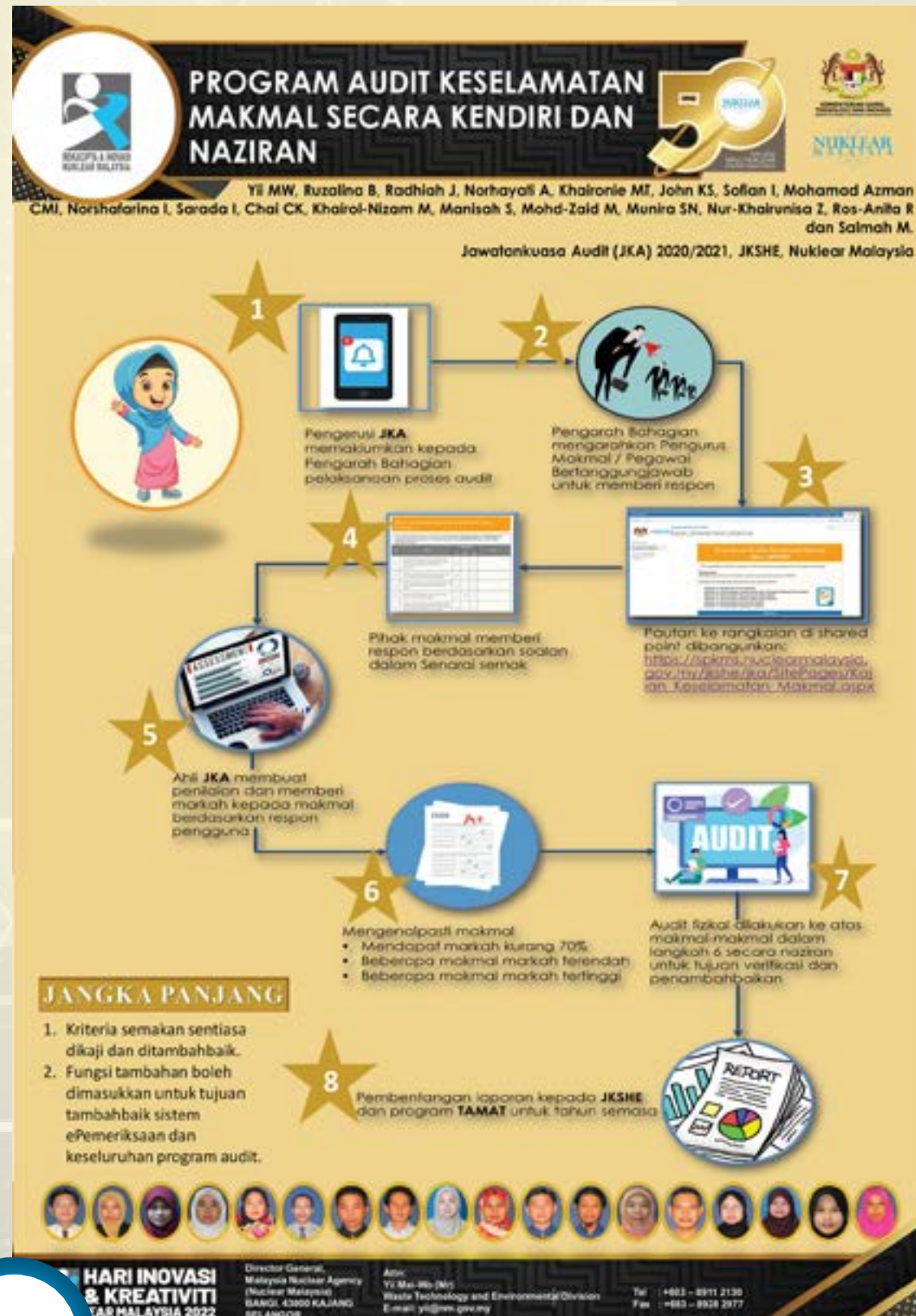
HARI INOVASI & KREATIVITI NUKLEAR MALAYSIA 2022

Director General, Malaysian Nuclear Agency (Nuklear Malaysia) SANGI, 43000 KAJANG, SELANGOR

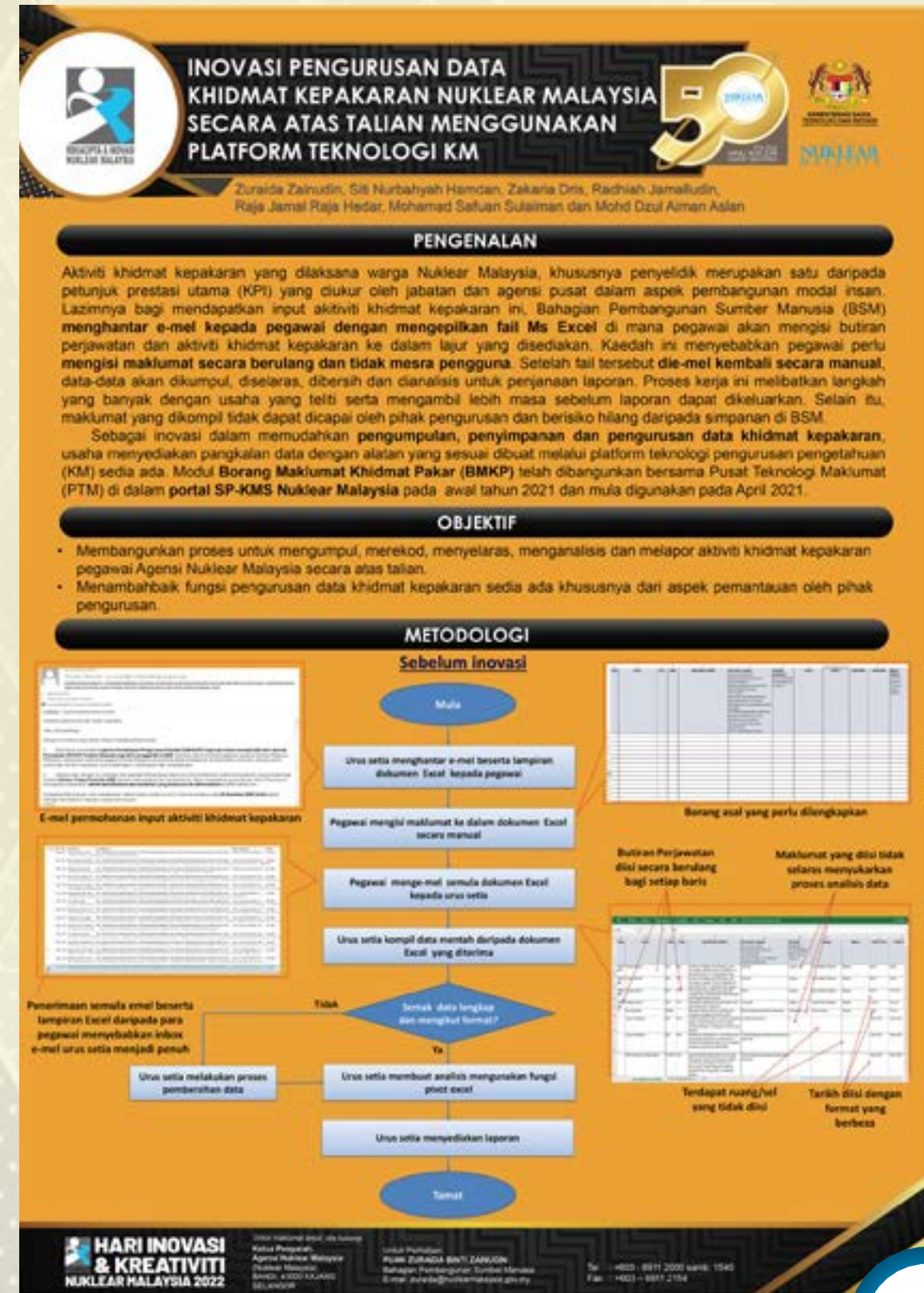
Attn: Yii Mei-Ru (M) Waste Technology and Environmental Division E-mail: yii@nma.gov.my

Tel : +603 - 8951 2130 Fax : +603 - 8928 2577

PAMERAN HIKNM



PAMERAN HIKNM



GPR RoadScan: Portable Mounting System

By: T S T Amran, M R Ahmad, M S M Amin, M F Osman, R M Zain, N A Masenwat, N A Razak, M A K Adnan, K N Mahat & H Ali

INNOVATION BACKGROUND

OVERVIEW

- Ground Penetrating Radar (GPR) is an imaging technology used for pavement testing, concrete structure and subsurface exploration.
- GPR uses electromagnetic wave propagation to image and identify changes in electrical and magnetic properties in ground.
- Most commercial GPR systems are developed as conventional ground-based radar system which conducted normally using a hand pushed cart type device.

The industry of GPR working requires night time road works or lane closure and off-boarding the emergency and highway facility maintenance team.

PROBLEM STATEMENT

In order to help mitigate the time taken to undertake the GPR scanning process, the GPR RoadScan: Portable Mounting System was designed to fully incorporate the GPR system into the vehicle including the survey wheel encoder for distance measuring and linear actuators to move the antenna up and down that give the GPR antenna air-coupled concept.

SOLUTION

The air-coupled concept is used, which allows as it can avoid road surface on, reducing the risk of damage to the antenna and without slowing down the vehicle. Besides, an angled antenna also can avoid the traffic jam and ensure the antenna is not damaged by the road surface.

NOVELTY

The portable mounting system design

GPR RoadScan: Portable Mounting System was designed to fully incorporate the GPR system into the vehicles including the survey wheel encoder for distance measuring and linear actuators to move the antenna up and down that give the GPR antenna air-coupled concept.

The mounting system provide an attachable & removable option for uses on sedan @ 4WD vehicles

This mount can easily broken down for storage & transportation

Versatility design to incorporate 3 different GSSI GPR antenna: 400 MHz, 300/800 MHz and 900 MHz GSSI GPR antennas into one mounting system

CONTRIBUTION TO SOCIETY

Save time

Safety

Easy To Use

The result is that in larger areas such as the highway and larger, cleared pedestrian areas, the vehicle can be used to cover the area more rapidly and reduce the number of shifts required to undertake the works, thus reducing public disruption.

This mount can be easily broken down for storage and transportation.

It is also eliminates the need for lane closures and provide a safer working environment. This mounting system provide an attachable and removable option for uses on sedan or four-wheel drive vehicle

PRODUCT

Product Description

- Complete, integrated with real-time acquisition/processing system for highway pavement inspection application.
- Installed with versatility design to incorporate with three different GSSI GPR antenna 400, 300/800 and 900 MHz.
- Rugged, design for vehicular installation (sedan @ 4WD).
- Installed with linear actuators to move the antenna up and down that give the GPR antenna air-coupled concept.

Collaborators

Commercial Potential

Construction and Civil Engineering industries eg. RMK, LPT, M&T, Seremban, PLUS, FELTA, GAMUDA, MOU, Unimap, MOA, Peracoda Sdn Bhd

MECHANICAL PUNCHER FOR TEST SAMPLE PREPARATION

By: Umni Tamimah Tukirin, M. Shariff Sattar & Suhaila Hani Ilias
MTEG, BTI

MECHANICAL PUNCHER FOR TEST SAMPLE PREPARATION

An efficient mechanical puncher is ready to be used and replace the expensive commercial puncher. A very simple operation that could be handled by any new operator in a short period of time.

INTRODUCTION

The puncher is developed from waste components such as door hinges, screwdrivers, and damaged cupboards. It is used to punch a sample according to the ASTM standard. It is efficient as many types of blades can be used with the puncher. This will reduce the cost of buying a commercial puncher for about RM2000. This will motivate good and safe practice in the workplace.

ADVANTAGES

- Many type of cutting blade could be mounted and used with this puncher.
- The puncher is developed from waste components (door hinges, screwdrivers, and damaged cupboards). No extra cost required.
- Ample space for sample placement before and during punching activity.
- No electricity is required for the operation.
- It could be used to punch a sample according to the ASTM standard.

CONCLUSION

The puncher is successfully developed to motivate good and safe practice in the workplace.

Figure 1: The newly developed puncher

PUNCHED EXAMPLES

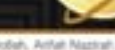
Figure 2: Dumb bell shaped

Figure 3: Button shaped



NUKLEA & KREATIVITI
NUKLEAR MALAYSIA

RADIOPROTECTIVE NANOPARTICLES FOR RADIOTHERAPY



50
SEKUTU
1963-2023



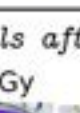
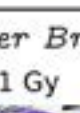
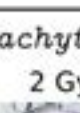
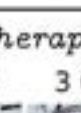
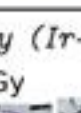
**NUKLEAR
MALAYSIA**

Irfan Norhidana Rahaman, Moor Nabillah Talle, Saion, Ridwan Abdulrahman, Norhayati Durbah, Anifah Nazrah Abdullah, Azzah S. Asaari, Marfat Algethami

1 School of Health Sciences, Universiti Sains Malaysia, Kubang Keran, Malaysia
 2 Department of Nuclear Medicine, Radiotherapy and Oncology, Hospital Universiti Sains Malaysia, Kubang Keran, Kelantan, Malaysia
 3 Physics Department, Faculty of Science, Taif University, Taif, Saudi Arabia
 4 Chemistry Department, Faculty of Science at Gera, South Valley University, Gera, Egypt
 5 Chemistry Department, Faculty of Science, Taif University, Taif, Saudi Arabia

RADIOPROTECTIVE FEATURES OF Fe-L2 NPs

Cells after Brachytherapy (Ir-192)

	0 Gy	1 Gy	2 Gy	3 Gy	4 Gy
MCF-7 cells + Fe-L2					
MCF-7 cells only					

Cells after 6MV of Photon beam

	0 Gy	2 Gy	4 Gy	8 Gy	10 Gy
MCF-7 cells + Fe-L2					
MCF-7 cells only					

Cells after 6MeV of Electron beam

	0 Gy	2 Gy	6 Gy	8 Gy	10 Gy
MCF-7 cells + Fe-L2					
MCF-7 cells only					

IRRADIATED SEWAGE SLUDGE AS SOIL CONDITIONER FOR SUSTAINABLE AGRICULTURE

Sarala Selambakkannu, Nor Azillah Fatimah Othman, Khomsaton Abu Bakar, Ting Teo Ming

Background

The National Water Services Commission (SPAN) governs centralized sludge management policy in Malaysia. The ultimate goals of SPAN are to reduce the amount of sludge generation, produce safe and hygienic material, and reuse the sludge for other applications. The common route used for the disposal of sludge in Malaysia is landfilling. Two significant concerns that arise from the landfilling of sludge are environmental issues and land availability. One of the most potential applications of sewage sludge is fertilizer. This research focuses on the plantation of Napier grass on soil mixed with irradiated sewage sludge. The uptake of the metal ion by Napier grass from soil amended with irradiated sewage sludge has been assessed thoroughly. On top of that, the psychological growth response of Napier Grass was evaluated as well.

Methodology

Liquid smoke

Growth response analysis

The average dry weight obtained for Napier shoot from control soil, non-irradiated and irradiated soil were approximately 20.20g, 30.07g, and 54.34g, respectively. The images of the root and shoot of the Napier grown in control soil, soil amended with non-irradiated and irradiated sludge powder were shown in FIGURE 1.

Results

Metal content analysis

The metal uptake by Napier grass from the soil amended with irradiated sludge was examined in the leave, shoot and root of the plants. The result obtained is displayed in TABLE 1. The metal content in leaves is almost insignificant. This indicates that the mitigation of metal from soil to the Napier plant occurs at a very minimal level.

Elements	Irradiated	Leave	Shoot	Root
Aluminium	1.12	0.068	0.035	0.044
Arsenic	0.0030	-	-	-
Cadmium	0.001	-	-	-
Chromium	0.0018	-	0.002	-
Copper	0.160	0.022	0.009	0.012
Iron	23.9	0.001	0.96	0.26
Lead	0.0028	-	-	-
Manganese	1.42	0.0022	0.0019	0.152
Nickel	0.0015	-	-	-
Potassium	0.917	-	-	-
Zinc	1.54	0.002	0.049	0.059

Novelty & Advantages

Conclusion

The sewage sludge is irradiated with an electron beam free of harmful chemicals, pathogens, and unpleasant odors. Moreover, the uptake of the micro-nutrients by plants becomes much easier and simpler, which supports the rapid growth. The sewage sludge as soil conditioner offers alternative method for sewage sludge disposal which reduces the impacts from landfilling and incineration. This also preserves the environment and human health air, water, and land pollution.

HARI INOVASI & KREATIVITI LEARN MALAYSIA 2022

Development of procedures on performing LASER Pointer (LP) Safety Evaluation and Hazard Analysis (1)

By: Shamesh Raj Parthasarathy, Zulkifli Yusof, Muhammad Shaheir & Aida Suzarrin

Introduction

Hand-held LASERs such as LPs have been widely used around the world with the most common used in presentations and demonstrations. These LPs are found in 3 main colors or wavelength, specifically red, green and blue. The power levels of the LPs are also varied ranging from safe level of less than 1mW to very dangerous level of 1W. The objective of this project is to develop procedures on performing safety evaluation and hazard analysis on LPs. Based on the power measured, the LPs will be classified and reclassified accordingly. Next, the Nominal Ocular Hazard Distance (NOHD) and the irradiance will be calculated, and compared with the Maximum Permissible Exposure (MPE).

Methodology

Wavelength & Output Power Measurement

Hazard Calculation & Analysis

Project Outcome & Impact

- Fully applied & at the same time updated regularly (Dynamic)
- Disseminate knowledge (awareness) on Laser Pointer Safety to public, industries, researchers, government & private entities.
- Research Paper publication & presentation
- Trainings & Awareness Program (LASER Safety)
- Guideline on Safe Laser Pointer usage (Standard Malaysia)
- First Hand Information and Facts on Laser Pointer Safety (scientific research explained in layman terms)
- Instill trust among public (social well being)
- Development on a more comprehensive & inclusive study on different Laser Pointers (High Power/Industrial)
- Research opportunities for researchers, academicians, students on LPs

HARI INOVASI & KREATIVITI NUKLEAR MALAYSIA 2022

Development of procedures on performing LASER Pointer (LP) Safety Evaluation and Hazard Analysis (2)

By: Shamesh Raj Parthasarathy, Zulkifli Yusof, Muhammad Shaheir & Aida Suzarrin

Know Your LASER Pointers (LPs): Awareness on the Safety for the Society

NOHD
Nominal Ocular Hazard Distance
(a distance)

MPE
Maximum Permissible Exposure
(an irradiance level)

After the irradiance falls below the MPE, the eye is not considered to be at risk of injury. Thus, the beam can be considered "eye safe" past the NOHD.

Within the NOHD, the eye is at risk of injury. The closer to the laser, the higher the risk.

1 mW LP (Key Chain);
Laser Hazard : Class 2
NOHD: 7m, No Skin hazard

1-4.9 mW LP (Key Chain);
Laser Hazard : Class 3R
NOHD: 16m, No Skin hazard

1-4.9 mW LP (Pen);
Laser Hazard : Class 3R
NOHD: 16m, No Skin hazard

5-20 mW LP (Medium size);
Laser Hazard : Class 3B
NOHD: 32m, No Skin hazard

30-50 mW LP (USB);
Laser Hazard : Class 3B
NOHD: 50m, Skin injury unlikely

50-150 mW LP (USB);
Laser Hazard : Class 3B
NOHD: 90m, Skin injury unlikely

Laser beams get wider with distance
(Divergence has been exaggerated vertically to show effect)

More hazardous closer to laser
Most or all of the beam can enter eye's pupil

Less hazardous farther from laser
Only part of the beam can enter eye's pupil

HARI INOVASI & KREATIVITI
NUKLEAR MALAYSIA 2022

Partially illustrated above content:
Directed: Shamesh Raj Parthasarathy
Radiation Safety & Health Division
Email: shamesh@nuklear.gov.my

Tel: +603 - 8911 2000 EXT 1152
Fax: +603 - 8911 2154

RADIATION WORKERS MANAGEMENT: MANUAL TO DIGITAL

Muhd Sarowi S¹, Hamdan S N², Tze Loong R Y¹, Samsudin N², Abd. Kadir A B¹, Abd Ghani N F², Aslan M D A², Konsoh J² and Hasan M H²

¹Health Physic Group, Radiation Safety & Health Division,
²Information Technology and Application Center, Technical Support Division,
³Secondary Standards Dosimetry Laboratory, Radiation Safety & Health Division,
Malaysia Nuclear Agency

BACKGROUND

- Malaysia Nuclear Agency (Nuclear Malaysia) has approximately 400 radiation workers.
- As a licensee, under Act 304, Nuclear Malaysia responsible to monitor an occupational exposure dose, training and medical check-up of the radiation workers.
- The Health Physics Group (KFK) of the Radiation Safety & Health Division is assigned and responsible in managing those radiation workers' aspect.
- Previously, these occupational dose was recorded manually to the individual dose exposure record namely LPTA/ABM 5 Seksyen B monthly and an excel file was used to monitor the latest radiation workers' training & medical check-up.

PROBLEM STATEMENT AND SOLUTION

- The task especially in recording an occupational dose to individual dose exposure record manually is time consuming and there is a chance of human error.
- Therefore, an improvement system is needed which is fast and can reduce human error.
- By integrating Nuclear Malaysia's online system that already in place which are the occupational dose results from the laboratory, eSSDL and agency's staff listing placement, Personnel Biodata System (Bioweb), the new system, **Radiation Workers Management System (SPPS)** was developed.

PRODUCT

- The SPPS automates the process of managing the records of the radiation workers
- Currently, radiation workers in the agency will be notified on the readiness of their exposure in the SPPS by email. Then, the verification by the Radiation Protection Officer (RPO) and radiation workers could be performed online. SPPS allows the radiation workers to print the result in pdf file and keep it as a hardcopy if necessary.

ADVANTAGES & IMPACT

- Speed and saved time
- Reduces human error
- Easy to use
- Saved storage area
- Improves agency's management efficiency towards radiation workers matter and could meet license requirement within the time outlined under the rule as enforced by the regulator.

NOVELTY

- The design of an occupational exposure record management system according to the requirements of Act 304.

Figure 1: Shows how verification process on occupational exposure was executed by the system.

Figure 2: Shows the transformation from manual to online system in recording & reporting an occupational exposure using form LPTA/ABM 5 Seksyen B.

HARI INOVASI & KREATIVITI
NUKLEAR MALAYSIA 2022

Partially illustrated above content:
Directed: Shamesh Raj Parthasarathy
Radiation Safety & Health Division
Email: shamesh@nuklear.gov.my

Tel: +603 - 8911 2000
Fax: +603 - 8911 2154

CHALCONE

Innovative Theranostic Agent for Future Colon Cancer Treatment

Rosniza Razali, Zainah Adam, Daryl Jesus Arapoc, Abang Aboul Rahim Ossen, Nurmaziah Mohammad Shafie, Azfar Hanif Abd Aziz, Nur Azizah Marsiddi

INTRODUCTION

Chalcone is a new compound produced from aldehyde and ketone derivatives reactions via Claisen-Schmidt condensation method. Physical nature of this compound is a light yellow powder with chemical formula $C_{15}H_{12}O$. Chemical characteristic of Chalcone has been confirmed using spectroscopic and FTIR methods. Chalcone possesses strong in vitro anti-cancer activity against colorectal cancer cells via apoptosis mechanism. This illustrates that Chalcone has the potential to be developed as a therapeutic agent for the treatment of colorectal cancer. Chalcone also exhibited $Tc-99m$ radiolabeling activity with promising radiolabeling results. This indicates that Chalcone has the potential to be developed as a new diagnostic radiopharmaceutical. The combined therapeutic and radiodiagnostic properties of Chalcone indicate that Chalcone has the potential to be further developed as a new theranostic radiopharmaceutical agent for diagnosis and treatment of colorectal cancer.

NOVELTY

A newly derived synthetic compound with promising anticancer and theranostic properties

APPLICATION

To be used for treatment and diagnostic of colon cancer

POTENTIAL USER

- Pharmaceutical industry
- Health industry
- Academician
- Researcher

BENEFITS

- Chalcone is a synthetic compound; therefore the production cost is lower than conventional isolated compounds.
- Production time is shortened compared to conventional isolation process.
- Innovative synthesis process resulted higher yield.

ECONOMICAL, SOCIAL & ENVIRONMENT IMPACT

- Reduce cost colon cancer management.
- Reduce dependency on natural resources.
- Improve quality of life of colon cancer patients.
- Improve the quality of the national healthcare system.
- Improve quality of knowledge and information.
- Generation of revenue through IP licensing.

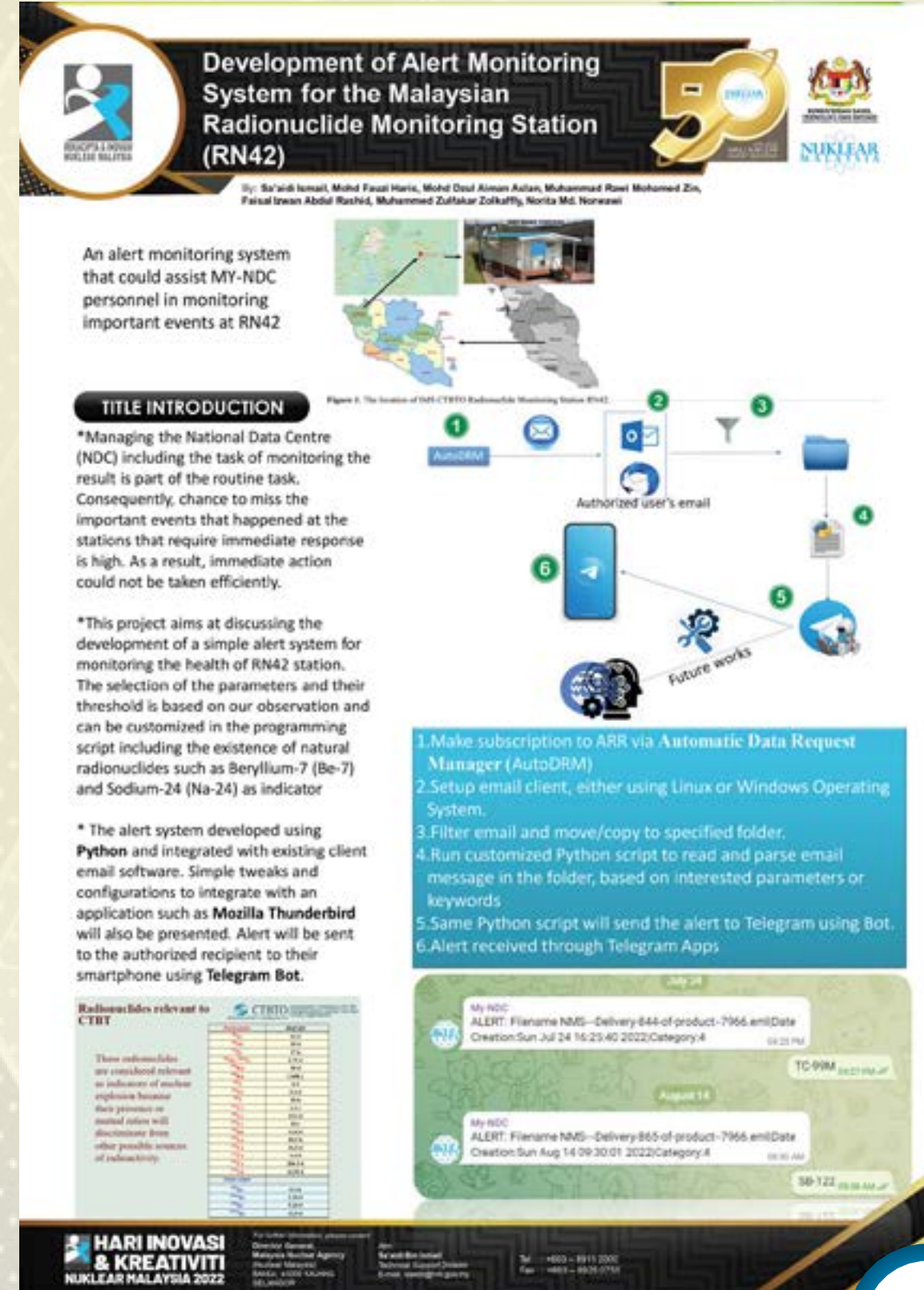
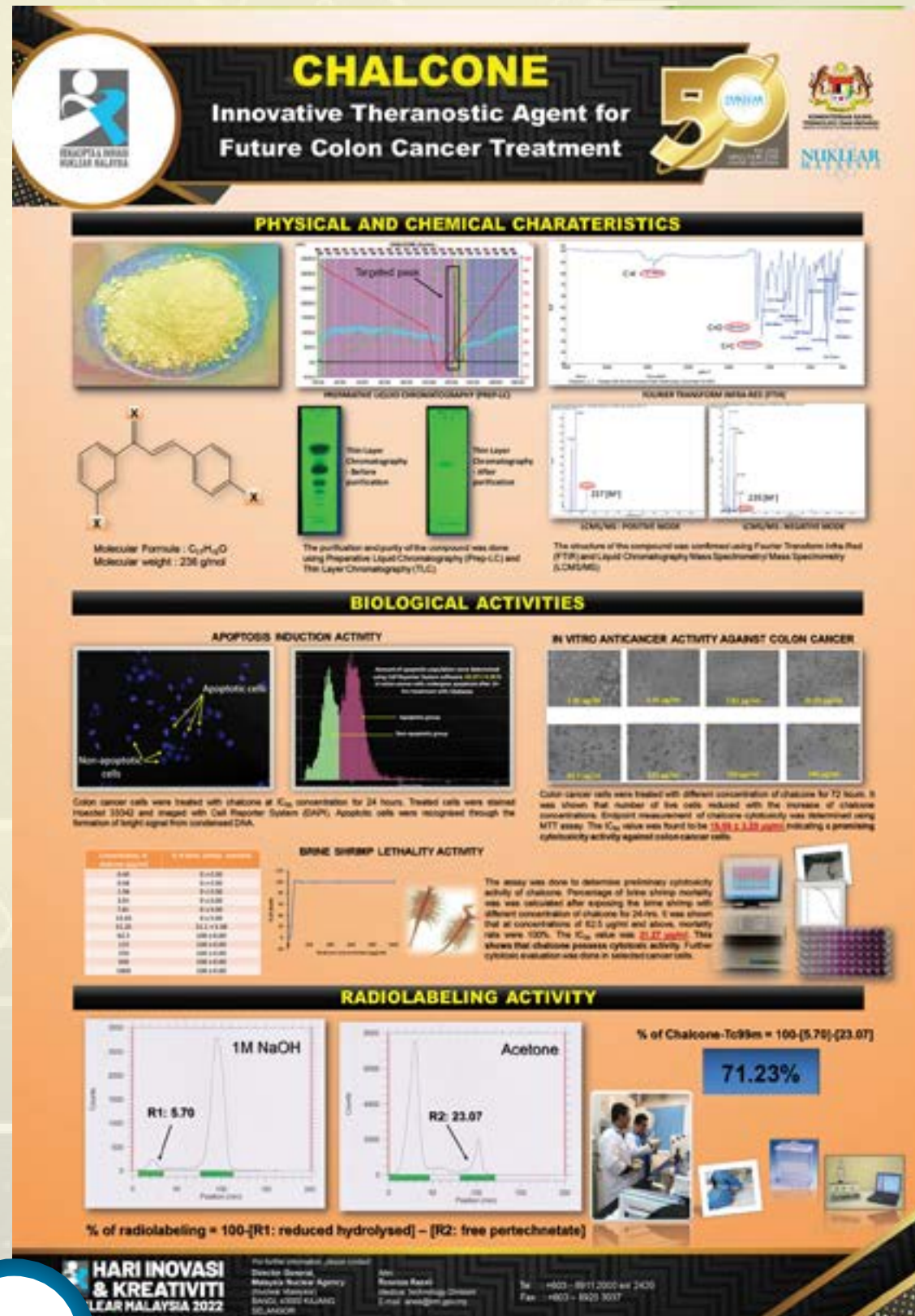
MARKET POTENTIAL

Colorectal cancer drug market size

The global colorectal cancer therapeutics market size stood at USD 9.26 billion in 2021 and is projected to reach USD 16.58 billion by 2026, exhibiting a CAGR of 7.83% during the forecast period.

POTENTIAL INDUSTRIAL PARTNER

Pharmaceutical industry



CENTRALIZATION FIRE ALARM SYSTEM (CFAS)

By: Nor Farhana Husna A Aziz, Giam Haddi Patei Mohamed, Maslina Mohd Ibrahim, Naida Yusup, Nabillah Ramli, Mohd Fauz Hanis, Chong Pui Yiong, Noorhazal Isahak, Isahak Ismail, Aulif Ashri

BACKGROUND

Fire alarm systems are important to make the building safe for the employees by providing prompt warning if a fire occurs. CFAS is the alarm system that used a low-cost general purpose electronic card with Ethernet interface by using microcontroller PIC18F4523 to read electronic indicators. The written code programmed for Ethernet communication include the internet protocol (IP) address that controlled by the switch. IP address is exclusively set for each electronic card. The alarm is triggered in the event of a fire and the alarm button turned to red at Emergency Control Centre by graphical based language using Microsoft Visual Basic 6.0.

PROBLEM STATEMENT

❌ Fast and effective emergency control ❌ emergency status or signal

PRODUCT

Easy programmable, Easy troubleshooting, Unique IP, Low cost

BENEFIT

- less expenses
- low maintenance cost
- No new wiring works
- Safety office
- Local expertise

Acknowledgement

This research was financial supported by Nuclear Malaysia. We thank IT, Electrical, UKF department for the success of the project.

Product at site

HARI INOVASI & KREATIVITI NUKLEAR MALAYSIA 2022

For further information please contact:
 Director General:
 Malaysian Nuclear Agency
 Nuclear Malaysia
 62000 KUALA SELANGOR

By: Nor Farhana Husna A Aziz
 Technical Support Officer
 Email: fahana@nma.gov.my

Tel: +603 - 8911 2000 ext. 1150
 Fax: +603 - 8911 2154

G² TAG SURVEY METER

By: Nor Arymaswati Abdullah, Azraf Azman, NurAira Abd Rahman, Maslina Mohd Ibrahim, Nabillah Ramli, Noor Farhana Husna A. Aziz

BACKGROUND

The G²Tag Survey Meter measures gamma and X-ray radiation with a Geiger Muller tube. The design specifications are tailored for industrial and environmental monitoring. This device is enhanced with Global Positioning System (GPS) module for automated location detection. The radiation data is stored in SD card and can be viewed in Google Maps or other equivalent applications. The device is capable to detect and measure radioactive contamination in geographic coordinates to media based. The device is embedded with LND 712 Geiger-Mueller tube and associated electronic components. The PCB comprises a high voltage circuit, pulse shaper, microcontroller, buzzer and power supply module. The power supply module covers 3.3 volts, 5.0 volts and other voltage levels according to PCB components requirements.

TECHNICAL FEATURES

- Controlled by membrane buttons
- Lightweight, ergonomics, sleek casing design and small
- 227.3 gram (including batteries)
- 13.1cm x 80.6cm x 2.5cm (LxWxH)
- Global Positioning System (GPS)
- Data storage function

ADD ON VALUES

- Lower cost for the industrial grade of gamma detector device.
- Innovative design: Integrated with GPS and data storage function.
- New local product. Available on the shelf.
- Enhanced and increase human capital in nuclear electronics.
- Open new business opportunities.

Product Dimensions

W, H, L, Time

GPS info, Dose rate, Date, SD card slot

Block Diagram

```

graph LR
    GM[GM tube] --> HV[HV module]
    GM --> Signal[Signal processing]
    Signal --> Micro[Micro controller]
    Micro --> Display[Display]
    Micro --> Buzzer[Buzzer]
    Micro --> Mem[Membrane button]
    Micro --> GPS[GPS]
    Micro --> Storage[Storage function]
  
```

Promote occupational health and safety in radiation technology related sectors such as NDT, oil and gas, hospitals, and universities in compliance with Act 304.

Tested and calibrated at Secondary Standard Dosimeter Laboratory (SSDL), Malaysian Nuclear Agency.

HARI INOVASI & KREATIVITI NUKLEAR MALAYSIA 2022

For further information please contact:
 Director General:
 Malaysian Nuclear Agency
 Nuclear Malaysia
 62000 KUALA SELANGOR

By: Nor Arymaswati Abdullah
 Technical Support Officer
 Email: arima@nma.gov.my

Tel: +603 - 8911 2221
 Fax: +603 - 8911 2154

Bismuth Oxide Nanoparticles (BiONPs): A Safe Radiobiological Enhancer for Breast Cancer Radiotherapy

Nur Hamidah Mohd Zainudin¹, Noor Nabillah Talik Sisin², Khairunisak Ab Razak³, Reduan Abdullah⁴, Wan Nordiana Rahman⁵

¹School of Medical Imaging, Faculty of Health Sciences, UniSZA, ²Medical Radiation Program, School of Health Sciences, USM, ³School of Materials and Mineral Resources Engineering, USM, ⁴Nuclear Medicine, Radiotherapy and Oncology Department, HUSM

BACKGROUND

The incidence of cancer has been increasing throughout the year. Therapeutic strategies in killing the cancerous tissue must be improved. Cancerous tissue killing can be further enhanced by introducing metallic nanoparticles (NPs) as radiosensitizers in radiotherapy.

IDEA/NOVELTY

Bismuth oxide nanoparticles (BiONPs) (Z=83) as a potential radiosensitizer. Criteria: Easy to synthesis, least toxic and biocompatibility properties.

PROJECT OBJECTIVE

Objective: To evaluate the potential of BiONPs to increase radiation treatment in breast cancer (MCF-7) cells and their side effects on the non-targeted MCF-7.

ANALYSIS

BiONPs boosted radiosensitization effects in treated cells compared to control cells.

Non-irradiated MCF-7 cells could maintain their cell viability for more than 80% after incubation with ICCM treated with BiONPs.

POTENTIAL

BiONPs are able to improve radiosensitization in radiotherapy. It is safe and does not significantly introduce side effects in the non-targeted cells.

IMPACT TO ECONOMY, SOCIETY AND ENVIRONMENT

Improve the effectiveness of radiotherapy. Improve the quality of life of cancer survivors. Beneficial to economy through the nanotechnology development.

Acknowledgment: This study is supported by the Ministry of Higher Education Malaysia for Fundamental Research Grant Scheme with Project Code: (FRGS/1/2020/STG07/USM/02/2).

HARI INOVASI & KREATIVITI NUKLEAR MALAYSIA 2022

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¹School of Medical Imaging, Faculty of Health Sciences, UniSZA, ²Medical Radiation Program, School of Health Sciences, USM, ³School of Materials and Mineral Resources Engineering, USM, ⁴Nuclear Medicine, Radiotherapy and Oncology Department, HUSM

BiONPs PREPARATION

Analysis of BiONPs using Field Emission Scanning Electron Microscope

IRRADIATION

Irradiation at 0 to 12 Gy with 6 MV photon beam

Bismuth oxide nanoparticles (BiONPs) was prepared through hydrothermal method.

CELL SURVIVAL ANALYSIS

Treated and control cells were subjected to irradiation at 0 to 12 Gy with 6 MV photon beam. Cells survival analysis for the treated and control group were compared.

CELL VIABILITY ASSAY

Treated and control cells were subjected to irradiation with 6 MV photon beam. Incubation for 1h. Collect and filter irradiated media. Transfer irradiated media to non-irradiated cells and incubate 48h. Add PrestoBlue reagent. Read samples with fluorescence microplate reader.

Acknowledgment: This study is supported by the Ministry of Higher Education Malaysia for Fundamental Research Grant Scheme with Project Code: (FRGS/1/2020/STG07/USM/02/2).

HARI INOVASI & KREATIVITI NUKLEAR MALAYSIA 2022

Azman Kamal Rat (AZK): The First Malaysia Hairless New Breed for Biomedical Study

Mohd Kamal NH, Azman M & Daryl JA

INTRODUCTION

- AZK rat underwent a selective in-breeding process at the In Vivo Research Laboratory, FRIM.
- It is a Sprague Dawley (SD) rat that has been bred by mating between them for 3 years.
- The project began in 2013 until the first hairless rats were discovered in 2016.
- The eye color of the AZK rat was red and its body was similar to that of the SD rat.
- Potentially to be used in biomedical research project with cost effective animal model.

SELECTIVE IN BREEDING PROCESS

The mating program was continued until 3 generations per year. The mating process was performed on year 2014 and continued to year 2015. Each year, the rats were mating until 3 generations. At end of 2015, sparse hairy rat was detected.

Advantages of AZK rat

- AZK rat is a **Malaysian breed**
- Skin can be examined directly
- Do not require shaving due to **lack of fur**
- Effect of allergen on rat's skin can be directly seen by naked eyes
- Tumor can be seen on its skin**
- Can be used for **BIOMEDICAL STUDY OF ANTI-CANCER, ANTI-ALLERGY AND WOUND HEALING STUDY.**
- Locally available**
- COST EFFECTIVE AND RELIABLE RODENTS MODEL**

REGISTRATION IN 'RAT GENOME DATABASE' WEBSITE

HARI INOVASI & KREATIVITI LEAR MALAYSIA 2022

INTERNET OF THINGS (IoT) BASED REAKTOR TRIGA PUSPATI (RTP) SIMULATOR FOR RESEARCH AND TRAINING (IoT-RTPSim)

By: Dr. Mohd Sabri Bin Minhat, Zareen Khan Bin Abdul Jali Khan, Mohd Khairulzwan Bin Abdul Manan, Dr. Mark Dennis Usang, Dr. Julia Binti Abdul Karim, Siti Fazlina Binti Mohd Ridhuan (UPM), Syazana Aqlah Binti Mad Saad (UPM), Siti Aishah Husna Binti Mohd Noor (UPM).

HOW DOES IT WORKS?

Application : ThingSpeak app

- Real life atmosphere of the nuclear Reactor is represented by RTP Simulator.
- Instructor explains how to **operate and monitor** RTP Simulator to visualize data and experiments through online meeting/sharing.
- Data will be collected through **ThingSpeak app**:
 - The simulator dynamically shows the **behavior and relationship** of all the reactor parameters.
 - The public is provided with a **beneficial understanding** of the safe reactor operation.

Project Description:
An educational tool to reproduce dynamic behaviors of nuclear reactor in Malaysia with maximum thermal power of 1MWth. Now, public is able to view all data reactor parameters through the RTP Simulator using IoT application.

ADVANTAGES & POTENTIALS

- Operation data is taken by real time
- Operation data storage represented in cloud platform
- Eliminates COVID-19 constraints
- Saving costs R,D & C funding
- Avoiding data duplication
- Raw data can be reuse for knowledge generation
- As a working tool to develop IoT in nuclear sector
- Geographical and time constraint are not an obstacle
- Workers can easily monitor all the reactor parameters
- Community can easily understand nuclear plant operation and application

IoT REAKTOR TRIGA PUSPATI SIMULATOR

LabVIEW **MATLAB** **RAOARS** **ThingSpeak**

HARI INOVASI & KREATIVITI NUKLEAR MALAYSIA 2022

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IOT RTP SIMULATOR

1. Operation
Staff operates RTP Simulator in the Instrumentation & Control Laboratory of Malaysian Nuclear Agency.

2. Data Storage
Simulation data (live data) is stored in the Cloud.

3. Acquiring Data
ThingSpeak (website) acquires Data from RTP Simulator.

4. Viewing Data
Download ThingView app on:
App Store
Google Play

5. Select options

1. Self-study

2. Physical lecture

3. Online Conference

Why should I learn this?
Coz it's important for public to learn about nuclear's safety and operation.

Learn about RTP Simulator with us!

- Visit our website to book a date: <https://urtp.nuclearmalaysia.gov.my/login.php>
- Join an Online Meeting with Nuclear Malaysia
- Explore a real-life experience of Reactor Triga Puspatti (RTP) simulator in Malaysia.

JOIN OUR CLASS NOW!

Channel ID : 1787462

- Fuel Temperature
- Pool Top Radiation
- Reactor Power
- Bulk Temperature
- Control Rod Position

HARI INOVASI & KREATIVITI NUKLEAR MALAYSIA 2022

Organized by: Malaysian Nuclear Agency
Venue: HARI INOVASI & KREATIVITI NUKLEAR MALAYSIA 2022
Date: 10-11 November 2022
Time: 9.00 AM - 5.00 PM
Ticket: RM100 (Adults), RM50 (Students), RM20 (Children)
Contact: 03-8951 2221, 03-8951 2154

GREEN CONCRETE

Muhammad Aidell Amir, Amer Hazreg Haron, Ahmad Hambali Ismail, Muhammad Izzuan Ghazali

INTRODUCTION

- Commercial concrete is made out of cement, aggregate, sand and admixture.
- 1m³ uses an average of 800kg of sand while an average of household (1000sqft) uses 22 tons of sand.
- Our objective is to replace 20% of sand with recycled plastic in M25 grade concrete.
- The world's annual consumption of plastic materials has increase from around 5 million tons in 1950s to nearly 100 million tons in 2001^[1].
- At a replacement ration of 20% by volume, this has the potential to save 1640 million tons of sand every year from being used in concrete mixes^[2].

APPLICATION

Might be used to build flexible concrete structure, from sidewalk and street barriers, to buildings and bridges.

BENEFITS & IMPACTS

- Cost Reduction: Reduce 20% of sand usage.
- Marketing Strategy: New eco-friendly product to Ready-mix concrete players.
- Environmental friendly: Potentially cut carbon emission, reduction in sand demand from the construction industry.
- Process improvement: Implement new technologies to improve the current product quality.

NOVELTY

- Reduce
- Reuse
- Recycle

FUTURE PROJECTS

Using plastic flakes by exposing with gamma radiation, then pulverizing to produce more stronger than conventional concrete.

ACKNOWLEDGEMENT

En. Khairil Nor Kamal - BTS
En. Noor Azreen - MSI, BTI
En. Ismail - PAT, BTI

PRODUCTS & ANALYSIS

Process Flow of Readymix Concrete

Figure 1: Green Concrete Compressive Strength

Date test	Age (days)	Reading	Compressive Strength (MPa)
18/08/2022	3	315	14
22/08/2022	7	389	17.3
29/08/2022	14	474	21.07
12/09/2022	28	582	26.7

Table 1: Green Concrete M25 Grade testing data

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MUDSkipper Scan[®]
Innovative On-site Radiometric Mapping System for Natural Radioactive Sediment Transport Monitoring and Efficient Coastal Erosion Monitoring

THE INNOVATION

In recent years, many countries face some issues with erosion in the coastal areas. Current technology used for shoreline coastal erosion management now use airborne, satellite and un-manned aerial vehicle (UAV) drone. However, these methods have an accuracy issue because of a limited supporting data by on-land remote sensing equipment for validation. Latest nuclear technology focus on mapping the sediment movement by collecting natural gamma radio-isotope sample and costing long time for spectrometry counting in the laboratory. The first in Malaysia, MUDSkipper Scan system will be used to collect total count data along 2-3 kilometres shoreline during low tides within 2-3 hours only! The MUDSkipper Scan system will be move along the beach, doing several profiles from the seawater line, till the dunes with 3-4 parallel profiles. The MUDSkipper name was chosen to replicate the movement of mudskipper fish because the system will collect data at every 10 meters position on the coastal area.

BENEFIT & IMPACT

Coastal erosion may lead to a variety of negative economic impacts. These can range from lost or damaged property or land to negative effects on tourism, shipping, trade, fishing, and other industries. For ecosystems, erosion translates into habitat loss as coastal wetlands deteriorate. The plants and wildlife that depend on these ecosystems are negatively impacted by the effects of erosion. Thus, early initiative to monitor the coastal erosion is crucial to prevent this environments impact.

MAPPING DATA

HARI INOVASI & KREATIVITI
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Director General,
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SANDI, KUALA KANGSAR
SELANGOR

50th Anniversary
NUKLEAR MALAYSIA

Dr. Mohd Anwar Rasyid Mohd Yusoff
Technical Technology Division
E-mail: rasyid@nma.gov.my

Tel: +603 - 8911 5221
Fax: +603 - 8911 2104



SISTEM PENGURUSAN PANGKALAN DATA (DBMS) UNTUK PROJEK R&D KUMPULAN E-TAG (BAS)

Oleh: Mohd Fairuz bin Khalid, Dr. Rahman bin Yacup, Dr. Kamarudin bin Samudung, Dr. Lakam anak Mejus, Nur Ruzanna binti Nurzahan

SISTEM PENGURUSAN PANGKALAN DATA (DBMS) UNTUK PROJEK R&D KUMPULAN E-TAG (BAS)

Tujuan sistem DBMS ini dibangunkan adalah sebagai satu platform atas talian bagi para penyelidik E-Tag (BAS) untuk menguruskan perihal projek R&D yang dijalankan dengan lebih efisien. Sistem ini terdiri daripada 3 pengguna utama iaitu pengarah BAS, pengurus dan penyelidik E-Tag. Sistem DBMS ini turut membangunkan 2 fungsi tambahan iaitu memuat naik & memuat turun hasil kerja penyelidikan dan juga "activity planner" bagi para penyelidik membuat perancangan aktiviti dan tugas yang dijalankan dalam projek R&D.

APLIKASI XAMPP

Rajah 1 menunjukkan Aplikasi XAMPP versi V3.2.4 yang digunakan untuk membangunkan sistem pengurusan pangkalan data (DBMS). Aplikasi ini menggunakan pelayar Apache untuk menghubungkan pengaturcaraan Hypertext Processor (PHP) dengan pangkalan data MySQL.

MODUL PENGURUSAN PROJEK R&D

Rajah 2 menunjukkan Halaman Log Akses untuk Modul Pengurusan Projek R&D. Modul ini digunakan oleh para penyelidik kumpulan E-Tag untuk menguruskan perihal projek R&D yang dijalankan. Perihal projek R&D merangkumi tajuk, latar belakang, objektif, milestone, aktiviti, hasil penyelidikan dan juga activity planner.

MODUL PEMANTAUAN PROJEK R&D

Rajah 3 menunjukkan Halaman Log Akses untuk Modul Pemantauan Projek R&D. Modul ini digunakan oleh pengurus E-Tag dan pengarah BAS untuk memantau dan juga menilai progres dan pencapaian projek R&D yang dijalankan oleh para penyelidik kumpulan E-Tag.

KESIMPULAN

Sistem DBMS ini menyediakan dua modul yang berbeza untuk kegunaan para penyelidik E-Tag, pengurus E-Tag dan pengarah BAS. Modul Pengurusan Projek R&D mampu memudahkan para penyelidik E-Tag menjalankan tugas pengurusan projek R&D. Manakala, Modul Pemantauan Projek R&D dapat membantu pengurus E-Tag dan pengarah BAS membuat pemantauan ke atas progres dan pencapaian projek R&D dengan efisien.

HARI INOVASI & KREATIVITI
NUKLEAR MALAYSIA 2022

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Dr. Mohd Fairuz bin Khalid
Division of Environmental & State
Techniques (DST)
E-mail: fairuz@nma.gov.my

Tel: +603 - 8911 2000 (ext. 1836)
Fax: +603 - 8911 2104

MyFlexiDet 50th Anniversary NUKLEAR MALAYSIA

Khairiah Yazid@ Khalid, Azraf Azman, Julie Andrianny Murshidi, Rafhayudi Jamro, Lojius Lombigit

MyFlexiDet :Flexible Interchangeable Detector

INTRODUCTION

Currently, the budget for R&D is limited but there is an urgent approach to guarantee positive progress in R&D activities. Hence, the Neutron Beam Application team has reinvented digital imaging detector suitable for neutron and X-ray imaging activities at Nuclear Malaysia. A new indirect digital imaging detector called MyFlexiDet is locally integrated and can be used either for neutron or x-ray imaging activities. An indirect imaging detector incorporates a scintillator screen with an optical image sensor. Compared to direct imaging detectors such as Flat panel, this indirect imaging detectors are significantly affordable. The cost of this detector depends on the resolution of the image sensor and type of scintillator screen.

FEATURES

- ✓ **Locally assembled**
- ✓ **Affordable** indirect imaging detector
- ✓ **Mobile**
- ✓ **Interchangeable camera** based on application
- ✓ **Interchangeable scintillator** screen (for neutron or x-ray)
- ✓ **Flexible** imaging environment, can be used for neutron imaging or x-ray imaging

Camera	Key Features	Image Sensor	Total Pixels	Pixel Size	Interface	Cost
Low light application	• Low light application	CCD	4.0 Megapixels	1800	25-30K	
High resolution	• High resolution			4.54 µm		
High sensitivity	• High sensitivity			3750 x 2300		
Cooled -35°C cooling	• Cooled -35°C cooling					
14-bit 6000 levels digital output	• 14-bit 6000 levels digital output					
Fast, compact	• Fast, compact	CMOS	2.2 Megapixels	1800	15-17K	
More 8-bit	• More 8-bit					
Industrial Application	• Industrial Application	CCD	1.3 Megapixels	Review	15-12K	
More 8-bit	• More 8-bit					

Detector	Type	Cost
Indirect digital detector	• Locally assembled	
	• ~RM400-600 depends resolution image sensor and type of scintillator screen	
	• Low maintenance cost	
Direct digital detector	• Import from overseas	
	• ~RM500-500K	
	• High maintenance cost	

Scintillator	Application	Efficiency
LiFZnS scintillator IC-TRITEC	Thermal Neutron	• High resolution
		• GE-75% low noise
Calcium Tungstate CAWO OG-14	X-ray	• Fast conversion
		• reasonable X-ray absorption in the 20-100 keV

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 Director General
 Malaysia Nuclear Agency
 Kuala Lumpur
 50450 KUALA LUMPUR
 Tel: +603-8911 1221
 Fax: +603-8911 2154

MyFlexiDet 50th Anniversary NUKLEAR MALAYSIA

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FLEXIBLE & MOBILE

RADIOGRAPH IMAGES

NEUTRON	X-RAY

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 Director General
 Malaysia Nuclear Agency
 Kuala Lumpur
 50450 KUALA LUMPUR
 Tel: +603-8911 1221
 Fax: +603-8911 2154

POTENTIAL VALUE ADDED ON SLAUGHTER HOUSE BLOOD VIA RADIATION TECHNOLOGY FOR MULTIPLE INDUSTRIAL APPLICATION

By: Khomsaton Abu Bakar, Sarada Idris, Nurhafarina Ismail, Sarala Selambakkannu

INTRODUCTION & INNOVATION

Blood rich with protein is the first by-product that is obtained after slaughter, but is commonly discarded or not fully utilized. It is a red fluid, which is made up of water, cells, enzymes, proteins, and other organic and inorganic substances that can be separated into 2 fractions, the cellular fraction (30-40%) and plasma(60%). The value of blood can be increased by separating the blood into plasma and cellular fraction that can be done by ionizing radiation and even ionizing radiation reduce contamination of blood during collection process. Ionizing radiation able to modify the primary structure of proteins which consist of polypeptide chain of amino acid through fragmentation, cross-linking and aggregation process. Radiation dose plays a major role in determining the application of modified protein formed from radiation.

PROTEIN STRUCTURE

PROBLEM STATEMENT

Environment Issues.
Blood as potential organic pollutant which degrades with difficulty and contribute to high COD, BOD and colour in slaughterhouse wastewater and can have major impact on environment if it is not adequately treated.

Health Issues.
Blood from slaughterhouse as sources of diseases

- Viral infections- The Hepatitis B virus(HBV), Hepatitis E virus (HEV), Rift Valley fever virus(RVF).
- Bacterial infection: Q fever, Salmonellosis, Bovine tuberculosis
- Parasitic infections- Echinococcus, Toxoplasma gondii.

OBJECTIVES

- To improve separation of plasma and cellular fraction.
- To characterize antimicrobial properties of plasma
- To improve environmental problem in slaughter house(COD & BOD reduction in wastewater)
- To control blood-borne diseases in slaughterhouses

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For further information, please contact:
Sarala Selambakkannu, Sarada Idris, Nurhafarina Ismail, Khomsaton Abu Bakar
Tel: +603-8911 1221
Fax: +603-8911 2154

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BENEFITS & ADVANTAGE

Ionizing Irradiation

- Simple and easy to automation and tailored the polypeptide protein for specific application
- Faster processes to create useful bioactive peptide.
- Improve the hygenity of irradiate blood.
- Improve blood separation process.

Conventional process

- Separation blood by centrifuge at specific condition(low temp and high rpm) – 15-30 min
- Bioactive peptide from polypeptide assist by specific enzyme at critical condition.- 3-7 days.

Time consuming

TECHNICAL/METHOD

APPLICATIONS

FOOD

- Whole animal blood as protein source in Spanish sausage.
- Porcine fibrinogen, thrombin as binder in restructured meat product.
- Porcine, chicken and bovine plasma as Protease inhibitor in surimi and cake

MEDICAL

- Bovine thrombin used to Promote blood coagulation, treatment of wound, hold skin graft in place.
- Bovin plasma used as medium for the growth of probiotic bacteria (Lactobacillus sp.)
- Bovine fibrinogen used as reagent for routine blood clotting in serology laboratories

INDUSTRIES

- Hemoglobin as Food source for carnivorous fish or shrimp in aquatic feed and pet food.
- Whole animal blood cow, sheep, pig chicken as protein source in pet food.
- Porcine, chicken and bovine plasma as Protease inhibitor in surimi and cake

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For further information, please contact:
Sarala Selambakkannu, Sarada Idris, Nurhafarina Ismail, Khomsaton Abu Bakar
Tel: +603-8911 1221
Fax: +603-8911 2154

MICROWAVE WELDING OF THERMOPLASTIC USING SILICON CARBIDE NANOMATERIAL AS NOVEL SUSCEPTOR

P. Y. Foong¹, C. H. Voon¹, B. Y. Lim², P. L. Teh³, M. A. Rojan³

¹Institute of Nano Electronic Engineering, Universiti Malaysia Perlis, Seruh, 01000, Kangar, Perlis, MALAYSIA
²Faculty of Chemical Engineering Technology, Universiti Malaysia Perlis, Aiput, 02600, Arau, Perlis, MALAYSIA
³Faculty of Mechanical Engineering Technology, Universiti Malaysia Perlis, Pauh, 02600, Arau, Perlis, MALAYSIA

ADVANTAGES

- Microwave welding is a relatively **cost saving** method because only a domestic oven is required.
- The process flow of microwave welding is **simple and safe** that required only three steps.
- Microwave welding is also a **time and power saving** methods due to the volumetric heating principle.
- This technology and SiCNWs susceptor used is **environmental friendly and biocompatible**.

PROCESS FLOW

ACKNOWLEDGEMENT

This work was supported by the Department of Education, Ministry of Education Malaysia (MOE) through Fundamental Research Grant Scheme (FRGS/1/2019/TK05/UNIMAP/02/7).

NOVELTY

- Microwave welded joint is **275% stronger** than the neat plastic product.
- Highest joint strength of **2.66 MPa** was achieved which is highest than previous reported results.
 - ◆ 2.09 MPa for nanographite.
 - ◆ 2.42 MPa for CNTs.
- SiCNWs not only served as **microwave susceptor** in microwave welding, but also as a **nanofiller** in the formation of nanocomposite.
- The mechanical properties (tensile and modulus of elasticity) of welded joint was **enhanced** after microwave welding due to the **formation of nanocomposite layer** at the joining interface.
- Nanocomposite layer only formed at the joining interface, **without** altering the dimension of the plastic product.

COMMERCIALIZATION

- Increase the productivity of industry
 - ◆ Welded joint can be formed within seconds.
- Help industry to fulfil customer requirement
 - ◆ Applicable on plastic with any geometry
- Reduce the processing cost

MARKETING TARGET

- Plastic manufacturing industry
 - ◆ Automotive industry
 - ◆ Medical industry

CONCLUSION

- With rapid, safe and simple microwave welding technology, microwave welded joint was successfully developed by employing SiCNWs as susceptor.
- The welded joint formed shows improved joint strength due to the formation of nanocomposite welded joint layer at the joining interface.

PUBLICATION

Accepted for Publication in:
 Chinese Journal of Polymer Science (IF: 3.815)
 Journal of Reinforced Plastic and Composites (IF: 3.383)

paniMmagnetic

Heliyati AHS, Muhammad Mahyiddin R, Mohd Nazim M, Norizah AR, Azizan A, and Nurul Huda O

PaniMmagnetic-A new EMI Shielding Film

A free-standing film made by copolymerization of two different polymers, polyaniline (PANI) and poly(methyl methacrylate) (PMMA). Benefiting from good conductivity of PANi and high optical characteristics, together with excellent scratch resistance of PMMA, this film provides good electromagnetic shield material for today's electronic devices.

INTRODUCTION

Electromagnetic Interference (EMI) is an interference (unwanted noise), in an electrical circuit. It caused by an outside source and cause malfunction to electronic devices or cause them to operate poorly or even stop working.

RESULTS

The Shielding efficiency of PMMA/PANI copolymer is 2x than pure PMMA. PANi eases the EM wave to be reflected and reduce the probability of the EM waves to transmit through the material.

NOVELTY & INVENTIVENESS

Steel (common EMI shield material) is heavyweight, high cost to fabricate on a large scale, prone to corrode, and lack of flexibility. Since PMMA is a polymer, it is a lightweight material with better corrode resistance which makes a suitable candidate as a new EMI shielding material.

OBJECTIVE

To produce a new EMI shielding material with better EMI shielding properties but at lower production cost by copolymerization PANi with PMMA.

METHODOLOGY

PMMA was copolymerized with 1.5 M HCl doped PANi (1:3 PMMA:PANI ratio) via free radical copolymerization reaction using benzoyl peroxide initiator for 2 hrs. The precipitate obtained from the polymerization reaction was dried in an oven overnight followed by solvent casting method using NMP to yield a free-standing thin film.

CONCLUSION

PaniMmagnetic is expected to be commercially used in EMI shield application due to its cost-effectiveness, and ease to fabricate using simple equipment and processing, but with better EMI shielding performance. This film is believed to open the door for next-generation cost-effectiveness EMI shielding material in many electronics applications.

NUCLEAR FORENSIC LIBRARY MANAGEMENT SYSTEM (MyNFL)

Dr. Hishamuddin Husain, Dr. Zalina Laili, Nadira Kamarudin, Wilfred Sylvester Paulus, Ahmad Hasrulhadi Che Kamaruddin, Muhammad Azfar Azman, Dr. Muhammad Ravi Mohamed Zin

MYNFL INTERFACE & PROCESS FLOW

1 • Identifying Human Resources

2 • Use of existing information to determine characteristics of the radioactive materials

3 Understanding signatures in materials

4 Nuclear or other radioactive material sample archive (e.g. DSRs & SRS inventory)

5 Library development and data entry

6 Radioactive Waste

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For further information, please contact:
 Director General,
 Malaysian Nuclear Agency
 Nuclear Technology Division
 61000 PETALING JAYA
 SELANGOR

Dr. Hishamuddin Husain
 Technical Technology Division
 E-mail: hishamuddin@nuklear.gov.my

Tel: +603 - 8911 2000 (Ext. 1086)

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MyNFL

Nuclear Forensic Library Management System (MyNFL) - a website that allows users mainly researchers and nuclear forensic officers to add, update and delete information on nuclear elements. It enables comparisons to information on known materials and data obtained from analytical measurements of nuclear or other radioactive materials found out of regulatory control.

INTRODUCTION

- MyNFL is a system for the identification of nuclear and other radioactive materials found out of regulatory control
- It comprises reference information and subject matter expertise on nuclear and other radioactive materials to identify the materials out of regulatory control
- Casual users are only be permitted to view the information posted by the admins on the home page and search for any keywords related to the elements posted
- Admin are permitted to view and manage listing tab and information to be shown to other users on the home page and search directories. Manage listing includes actions such as add, update, and delete permanently
- For security reason, super admin has an authority to assign admin rules and give permission to casual users in accessing the system

ROLES OF MyNFL

- Provides the information for nuclear security investigation to the policy makers, competent authorities, law enforcement officials, and technical personnel
- Can be used to respond appropriately which answering various questions regarding nuclear and other radioactive materials in support of investigations when they are detected out of regulatory control
- Identify intended material uses, possible origins, connections between different cases involving illicit trafficking, and pathway or trafficking route analysis

NOVELTIES AND ADVANTAGES

- The only Nuclear Forensics project in Malaysia supported by IAEA
- The only national forensics library (NFL) developed locally
- Comply with the IAEA guidelines and standard IAEA-TDL-009
- User-friendly system to the users and contributors
- High traceability on retrieval the information
- High security access control
- Low cost of maintenance

ACKNOWLEDGEMENT

We gratefully acknowledge the support from Malaysian Nuclear Agency and the IAEA for the guides and funding of CRP Project No.23096

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For further information, please contact:
 Director General,
 Malaysian Nuclear Agency
 Nuclear Technology Division
 61000 PETALING JAYA
 SELANGOR

Dr. Hishamuddin Husain
 Technical Technology Division
 E-mail: hishamuddin@nuklear.gov.my

Tel: +603 - 8911 2000 (Ext. 1086)



INTERCEPTOR




By: Che Mat Isa M.A, Farid M.F, Md Dan R, Kassim M, Mohamed K.N, Mansor I, Mat Zin M.R, Amir S.M.M, Ligam A.S, Mutalib R, Ikhsan N.A, Anuar A.A.

(INTEGRATED INTERCEPTOR COLLECTOR SYSTEM FOR RIVER SOLID WASTE MANAGEMENT COMBINED WITH RADIATION TECHNIQUE)

Provides the solution for river solid waste pollution problem. The Integrated Interceptor Collector System works to collect the organic and non-organic floating waste that pollutes the river.

BACKGROUND OF INNOVATION

River pollution in Malaysia is in increasing pattern every year and this situation has disrupted the river flow. This leads to poor water quality, destruction of the river ecosystem and eventually the river flow becomes narrow. This contributed to the major flash floods in the country.

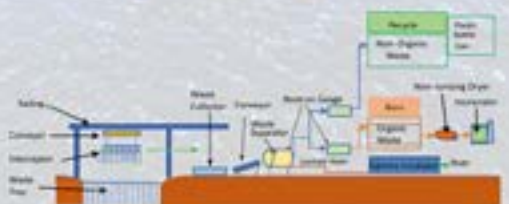
Integrated Interceptor Collector System for River Solid Waste Management, which provides the solution for river solid waste pollution problem. The Integrated Interceptor Collector System works to collect the organic and non-organic floating waste that pollutes the river. This system consists of Interceptor (waste grabber), waste trap, conveyor system, waste collection point, waste separation machine, non-ionizing heating (dryer), neutron moisture gauge, gamma irradiator and incinerator.

The development of the Integrated Interceptor Collector System for River Solid Waste Management is the answer to overcome the river solid waste pollution problem to ensure the sustainability of the river.

BEFORE



INNOVATION



AFTER



NOVELTY OF INNOVATION

Solving the problem of river solid waste pollution includes organic and non-organic solid wastes using the designed Integrated Interceptor Collector System. In the real situation at maximum operation, the system operates 24 hours with 2 interceptors continuously. The system is also designed to operate at extreme conditions such as bad weather, flash flood etc. It is an automated system where the waste trap will be raised automatically in the event of a major flood. This allows the water to flow without interference from the waste traps.



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For further information, please contact:
Director General,
Malaysia Nuclear Agency
Bukit Jalil, Kuala Lumpur
54000 KUALA LUMPUR

Dr. N. Dr. Mohamed Anwar Bin Che Mat Isa
Technical Support Director
Email: n_a_anwar@nma.gov.my

Tel: +603-8911 5221
Fax: +603-8911 2154



INTERCEPTOR




By: Che Mat Isa M.A, Farid M.F, Md Dan R, Kassim M, Mohamed K.N, Mansor I, Mat Zin M.R, Amir S.M.M, Ligam A.S, Mutalib R, Ikhsan N.A, Anuar A.A.

(INTEGRATED INTERCEPTOR COLLECTOR SYSTEM FOR RIVER SOLID WASTE MANAGEMENT COMBINED WITH RADIATION TECHNIQUE)

Provides the solution for river solid waste pollution problem. The Integrated Interceptor Collector System works to collect the organic and non-organic floating waste that pollutes the river.

DESIGN OF PROJECT

This system operates when the wastes (organic and non-organic) carried by river currents accumulate in the waste trap. When the accumulated waste is trapped, the water level will rise due to the obstacle to the river flow, and this will be detected by the sensor of the trap system. The sensor will give signal to the system to start operating. The waste interceptor will move towards the waste trap using a conveyor. The interceptor will be lowered automatically to pick up the waste collected in the waste trap. Then, the waste will be taken to the waste collection division. The collected waste will go through a separation process using a separation machine where the organic waste will be dried before it is incinerated. While non-organic waste will be recycled according to the type of waste.

Non-ionizing heating is used for heating purposes in solid organic waste and recycling waste. This is intended to lower the moisture level of the waste to be processed. The moisture content in each process will be measured using neutron moisture gauge and the amount of hot air will be adjusted so that the waste gets a moisture value in each drying process. The waste separation process also produces leachate water. This leachate water will be treated using gamma radiation for removal of organic load in terms of biological and chemical oxygen demand before the water is release back to the river.

The system will be operated based on the water level elevation sensor. The system will stop operating and be in standby mode after the water level has decrease. The entire system operates automatically and only one operator is in charge during operation and on process maintenance.

BENEFIT AND IMPACT OF INNOVATION

ECONOMY

1. Technology developed is from local technology.
2. Reduce the cash flowing out when purchasing nontocal technology or products for river cleaning.
3. Reduce the operation cost.
4. Increase and boost the country's economy on the construction and manufacturing industry.
5. Increase the country's economy when the system can be marketed abroad.
6. To develop local expert in river solid waste pollution problems

SOCIETY

1. The cleanliness and ecosystem of the river is preserved.
2. Improving the socio-economy of the people around the river such as river fishing activities.
3. A place for recreation, jogging, camping if the river is protected from river pollution.

ENVIRONMENT

1. Reduced the river pollution from waste such as organic and non-organic
2. Preservation of the river increases the population of fish, plants, and others.

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For further information, please contact:
Director General,
Malaysia Nuclear Agency
Bukit Jalil, Kuala Lumpur
54000 KUALA LUMPUR

Dr. N. Dr. Mohamed Anwar Bin Che Mat Isa
Technical Support Director
Email: n_a_anwar@nma.gov.my

Tel: +603-8911 5221
Fax: +603-8911 2154

GAMMA RADIATION-SYNTHESIZED FUEL CELL ELECTROCATALYST

By: Choo Thye Foo, Nur Ubaidah Saidin, Nurazila Mat Zali, Kok Kuan Ying, Leo Kwee Wah, Rozan Mohamad Yunus, Wong Wai Yin & Lim Kean Long



GAMMA eCAT

- A novel electrocatalyst that synthesized by a facile gamma radiation technique
- A cost-effective non-platinum group metal (non-PGM) electrocatalyst for fuel cell applications
- An electrocatalyst that utilizes the synergistic effect of cobalt oxyhydroxide nanoparticles and graphene oxide
- A high-performance competitive electrocatalyst for the replacement of expensive platinum/carbon electrocatalyst

MOTIVATION

Hydrogen and its applications could very well become our saving grace



Population growth



Improve the air



Environmental impacts

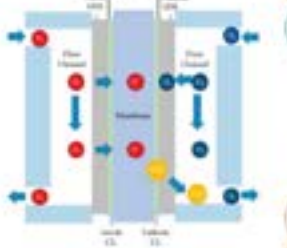


Ensure secure and reliable energy



Reduce greenhouse gas emission

HYDROGEN FUEL CELL



Technical barriers:

- Sluggish ORR process
- High overpotential
- High Pt loading
- Catalyst durability



POM-FREE

Efficiency

Durability

Fe Co Ni Mn Cu

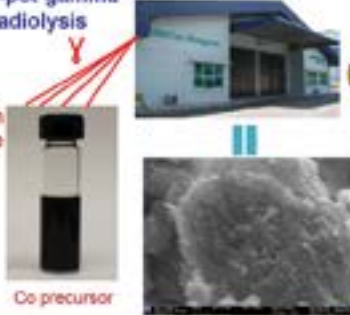
HIGHLIGHT

Eco-Graph

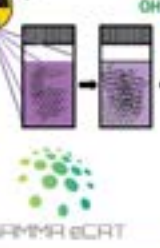


In-house synthesized high quality graphene from battery waste

One-pot gamma radiolysis



Co precursor



GAMMA eCAT

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Participating institutions, please contact:
Director General,
Malaysia Nuclear Agency
JALAN INOVASI
63000 KUALA
SULAWANG

Dr. Choo Thye Foo
Materials Technology Group
Industrial Technology Division
E-mail: ctfo@nuklear.gov.my

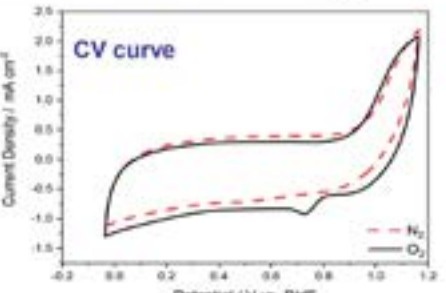
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Fax: +603 - 8911 2154

GAMMA RADIATION-SYNTHESIZED FUEL CELL ELECTROCATALYST

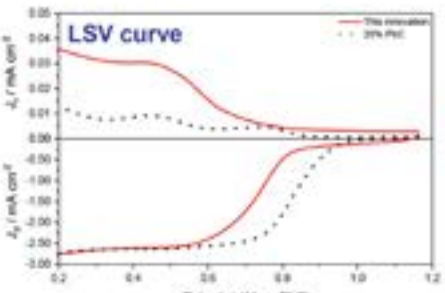
By: Choo Thye Foo, Nur Ubaidah Saidin, Nurazila Mat Zali, Kok Kuan Ying, Leo Kwee Wah, Rozan Mohamad Yunus, Wong Wai Yin & Lim Kean Long

ELECTROCATALYST PERFORMANCE

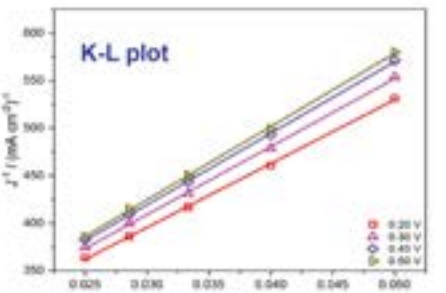
CV curve



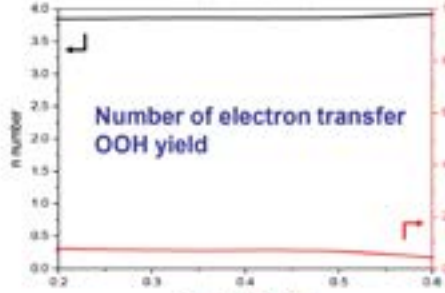
LSV curve



K-L plot



Number of electron transfer OOH yield



CONCLUSION

	GAMMA eCAT	Pt/C
E_{onset} (V vs. RHE)	0.90	1.02
$E_{1/2}$ (V vs. RHE)	0.75	0.84
J_{lim} (mA cm ⁻²)	2.26	2.10
n	3.86	3.98
% OOH	7.08	1.81



Green Technology



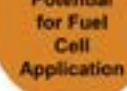
Facile Technique



Mass Production



Good Potential for Fuel Cell Application



Free Toxicity and External Heating



Lower Production Cost



GAMMA eCAT

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Participating institutions, please contact:
Director General,
Malaysia Nuclear Agency
JALAN INOVASI
63000 KUALA
SULAWANG

Dr. Choo Thye Foo
Materials Technology Group
Industrial Technology Division
E-mail: ctfo@nuklear.gov.my

Tel: +603 - 8911 1221
Fax: +603 - 8911 2154



EASY NEEDLE




Anwar Suryani Said, Saifulizan Mohamad, Muhammad Ridwan Rosdi, Khairi Nor Kamal Umar, Wan Hanizul Bahrin Wan Kamal, Marina Talib, Ng Yen, Siti Nurfa Mohd Janis, Siti Selma Abdul Hamid, Mansoor Saedon & Mohd Faisal Abd Rahman

ABOUT EASY NEEDLE

NOVELTY

- EASY NEEDLE was invented to ease the difficulty in performing intravenous injection to administer drug and draw blood during the experiment in animal studies.
- Even though butterfly needle of various sizes and design are available on the market, none is suitable for use in rodents' research

ADVANTAGES

HYPODERMIC NEEDLE 30G

- EASY NEEDLE requires small size and short needle to accommodate the small tail vein of rodents

POLYETHYLENE TUBE PE-10

- The tubing is used to flush the rodent's vein with heparinised saline and to administer drug or draw blood

WING HINGE

- The wing hinge act as needle holder that aid the user when performing intravenous tail vein injection

BENEFIT & IMPACT

ECONOMY

- Our invention can be commercialised for application in animal research

SOCIETY

- EASY NEEDLE is animal friendly. It requires only single venipuncture for multiple procedure

ENVIRONMENT

- EASY NEEDLE can be reuse



1

anaesthesia



2

vein puuncture



3

vein flushing



4

administer drug
draw blood



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LEAR MALAYSIA 2022

Pembantu persembahan khusus kepada:
Dewan Pemuda UMMA Malaysia
Malaysia Business Agency
(MABA) Kuala Lumpur
BANGSA BERSAMA MELAKSANAKAN TRANSFORMASI

Jika:
Anwar Suryani Said Said
Inventor Technology Creation
Email: anwar@inovasi.gov.my

Tel: +603 - 8211 1237
Fax: +603 - 8202 9037

EASY NEEDLE

FEATURES OF EASY NEEDLE

- EASY NEEDLE mimics the butterfly needle which is a device used to access a vein for drawing blood or giving intravenous medications.
- EASY NEEDLE has one needle attached to one end of tubing with wing hinge to hold the needle for intravenous injection, while the other end has a syringe adaptor to twist a syringe onto

NEEDLE

- Size: 30G (0.30 mm)
- Length: 0.5 inch (13 mm)
- Material: hypodermic needle

WING HINGE

- Width: 15 mm
- Length: 30 mm
- Material: ABS (acrylonitrile butadiene styrene)

SYRINGE ADAPTOR

- Size: 30G (0.30 mm)
- Length: 0.5 inch (13 mm)
- Material: hypodermic needle

TUBING

- ID size: 0.28 mm
- Length: 150 mm
- Material: PE-10 (polyethylene)

HARI INOVASI & KREATIVITI NUKLEAR MALAYSIA 2022

For further information, please contact:
 Dr. Anis Suriani Ismail, Malaysian Nuclear Agency
 (Kuala Lumpur)
 Email: anis@nuklear.gov.my

Tel: +603-8911 9007
 Fax: +603-8911 9037



EASY NEEDLE




Aree Suryani Sued, Saifulizan Mohamed, Muhammed Ridwan Rosli, Khairi Nor Kamal Umar, Wan Haniatul Bahrin Wan Kamal, Sharina Taki, Ng Yen, Siti Najla Mohd Janis, Siti Selma Abdul Hamid, Marniah Saadon & Mohd Palau Aji Rahman

CONSTRUCTING EASY NEEDLE

1 DISASSEMBLE HYPODERMIC NEEDLE

- Remove needle cap
- Remove needle clip for syringe adaptor
- Remove whole plastic parts for needle body



2 CONSTRUCT WING HINGE

- Design wing hinge
- Print with 3D-printer
- Trim wing hinge



3 CUT TUBING

- Measure length (150 mm)



4 ASSEMBLE EASY NEEDLE

EASY NEEDLE Components:

- Needle body
- Wing hinge
- Needle cap
- PE-10 tube
- Syringe adaptor



**HARI INOVASI
& KREATIVITI
LEAR MALAYSIA 2022**

Produk ini dihasilkan oleh:
SUKELAR Malaysia
Malaysia Science Agency
Gedung Kejuruteraan
BANDAR KUBANG KALUANG
SILANGOR

Atas: Aree Suryani Sued
Jurutera, Teknologi Ciptaan
E-mail: a.suryani@msa.gov.my

Tel: +603-8911 1207
Fax: +603-8925 3037



NUKLEAR MALAYSIA

MANDREL-LESS ORBITAL FRICTION STIR WELDING (FSW) FOR PIPE JOINING



50



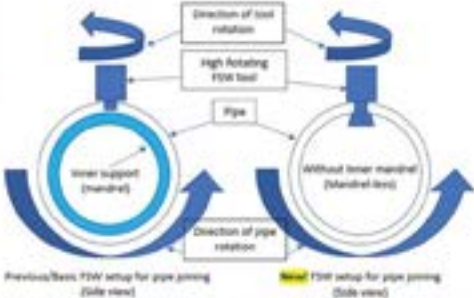
NUKLEAR MALAYSIA

By: Azman Ismail, Fatin Nur Zulkipri, Jayryan Jasni, Ady Idham Zinodin, Bakhtiar Ariff Baharudin, Mokhtar Awang, Rahiman Sham Mohd Khaidzir, Endy Chaniago, Andreas Oechsner, Mohd Jasmin Zainuddin, Darulhisn Abdul Hamid.

INTRODUCTION & PROBLEM STATEMENT

- ❑ The Friction Stir Welding (FSW) process is the best technique to replace the fusion welding process for a defect-free pipe joint.
- ❑ This welding technique makes use of a non-consumable welding tool to generate frictional heat, stir and join two pipes together.
- ❑ The available fixtures nowadays require internal mandrel support thus limits its application to cater for a long pipeline joining.

NEW SETUP



Previous/Basic FSW setup for pipe joining (Side view) **New** FSW setup for pipe joining (Side view)

OBJECTIVES

- ❑ To prepare a setup to cater for mandrel-less pipe joining by FSW.
- ❑ To produce a pipe butt joint.

RELEVANCE

- ❑ To promote the use of FSW for industrial application to cater for long pipeline joining.

BENEFIT/SIGNIFICANCE

- ❑ Keeps environment safe as this process requires no filler metal or shielding gas, produce no fumes and arc.
- ❑ Single run only.
- ❑ No edge preparation and gap required.
- ❑ Caters industrial applications.

NOVELTY

- ❑ A new fixture setup without the use of internal support (mandrel-less) for pipe joint.

IP, PUBLICATION & GRANT

- ❑ https://www.researchgate.net/profile/Azman_Ismail
- ❑ <http://orcid.org/0000-0001-6857-5423>
- ❑ Short Term Research Grant (RM20K)
- ❑ IP right: MY 13-00895-0101, PI 2014001404

NEW FIXTURE & TRIAL RUN



IN COLLABORATION WITH






OUTPUT



HARI INOVASI & KREATIVITI NUKLEAR MALAYSIA 2022

For further information please contact:
 Director General,
 Malaysia Nuclear Agency
 Nuclear Science
 Section, 61000 KUALA
 SELANGOR

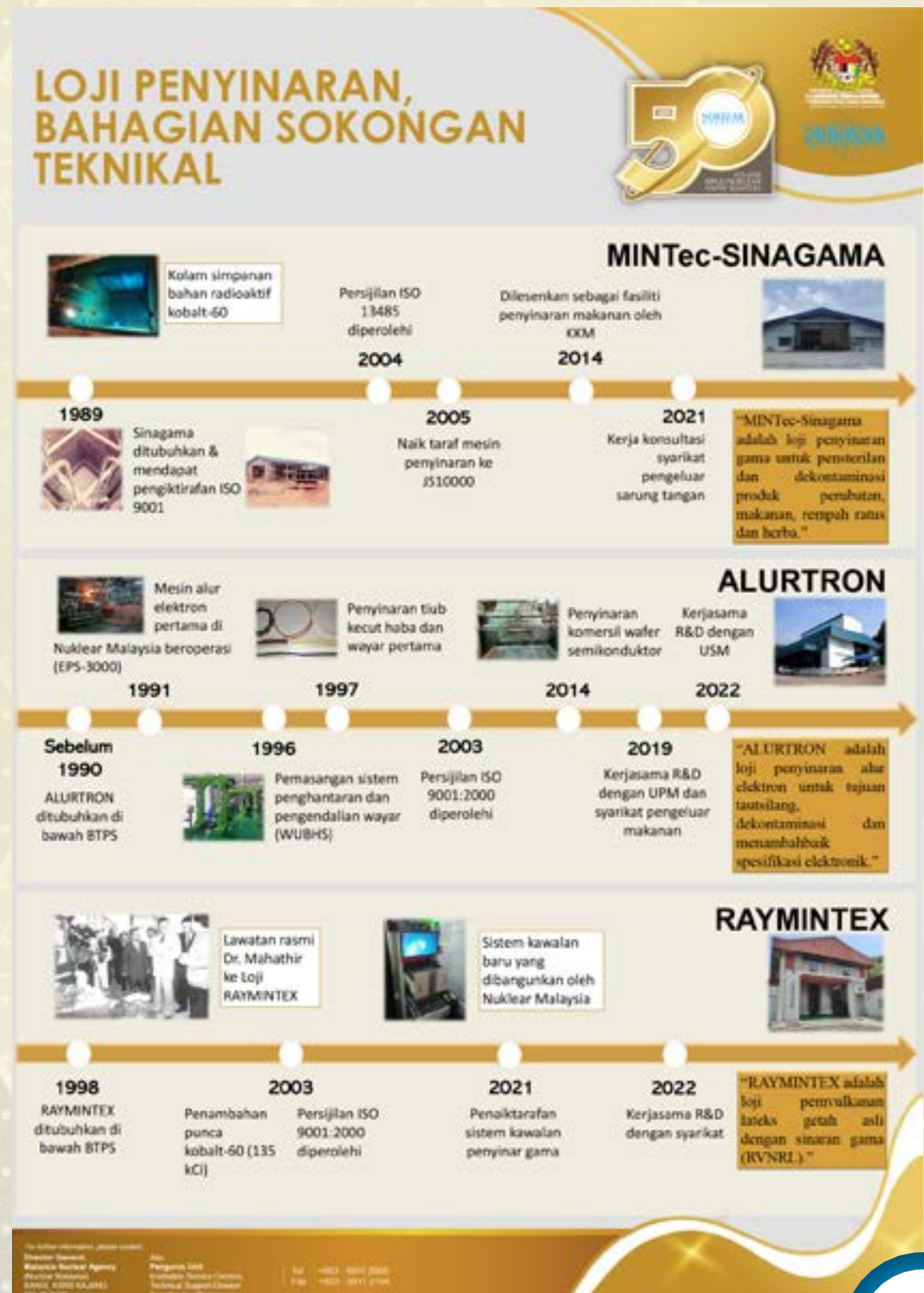
Astia
 Khatun Project
 Technology Officer
 E-mail: khatun@nuklear.gov.my

Tel: +603-8911 1271
 Fax: +603-8911 2154



Pameran Jubli Emas 50 tahun
19 September 2022

PAMERAN JUBLI EMAS 50 TAHUN



Refleksi

AN EMPOWERMENT OF LEAK TEST LABORATORY IN MALAYSIAN NUCLEAR AGENCY

By: Health Physics Group
Radiation Safety and Health Division

Abstract

Leak Test Laboratory, Malaysian Nuclear Agency (Nuclear Malaysia) is the leading agency and very committed in conducting the leak test of radioactive material in Malaysia. This activity was licenced and fulfill the regulatory requirements under Atomic Energy Licensing Act 1984 (Act 304). To performed the test, the leak tester must be a competent person which was trained and certified by the Atomic Energy Licensing Board, AELB. The leak test is a physical test that conducted on sealed source to ensure the integrity of the capsule is always in a good condition and safe to be used. Those sealed sources were wiped or smeared, then the samples were analysed and counted using GM-counter at the laboratory. The sealed source was considered leak if the values exceed 185 Bq (0.005 microcuries) as it documented in the guideline, LEM/TEK/60 Pin.1. Since year 2009 to year 2020, a total of 11741 unit of sealed sources were conducted for the assessment of leak testing at this lab. This paper will highlight on experiences in conducting the testing, challenges and future direction for radioactive leak test in Malaysia.

Introduction

Leak test of radioactive sealed sources is merely a physical test conducted on the capsule by collecting any radioactivity resulting from the leakage.

Objectives

- To ensure sealed sources received from manufacturer in good condition
- To ensure sealed sources is properly sealed and intact in its original capsule/container
- To ensure sealed sources is safe to handle by worker before use
- To ensure sealed sources is not contaminate the working area
- To ensure contamination by sealed sources will not effect to the worker health or environment

Leaking factors

Chemical

Mechanical

Physical

Broken container

Improper handling

Leaking of shielding material

The requirement of leak test

- when used continuously sealed sources, leak test shall be conducted at least once a year;
- when the sealed source or shielding (DU) stored more than a year, a leak test must be performed before the sealed source reused or transferred;
- when a fault occurs on or shielding (DU) radioactive sources, leak test shall be performed immediately before the operation or the transfer carried out
- when the sealed source or shielding (DU) stored and handled, leak test shall be conducted once every two (2) years;
- when directed by AELB

Leak test procedure

Graph 1: Number of leak test samples conducted by KFK/BKS

Conclusion

The Leak Test Laboratory, Malaysian Nuclear Agency (Nuclear Malaysia) is very excellent in providing the services by fulfil the requirement of licensing under Atomic Energy Licensing Act 1984 (Act 304). This strengthen is the main strategy to empowerment the Leak Test Laboratory, Malaysian Nuclear Agency

INFOGRAFIK PUSAT PEMBANGUNAN LOJI & PROTOTAIP (PDC) BAHAGIAN SOKONGAN TEKNIKAL (BST)

Perkhidmatan utama unit PDC:

Penyelidikan dan pembangunan kejuruteraan berkaitan dengan teknologi nuklear dan sokongan penyelidikan.

PDC telah menjadi rakan teknikal selama lebih 30 tahun dan menghasilkan pelbagai alat, sistem dan radas untuk aktiviti R&D serta merealisasikan pembangunan loji-loji rintis dan utama di Agensi Nuklear Malaysia.

Perkhidmatan teknikal

- ✓ Rekabentuk kejuruteraan
- ✓ Pemrosesan dan fabrikasi logam
- ✓ Kimpalan
- ✓ Peleburan plumbum
- ✓ Pemisahan dan pengujian
- ✓ Peraltauran sistem kejuruteraan

Perkhidmatan dari Unit Kejuruteraan ke Pusat Pembangunan Loji dan Prototaip (PDC)

- Peralatan daripada pemrosesan konvensional kepada mesin NC & CNC
- Penggunaan peralatan 3D wire modelling, CATIA & Inventor
- Penggunaan perisian CAM untuk pemrosesan
- Proses-proses automasi dan robotik bermula.
- Projek-projek prototaip: Portable Tomography, Gamma Process Tomography, Film Badge Serial Puncher, SSOI, Source Drive Mechanism, Automatic Controlled Jet Pump for Radioactive Liquid Waste Transfer, Medical Radiography Film Processing, Gamma Projector, Seed Dispenser
- Projek-projek pengendalian sel aktif: Can Cutter Machine, Ceria Canister Sealer
- Projek - projek loji: Volcanizer Latex Irradiation Plant, Beta-Graft Synthesis Formulation Plant, Waste Treatment Automation, Lipi Carbon-14, Chitosan Formulation Plant
- Projek - projek robotik: Robotik? Emergency Rescue Robot, Radioisotope Handling Robot
- Projek - projek pembangunan infrastruktur: GMP Clean room, BioDesign (GMO) Agroween, Gamma Greenhouse
- Perkhidmatan luar agensi: Pemisahan pinta plumbum UTM, Terbitan dengan pemisahan penapisan penapisan kategori 1 di Hospital Bertina

2020

- Projek pemisahan: Prototaip kotak Liji/Gli (Gentle/Ling), Injektor lusi, Fast Patel Hand Sanitizer Dispenser
- Perkhidmatan luar agensi: Projek pemisahan: peralatan pemisahan kategori 1, Isotomography HCE2, mesin pemisahan X-ray Kajian, dan NCCPL, Perundangan teknikal bangunan DORS kepada pihak JKR

The way forward of PDC:

- Pemrosesan moden: pemrosesan laser & water jet, pencetak 3D logam, pengiraan 3D
- Robotik dan automasi: Master Slave manipulator, robotik, robot, modul automasi
- Prototaip: Implanasi kapsula, Program guna semula pucuk terdapat guna, transfer seak untuk pucuk jenis penul, Se Aktif pelbagai guna
- Pembangunan loji: Liji reactor dan Sistem Pengiraan aktif BBO
- Perkhidmatan luar agensi: Menyediakan perkhidmatan not sel ke luar agensi

2010

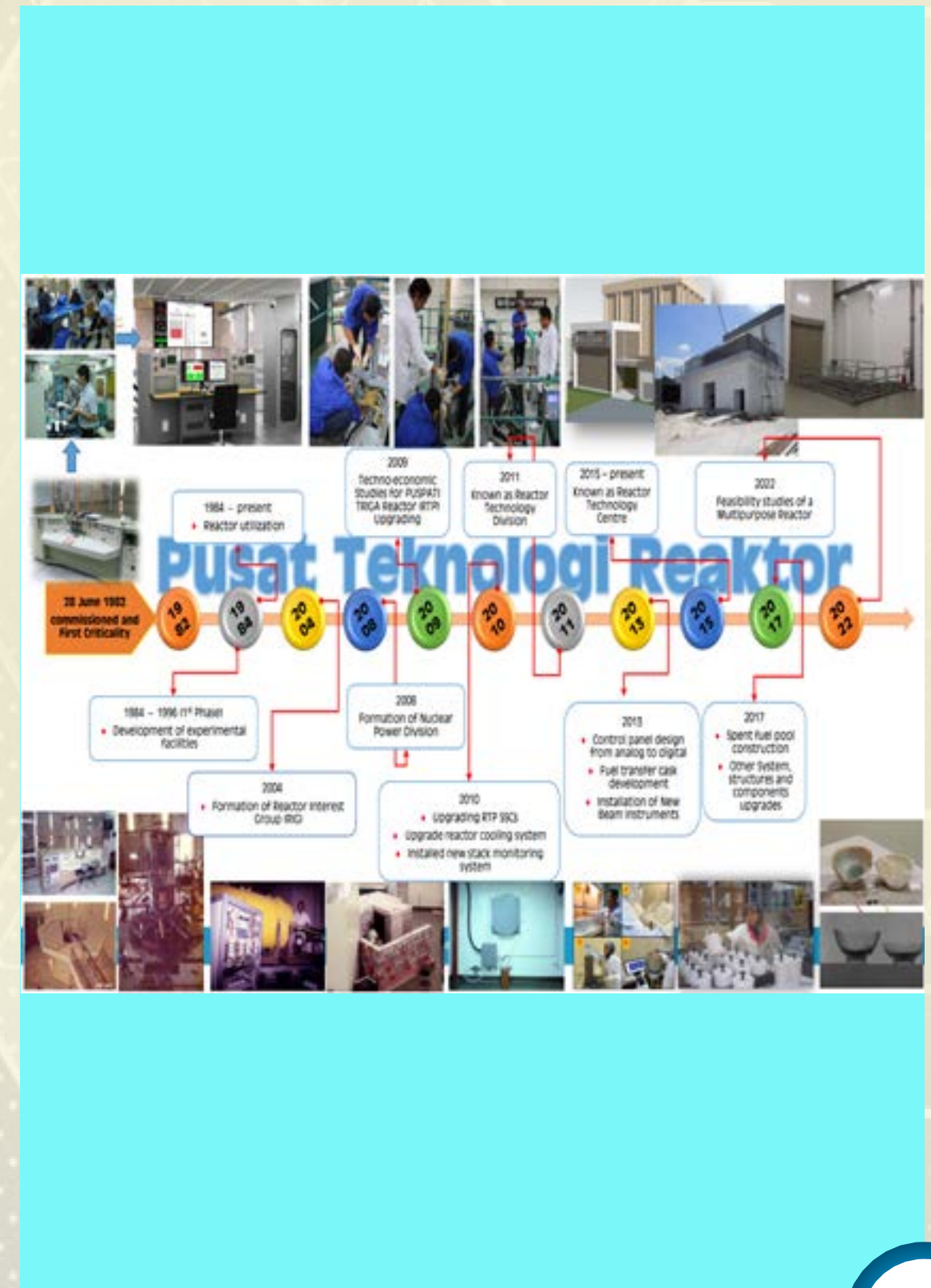
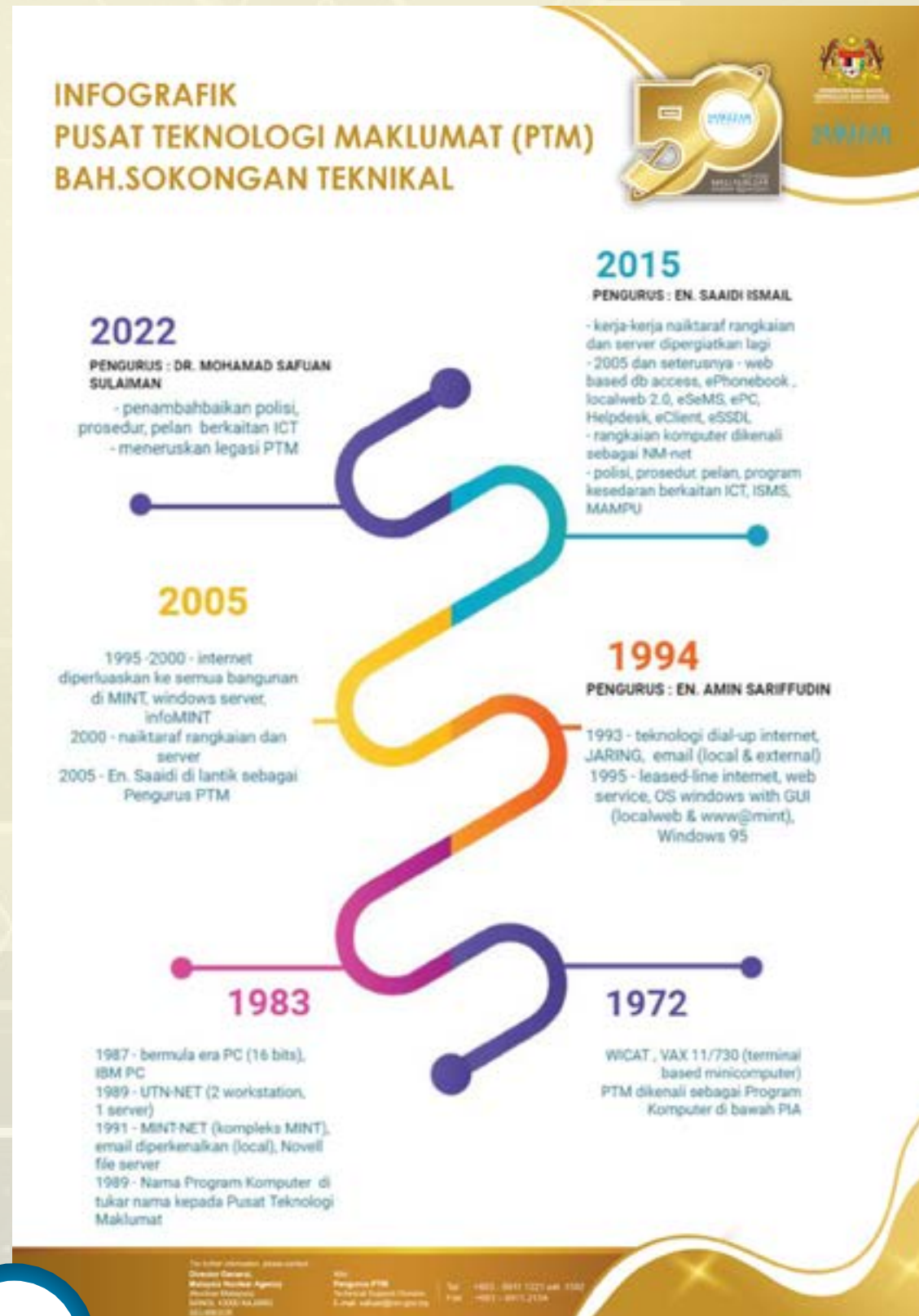
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- Perkhidmatan luar agensi: Menyediakan perkhidmatan not sel ke luar agensi

2000

- Pemrosesan moden: pemrosesan laser & water jet, pencetak 3D logam, pengiraan 3D
- Robotik dan automasi: Master Slave manipulator, robotik, robot, modul automasi
- Prototaip: Implanasi kapsula, Program guna semula pucuk terdapat guna, transfer seak untuk pucuk jenis penul, Se Aktif pelbagai guna
- Pembangunan loji: Liji reactor dan Sistem Pengiraan aktif BBO
- Perkhidmatan luar agensi: Menyediakan perkhidmatan not sel ke luar agensi

1990

- Pemrosesan moden: pemrosesan laser & water jet, pencetak 3D logam, pengiraan 3D
- Robotik dan automasi: Master Slave manipulator, robotik, robot, modul automasi
- Prototaip: Implanasi kapsula, Program guna semula pucuk terdapat guna, transfer seak untuk pucuk jenis penul, Se Aktif pelbagai guna
- Pembangunan loji: Liji reactor dan Sistem Pengiraan aktif BBO
- Perkhidmatan luar agensi: Menyediakan perkhidmatan not sel ke luar agensi



affordable
fast
accurate
reliable

Fluorescence Spectrometer

UV-Vis Spectrometer

Universal Testing machine

Creep Machine

Corrosion Analyzer (Potentiostat)

Simultaneous Thermogravimetric Analyzer (TGA/DSC)

Arc-spark Optical Emission Spectroscopy

Zeta Sizer

instruments
materials characterization

MATERIAL TECHNOLOGY GROUP, INDUSTRIAL TECHNOLOGY DIVISION, MALAYSIAN NUCLEAR AGENCY

PROGRAM PEMANTAUAN RADIOLOGI ALAM SEKITAR

Oleh: Kumpulan Fizik Kesihatan (KFK)
Bahagian Keselamatan dan Kesihatan Sinaran

PENGENALAN

Kumpulan Fizik Kesihatan (KFK) bertanggungjawab dalam menjalankan program pemantauan radiologi alam sekitar untuk khidmat luar di seluruh Malaysia. KFK juga menjalankan pemantauan radiologi alam sekitar meliputi sebelum dan semasa operasi Reaktor TRIKA PUSPATI Agensi Nuklear Malaysia. Program pemantauan radiologi alam sekitar dilaksanakan bertujuan untuk mengesan sebarang perubahan aras sinaran dan keradioaktifan alam sekitar yang mungkin terhasil daripada aktiviti yang dijalankan dan boleh menyebabkan dos sinaran tambahan kepada orang awam di kawasan sekitarnya. Parameter pemantauan seperti jenis sampel, jenis radionuklid yang dianalisis dan kekerapan pemantauan adalah berdasarkan kepada syarat lesen yang ditetapkan oleh Lembaga Perlesenan Tenaga Atom (AELB). Antara pemantauan yang dijalankan adalah pemantauan tahap radioaktiviti pada sampel alam sekitar (sampel tanah, flora, sedimen, air sungai, air bawah tanah, air paip, debu udara), pemantauan aras sinaran luar (secara aktif atau pasif) dan pemantauan radon toron progeni. Program pemantauan radiologi alam sekitar merangkumi kerja pensampelan, pra-rawatan sampel dan pengukuran menggunakan alat pembilang.

RINGKASAN METODOLOGI

Proses Pensampelan (Berdasarkan)

- Pensampelan Flora
- Pensampelan Tanah
- Pensampelan Sedimen
- Pensampelan Air
- Aras Sinaran Luar
- Pensampelan Debu Udara
- Radon Toron Progeni

Pro-Rawatan

- Abu & Mampat
- Sampel Flora
- Sampel Tanah & Sedimen
- Pengeringan
- Sampel Air (Penyejatan)
- Hancur & Seragam
- Hancur & Seragam

Pengukuran

- Pengukuran sinaran α
- Pengukuran sinaran β
- Pengukuran sinaran γ
- Pengukuran Gross α & β
- Neutron Activation Analysis

Jenis radionuklid dan tahap radioaktiviti dikenalpasti semasa pengukuran.

Laporan

Antara senarai syarikat yang menerima khidmat pemantauan radiologi alam sekitar:

- Agensi Nuklear Malaysia
- MB Inc.
- Venator Asia Sdn. Bhd.
- R-Sync Technical Resources Sdn. Bhd.
- Techno Indah Sdn. Bhd.
- Endeka Ceramics Sdn. Bhd.
- Zircosil (M) Sdn. Bhd.
- Cookson Matthey Ceramics (M) Sdn. Bhd.
- Samsung Electronics Sdn. Bhd.
- Petronas Carigali Sdn. Bhd.
- Wijaya International Medical Centre Sdn. Bhd.
- Trienekens (Sarawak) Sdn. Bhd.

DATA TAHAP RADIOAKTIVITI

Carta Perbandingan Radioaktiviti Sampel Tanah

Carta Perbandingan Radioaktiviti Sampel Sedimen

Carta diatas merupakan salah satu carta perbandingan sampel alam sekitar di sekitar Agensi Nuklear Malaysia yang dibandingkan dengan pemantauan yang dijalankan pada 1985-1990. Program pemantauan radiologi alam sekitar telah dilaksanakan semenjak reaktor TRIKA PUSPATI mula beroperasi pada tahun 1982.

PIPESCANNER

Non-Destructive Detection of Blockage and Material Deposits in Pipeline



Introduction

The PIPESCANNER is a portable, nucleonic gauge for non-destructive detection of blockage and material deposits in insulated or non-insulated pipelines in industrial process plants, developed by Plant Assessment Technology Group (PAT), Malaysian Nuclear Agency (Nuklear Malaysia). The gauge can provide a rapid means of locating and measuring the thickness of deposits without the need to shut down the plants or stop the process.

Typical Application

- Locating blockages in pipeline
- Determining the extent and magnitude of scale or sludge build-up in pipelines
- Detecting "liquid foot" in vapour or flare lines
- Measuring fluid flow densities
- Detecting liquid-liquid interfaces during batch transfers
- Evaluation fluidization of catalysis

Main Features

INSPECTION

- # Non-destructive inspection
- # Non-contact measurement and not affected by high temperature, high pressure or corrosiveness. Non-elaborate preparation of pipelines necessary
- # "Volume metric" measurement

SAFETY

- # Portable, rugged, easily dismantled and reassembled
- # Sealed Source - used small amount of radioactive material with built-in radiological safety features

GAUGE SYSTEM

- # Suitable for inspecting pipes with or without insulation
- # Suitable for liquid and gas processing pipeline
- # Suitable for any type of pipe, metallic or non-metallic
- # Telescopic system- application on wide range of pipe sizes
- # Computer-aided data acquisition and analysis system for fast, accurate and reliable results

On-site Calibration



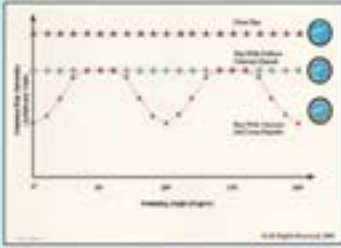
Setup Equipment & System



Scanning & Leveling



Scanning Profile (mm)



Scanning Profile (mm)



For further information, please contact:

Director General
Malaysian Nuclear Agency
No. 42000, 64000, 64000

Malaysian Nuclear Agency
Plant Assessment Technology Group - PAT
Technical Services Division

Pat

Pusat Instrumentasi & Automasi (PIA)

FASA PUSPATI/UTN: 1983 - 1993
Penyenggaraan Peralatan Instrumentasi Nuklear di Reaktor Penyelidikan



FASA MINT: 1994 - 2004
Penyenggaraan Peralatan Instrumentasi Nuklear dan Saintifik



FASA AGENSI NUKLEAR MALAYSIA: 2005 - 2022
Penyelidikan & Pembangunan, Penyenggaraan Peralatan Saintifik & Nuklear, Audio Visual, Aset Alih dan Khidmat Perundingan



AGENCI NUKLEAR MALAYSIA: 2030
Hub Lokal Kepakaran Instrumentasi Nuklear



2030

For further information, please contact:

Director General
Malaysian Nuclear Agency
No. 42000, 64000, 64000

Malaysian Nuclear Agency
Plant Assessment Technology Group - PAT
Technical Services Division

Pat

**Technical Support Division
IRRADIATION SERVICE CENTER
MINTec-SINAGAMA
MAJU NUKLEAR RAKYAT SEJAHTERA**



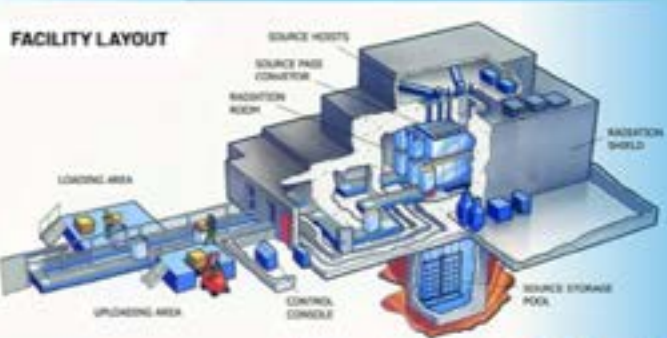

MINTec-SINAGAMA

Nuclear Malaysia started projects on radiation processing of various products using gamma irradiation in January 1989. MINTec-SINAGAMA irradiation plant operates on (S10000 (R-219), which it is able to irradiate various products requiring different doses simultaneously. MINTec-SINAGAMA is certified with MS ISO 9001:2015 and ISO 13485:2016.

Initially designed as a multi-purpose pilot facility for research and development purposes, the plant activities later diversified to offer services to the public and private enterprises, as in the following:

- ✓ Sterilisation of medical products and packaging materials
- ✓ Decontamination of food, pharmaceuticals, herbs and animal feeds
- ✓ Disinfections of insects in agricultural commodities, including for quarantine purposes
- ✓ Samples for R&D purposes.

FACILITY LAYOUT



PRODUCT IRRADIATION SERVICES:

- Sterilization of Medical Devices, Packaging Materials & Laboratory Supplies
- Sterilization of Pharmaceutical Products
- Veterinary Products
- Food, Herbs & Spices
- Cosmetics Products

How does product irradiation work?



Unirradiated product

The ionizing energy passes completely through the product to kill spoilage and disease causing microorganisms with minimal temperature rise

Irradiated products remain intact with no radioactive or chemical residue

The Irradiation Service Center
Director General,
Nuclear Malaysia Agency
Technical Division
Jalan 1/10, 43000 Kajang,
Selangor

Mr. Ahmad Ridwan bin. Abd. Halim
Manager,
Irradiation Service Center
MINTec-SINAGAMA
Technical Support Division
E-mail: mntec@nuklin.gov.my

Tel : +603 - 8911 1221
Fax : +603 - 8911 2104

**GAMMA SCORPION:
NON-INVASIVE IMAGING FOR
MATERIALS VISUALISATION AND
ENGINEERING INSPECTION**

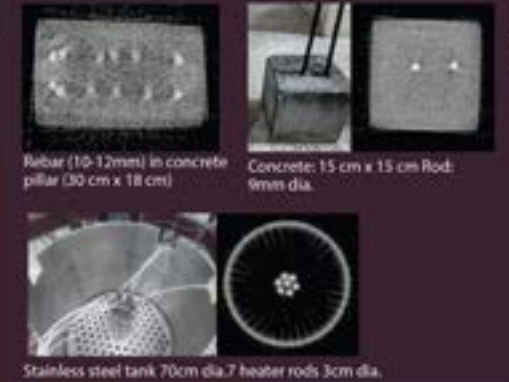


Introduction

Gamma computed tomography (gamma CT) is an imaging method that uses gamma ray to obtain a two-dimensional (2-D) cross-sectional view of the interior of an object.

The gamma-ray transmission data are collected by radiation detectors at many different angles within the image plane, and these data are then used to reconstruct a cross-sectional image that is essentially a map of the object's density distribution.

CT Images visualisation

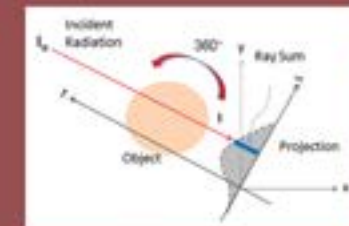


Rebar (10-12mm) in concrete pillar (30 cm x 18 cm)

Concrete: 15 cm x 15 cm Rod: 9mm dia.

Stainless steel tank 70cm dia. 7 heater rods 3cm dia.

Tomography Measurement



Incident Radiation

Object

Projection

Ray Sum

360°

Gamma rays continuously penetrate through the object while the detector-source gantry is rotated 360°. A set of projections is acquired at regular increments. Filtered back projection algorithm is applied to reconstruct the object's image.



- Portable gamma-ray tomography system for early detection of basal stem rot in oil palm plantations
- Sample Diameter : 50 - 80 cm



Healthy Infected Infected

The Irradiation Service Center
Director General,
Nuclear Malaysia Agency
Technical Division
Jalan 1/10, 43000 Kajang,
Selangor

Mr. Ahmad Ridwan bin. Abd. Halim
Manager,
Irradiation Service Center
MINTec-SINAGAMA
Technical Support Division
E-mail: mntec@nuklin.gov.my

Tel : +603 - 8911 1221
Fax : +603 - 8911 2104

GAMMASPIDER

PORTABLE CLAMP-ON GAMMA-RAY TOMOGRAPHY SYSTEM FOR NON-INVASIVE INSPECTION



Introduction

A portable clamp-on gamma-ray computed tomography system for non-destructive imaging has been developed by the Malaysian Nuclear Agency. The technique, using a gamma-ray source, is an imaging technique that can provide a 2-D cross-sectional view of the interior of an object. The gamma-ray transmission data are collected by a radiation detector at many different angles within the image plane, and these data are then used to reconstruct a meaningful cross-sectional image that is essentially a map of the density distribution. The complete system is totally autonomous and is clamped on the interest object that allows it to be easily operated in the fields by one or two operators.

Typical Applications

Industry

- Imaging blockage in pipeline.
- Imaging pipe structure and thickness.
- Imaging sludge build-up in pipeline.

Civil

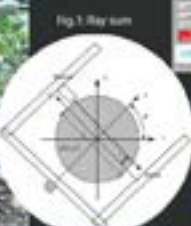
- Imaging column structure.

Agriculture

- Gaharu determination in Kasas Tree.
- Imaging void inside tree trunks.



Fig 1. Ray sum

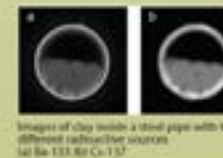


Features

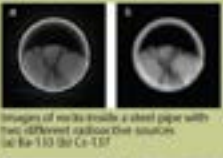
- Non-Destructive and non-invasive measurement using portable measuring system.
- Applicable for all pipeline and object with diameter less than 50 cm.
- Clamp-on system used thus capable of measuring at any height without standing platform.
- Utilizes small amount of "sealed radioactive source of Cs-137 or Ba133".
- Measurement is totally external and no preparation needed (in-situ measurement).
- Not affected by temperatures, corrosive, abrasive and other environmental hazards, as measurement is totally external.
- Computer-aided data acquisition and analysis system to provide fast, accurate and reliable results.



Test phantom images with two different radioactive sources: (a) Ba-133 (b) Cs-137



Images of clay inside a steel pipe with two different radioactive sources: (a) Ba-133 (b) Cs-137



Images of metal inside a steel pipe with two different radioactive sources: (a) Ba-133 (b) Cs-137



Cross-section images of a Kasas Tree trunk for resin Gaharu detection: (a) Healthy Kasas trunk image (b) Kasas trunk sample (c) Isolated Kasas trunk image

For further information, please contact:

Project Manager:
Malaysian Nuclear Agency
(Public Division)
Jalan KEMAS 9/1, (KEMAS)
63000 Seremban, Negeri Sembilan

Site Manager:
Nuclear Measurement Technology Group - (MNT)
Industrial Technology Division

Tel: +603-8977-4332
E-mail: pm@mnt.mta.gov.my
P.O. Box 10000, Seremban

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Created with Adobe Photoshop CS2
P.O. Box 10000, Seremban

MICRO-CT

Micro Computed Tomography



Introduction

- Tomography is the imaging of the internals of a material or product, through the use of any kind of penetrating source. The production of these images is based on the mathematical procedure tomographic reconstruction.
- Since its introduction in the 1970s, tomography has become an important tool in medical imaging and it is now also used in the industrial sector.
- Micro computed tomography (Micro-CT) system is used in scanning small samples and producing high resolution cross sectional images. Images from a Micro-CT system allows the user to see insides of an object without physical cutting.
- Complete 2D and 3D images permits quantitative analysis of the reconstructed volumes from the CT scans. Physical features of the object such as pores, density, joints are visualised realistically.

Advantages

- Short scan times (up to 15 minutes depends on the scanning angle)
- Very simple sample preparation
- Non destructive evaluation
- Variable filter choices for scanning of high density and low density materials.

Features

Represents 3D volumes, where very fine scale internal structure of objects is imaged non-destructively. Very simple sample preparation, no thin slicing - a single scan will image the complete internal 3D structure of sample at high resolution, plus you get your intact sample back at the end.

Area of Applications

- Pharma
- Composites and fibers
- Electronic components and assemblies
- Geologies
- Wood and seeds



Image of tooth



Section image of fabric fiber



Image of beetle



Section image of metallic foam

For further information, please contact:

Project Manager:
Malaysian Nuclear Agency
(Public Division)
Jalan KEMAS 9/1, (KEMAS)
63000 Seremban, Negeri Sembilan

Site Manager:
Nuclear Measurement Technology Group - (MNT)
Industrial Technology Division

Tel: +603-8977-4332
E-mail: pm@mnt.mta.gov.my
P.O. Box 10000, Seremban

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Created with Adobe Photoshop CS2
P.O. Box 10000, Seremban

Industrial Technology Division
MATERIAL TECHNOLOGY GROUP (MTEG) SERVICE CENTRE
Products

NuRust
Creates New Corrosion Resistance Layer

ADVANTAGES

- Minimum surface preparation
- Water-based compound
- Easy to use
- Reacts with rust to retard the oxidation process
- Protects against future corrosion

APPLICATIONS

Automotive, Pipeline, Construction, Industrial Application

ALUNODE™
ALUMINIUM ALLOY SACRIFICIAL ANODE

ADVANTAGES

- Environment friendly
- Light weight
- Low cost compared to Zn and Mg anodes
- High anode capacity
- High corrosion potential
- Last longer than Zn anode

APPLICATIONS

- Screw anode: Heat exchanger & engine of ship
- Bolted & Welded Anode: Jetties, ship hulls, boats, platform, structural & piping system submerged in seawater, marine muds or brackish water

For further information please contact:
Industrial Division, Ministry of Science, Technology and Innovation, 40150 Kuala Lumpur, Malaysia
Tel: +603-8941 1234
Fax: +603-8941 1235
Email: info@msiti.gov.my

Industrial Technology Division
MATERIAL TECHNOLOGY GROUP (MTEG) SERVICE CENTRE

PHASE ANALYSIS
X-Ray Diffraction (XRD), Small Angle X-Ray Scattering (SAXS), Small Angle Neutron Scattering (SANS), X-Ray Fluorescence (XRF)

ELEMENTAL ANALYSIS
Energy Dispersive X-Ray Fluorescence (EDXRF), Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES), Inductively Coupled Plasma Mass Spectrometry (ICP-MS)

PARTICLE SIZE ANALYSIS
Laser Light Scattering (LLS), Dynamic Light Scattering (DLS), Sedimentation, Microscopy

IMAGING / MICROSCOPY
Scanning Electron Microscope (SEM), Field Emission Scanning Electron Microscope (FESEM), Atomic Force Microscope (AFM), Optical Microscope

MECHANICAL TESTING
Universal Testing Machine, Compression Testing Machine, Tensile Testing Machine, Hardness Tester, Impact Tester

CORROSION ANALYSIS
Potentiostat/Galvanostat, Electrochemical Impedance Spectroscopy (EIS), Linear Polarization Resistance (LPR), Tafel Plot, Salt Water Bath, Corrosion Cell

For further information please contact:
Industrial Division, Ministry of Science, Technology and Innovation, 40150 Kuala Lumpur, Malaysia
Tel: +603-8941 1234
Fax: +603-8941 1235
Email: info@msiti.gov.my

COLUMN SCANNING

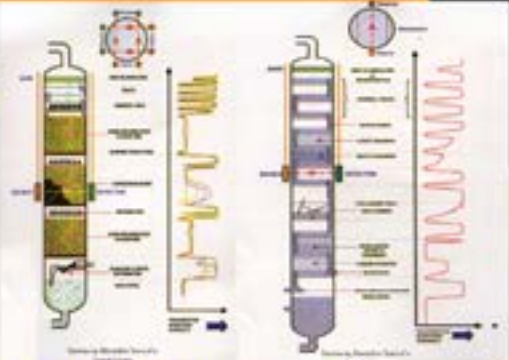
Non-disruptive and on-line inspection technique for troubleshooting, optimisation and predictive maintenance of distillation columns



Introduction

In petroleum, gas and chemicals industries, plant performance depends to a large extent on the ability of these columns to function as intended. Defective columns may lead to serious consequences to the plant operation and hence the quality of the product.

Thus, when a distillation column experiences irregularities, it is urgently necessary to find out exactly what is happening inside the column. Any kind of problem can result in a large financial loss especially when it involves off-spec product, loss of production or unexpected shut down of the plant. The earlier the problem is identified and corrected, the lesser will be the loss and the cost to rectify it.



Gamma Scanning Can Identify a Number of Common Malfunctions

Mechanical Problems

- Displaced or damaged trays, demister pads and packing
- Corrosion resulting in partial tray damage
- Missing, collapsed or buckled trays or manways
- Out-of-place liquid or vapour distributors
- Level control problems on chimney trays or base liquid level

Rate Related Problems

- Entrainment (slight, moderate, severe, jet flooding)
- Weeping or dumping trays
- Dry or flooded trays due to loading conditions
- Unequal liquid levels on trays and in parting boxes, troughs and collectors

Process Related Problems

- Foaming on trays or in reboilers, condensers and accumulators
- Maldistribution of vapour and liquid in packing
- Liquid hold-up due to plugging and fouling
- Superheated or subcooled feed or reflux

Distinguishing Features of the Technology

- Non-disruptive and non-invasive investigation
- On-line inspection; no operation shutdown needed
- Convenient, cost-effective, fast and efficient inspection
- Full length scanning capabilities
- No components dismantling required
- No insulation or lagging need to be removed
- Non-contact measurement; not affected by high temperature, high pressure, corrosiveness etc.
- Small activity of "sealed radioactive source"; range of millicurie
- Fast, accurate and reliable results; immediate use as well as for future comparisons
- Applicable to most of column sizes

PTT

LENDT

Leading Edge Non Destructive Testing Technology Group

PHASED ARRAY ULTRASONIC TESTING (PAUT)

Phased Array Ultrasonic Testing (PAUT) which is an advanced Ultrasonic Testing (UT) technique is different with conventional ultrasonic testing techniques. Phased array ultrasonic uses an array of ultrasonic piezoelectrics that can be triggered individually. This enables phasing, a way of controlling the generation of waves and provides the ability to bend, steer or focus the energy wavefront.



ADVANTAGES OF PAUT

- Increased inspection speed through faster scanning
- Small footprint and beam sweeping
- Increased productivity of detection
- Increased productivity at 15 times faster than conventional UT
- Multiple angle of beam without moving probe
- Focus beam at multiple depths for sizing of defects

APPLICATIONS OF PAUT

- GENERAL MANUFACTURING
- TUBULAR TUBE
- AEROSPACE
- POWER GENERATION

INFRARED THERMOGRAPHY TESTING

Infrared Thermography Testing (IRT) is a science of acquisition and analysis of thermal information from noncontact imaging devices. It is a Non-Destructive Testing (NDT) technique based on measuring the distribution of radiant thermal energy (heat) emitted from a target surface by the use of an infrared camera, and converting this to a map of radiation intensity differences (surface temperature map) or thermogram.

Infrared Thermography Testing is one of many select energy predictive maintenance services designed to save time and cost through early detection of any process that uses or produces energy. Advance notice of developing problems enables you to perform the necessary adjustments or repairs before costly, sometimes catastrophic failures occur.

APPLICATIONS

- ELECTRICAL**
To ensure the integrity of electrical installations for reduced down time, fire and safety or insurance company compliance
- MECHANICAL**
Thermal inspections of rollers, joints, fans, bearings, compressors, heating elements, manifolds etc. can be analysed for leaks and decrease in efficiency. Fatigue and stress concentration in components can be detected and verified
- BUILDING & PROCESSING EQUIPMENT**
Internal properties in walls and pipes such as building and civil engineering insulation and furnace refractory breakdown and efficiency, scale build up, fluid build up in composite structures etc. can be determined

For further information, please contact:

Malaysia Branch
Malaysia Branch Agency
No. 10, Jalan...
Kuala Lumpur

Head Office
Head Office Agency
No. 10, Jalan...
Kuala Lumpur

For further information, please contact:

Malaysia Branch
Malaysia Branch Agency
No. 10, Jalan...
Kuala Lumpur

Head Office
Head Office Agency
No. 10, Jalan...
Kuala Lumpur

LENDT

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EDDY CURRENT THERMOGRAPHY

Eddy Current Thermography testing techniques is an emerging non-destructive testing technique which combines the well-established inspection techniques eddy current testing and thermography. It is such an advanced method for the detection of cracks in electrically conductive material. This technique is able to produce both quantitative and qualitative information about the material being test.



Experimental set-up of eddy current thermography system

BENEFITS OF EDDY CURRENT THERMOGRAPHY

- Test results can be immediately accessed to provide an indication of any major faults and the data sequences further analysed to provide quantitative information
- Able to inspect a relatively large area in a short time
- Probe does not have to contact to the work surface
- The technique is applicable to a wide range of materials, though selection of the optimal excitation parameters

PULSED EDDY CURRENT (PEC)

Pulsed Eddy Current (PEC) technique is one of advanced non-destructive testing (NDT) method which is based on inducing electrical currents in conductors and measuring the accompanying secondary magnetic decay signal generated through this process. The advantage of using rectangular waveform is the reaction pulses always come when an excitation pulse is already over thus making the system less vulnerable to interference effect.

Potential inspection or measurement includes polymer coating, composite wrap, concrete and insulation of weather jacket. This technology offers new perspectives for the detection and characterisation of defects in test samples by measuring the transient response of the magnetic field.



ADVANTAGES OF PULSED EDDY CURRENT

- In service inspection
- High accuracy of results
- No need surface preparation-speedy inspection
- Good reproducibility of PEC readings at the same

MAGNETIC FLUX LEAKAGE (MFL)

This method is used for the detection of surface and near-surface flaws in ferromagnetic materials and is primarily used for crack detection. The specimen is magnetised either locally or overall, and if the material is sound the magnetic flux is predominantly inside the material. If, however, there is a surface-breaking flaw, the magnetic field is distorted, causing local magnetic flux leakage around the flaw. This leakage flux is displayed by covering the surface with very fine iron particles applied either dry or suspended in a liquid.

Unlike MPI, this method is not limited to surface-breaking or near-surface flaws, but actually becomes increasingly sensitive to far-surface flaws with increasing levels of magnetisation.

MFL System

Magnetiser + Sensing element + Scanner



MFL System Components



MFL System Components

MFL Differential Amplifier P-43
MFL 48dB/Hz Filter P-85

To further information, please contact:
General Manager,
Malaysia Nuclear Agency
Jalan KAS 1/2, KAS 1/2
63000 Kuantan

Attn: Mr. Wan Mohd Azmi Zaidi
Manager LENDT Group
Malaysia Nuclear Agency
Jalan KAS 1/2, KAS 1/2
63000 Kuantan

Tel: +603 8911 1221
Fax: +603 8911 2154
E-mail: lndt@nuklear.gov.my

SEJARAH PERKEMBANGAN 23 TAHUN PEMBANGUNAN GROUND PENETRATING RADAR

DARI TAHUN 1998 - 2022

Penyelidikan Ground Penetrating Radar (GPR) telah dimulai oleh Dr. Azmi Ibrahim dan En. Amry Yassin pada tahun 1998 dengan pembelian alat GPR yang bertujuan untuk menjalankan servis pada peringkat awalan. Seterusnya, pada tahun 2015 GPR melalui fasa-fasa penyelidikan dalam memahami dengan lebih mendalam tentang pengeluaran data. Beberapa siri kerjasama dengan Universiti dan juga industri telah membawa kepada potensi GPR ke peringkat yang lebih tinggi seperti yang tertera di bawah:

1998-2007	2008-2016	2017-2019	2020-2022	Future
• Pembelian alat Troder dan GPR • Menjalani siri training penggunaan alat (MALA) • Menjalankan servis dan konsultasi dengan PLUS Highway selama 10 bulan berkenaan kelembapan dan kepadatan asfalt jalan.	• Permulaan penyelidikan ARE (Thorium) • Servis mencari harta karun. • Menwujudkan GPR test rig di Blok 60. • Bekerjasama dengan TNB untuk stesen janakuasa hidro. • Bermulanya siri promosi GPR dengan skif.	• Pembelian GPR GSSI dengan keupayaan dual frequency dan pensiran lekoni. • Bekerjasama dengan Kem Terendak untuk pencarian kubur askar Commonwealth (CPS REUNITE) • Menjalankan demo di PULAPOL. • MOA dengan PESCADA untuk 3D mapping DEKL. • MOU dengan UNMAP. • Temuramah dengan ASTRO Awani.	• Test rig untuk penggunaan GPR untuk water leakage di Blok 60. • IUMAP (Intelligent Utility Mapping) mendapat trademark dan mendapat Gold Medal (Hari Inovasi Nuklear) • IUMAP mendapat silver medal di MTE. • Permulaan test rig untuk jalan di Blok 60 bertujuan sebagai Calibration Centre.	• Permulaan untuk projek GPR untuk pensijilan dan training.

INFOGRAFIK PUSAT PEMBANGUNAN AKSELERATOR ACCELERATOR DEVELOPMENT CENTER (ADC) BAHAGIAN SOKONGAN TEKNIKAL

2001 **Intelligence System Group (ISG)**

Bahagian Projek Khas
Pengurus: Dr. Ashhar Khalid



Pembangunan **Baby- Electron Beam Machine (EBM)** 120 KeV dengan modifikasi dari mesin sinar-x lama

2004 Alur Elektron pertama dihasilkan oleh **Baby-EBM**

Pembangunan peranti **Plasma Fokus Intelligence System Group (ISG)**

2006 Bahagian Sokongan Teknikal

Pengurus: Dr. Ashhar Khalid



Pentauliahan peranti Plasma Fokus 3.3 kJ, 150 kA

2007 Sinar-X telah dihasilkan oleh peranti **Plasma Fokus**

2008 Pusat Pembangunan Akselerator Bahagian Sokongan Teknikal

Pengurus: Dr. Abu Bakar Ghazali



Merekabentuk bunker ELV-4

Pemasangan, pengujian dan pentauliahan Akselerator ELV-4; 1 MeV, 50 mA

2010 Pengurus: Muhamad Zahidee Taat

Pentauliahan Akselerator ELV-4

2012 Pengurus: Ts. Dr. Siti A'lasah Hashim

Pembangunan produk Inovasi – **Portable Spot Welding Machine POMISLOT**

Naik taraf **Baby-EBM** kepada Akselerator Elektron Bertenaga Rendah (Low- Energy Electron Accelerator, **LEEA**) 200 keV 10 mA

2013 Pembangunan pembekal kuasa voltan tinggi **Cockroft-Walton 250 kV**

2016 Peranti **Plasma Fokus** telah dikesan menghasilkan **Neutron**

2018 Pengurus: Ts. Dr. Leo Kwee Wah

Khidmat penyinaran **Plasma fokus**

2019 Pentauliahan dan khidmat penyinaran **LEEA**

Terkini



Plasma Fokus

LEEA

For further information, please contact:

Director General,
Malaysia Nuclear Agency
(Nuclear Malaysia)

Attn:

Director

Technical Support Division

E-mail: ishak_mansor@nm.gov.my

Tel : +603 - 8911 1221

Fax : +603 - 8911 2154

KUMPULAN SEKURITI NUKLEAR

Oleh: Kumpulan Sekuriti Nuklear, Bahagian Keselamatan dan Kesihatan Sinaran, Agensi Nuklear Malaysia.



Kumpulan Sekuriti Nuklear (KSN) di Bahagian Keselamatan dan Kesihatan Sinaran (BKS) ditubuhkan oleh Pihak Pengurusan Agensi Nuklear Malaysia secara rasminya pada 28 Disember 2018 dalam Mesyuarat Pengarah-Pengarah Bil 3/2018. Penubuhan KSN pada masa itu juga adalah selaras dengan Pelan Strategik Agensi Nuklear Malaysia 2012-2020: Teras Strategik 6 : Memperkasa Program Keselamatan Sinaran, Sekuriti dan Kawalseliaan (3S) iaitu memperkukuhkan prasarana, meningkatkan amalan dan membudayakan 3S. Penubuhan ini adalah penting setelah mengambil kira keperluan semasa bukan sahaja di dalam negara bahkan di peringkat antarabangsa yang sangat mengambil berat dan memandang isu sekuriti nuklear secara serius terutama selepas peristiwa 11 September 2001.



SEKURITI NUKLEAR



Badan antarabangsa berkaitan tenaga atom, iaitu Agensi Tenaga Atom Antarabangsa (IAEA) melalui Department of Nuclear Safety and Security telah memperkenalkan beberapa inisiatif berkaitan sekuriti nuklear iaitu Nuclear Security Support Centre (NSSC), Nuclear Security Portal (NUSEC), International Nuclear Security Education Network (INSEN) dan juga mengadakan kerjasama bersama World Institute of Nuclear Security (WINS) bagi menganjurkan kursus dan pelbagai gerak kerja pengukuhan program sekuriti nuklear. Fungsi Malaysia sebagai non-permanent member di United Nation Security Council turut memainkan peranan penting dalam mempromosi dan memperkasakan keupayaan sekuriti nuklear di rantau Asia Pasifik.

Objektif penubuhan:

1. Memperkasakan fungsi Bahagian Keselamatan dan Kesihatan Sinaran (BKS) selaras dengan keperluan dalam Akta Perlesenan Tenaga Atom, 1984 (Akta 304).
2. Mewujudkan subject matter experts (SME) dalam bidang sekuriti nuklear di peringkat kebangsaan and serantau.
3. Sebagai 'focal point' agensi dalam penyampaian dan penyaluran maklumat / dasar / program-program sekuriti dan kawal guna nuklear yang dilaksanakan.
4. Menjalankan R&D dalam bidang sekuriti nuklear dan kawalgunaan nuklear
5. Merancang dan melaksanakan pelan sekuriti nuklear ke arah menjayakan program-program utama agensi.
6. Merancang dan melaksanakan program-program pemupukan jalinan hubungan/kerjasama sekuriti nuklear dengan pihak berkepentingan dalam dan luar negara.
7. Melaksanakan Kajian Keberkesanan Pelan Sekuriti Nuklear secara berkala di peringkat agensi melalui program peer review
8. Berperanan ke arah pusat kecemerlangan sekuriti nuklear di peringkat kebangsaan dan juga rantau asia pasifik.
9. Menjadi platform untuk berkongsi maklumat teknikal dan pengalaman dalam sekuriti nuklear di kalangan pihak berkepentingan.
10. Menyelaraskan aktiviti amalan dan pmbudayaan sekuriti di Agensi Nuklear Malaysia.



Alamat pejabat: Agensi Nuklear Malaysia
Kementerian Alam Sekeloa, Persekitaran
Kuala Lumpur
43000 KAJANG
SELANGOR

Unit Penguatkuasaan
Keselamatan Sinaran
Bahagian Keselamatan
dan Kesihatan Sinaran
Agensi Nuklear Malaysia

Tel : +603 - 8911 2000
Fax : +603 - 8911 2000
E-mail : ishak_mansor@nm.gov.my

LENDT

Leading Edge Non Destructive Testing Technology Group

RADIOGRAPHIC TESTING - DIGITAL (RT-D)

Digital Detectors using Computed Radiography (CR) and Digital Detector Array (DDA) technology, can be used to access welds, castings, tubes and pipes. Because of its high dynamic range, Digital Detectors poses more advantages in visualization of flaws.

RT-D BENEFITS

Archiving on digital media No image decomposition over the years, copies of identical quality	Quantitative evaluation Measurements, differences in wall thickness derived from grey value variations
Image processing To improve the visual evaluation, as a preparatory step for the computer aided image interpretation	Fast image transmission Taking advantage of the telecommunication "remote expertise"
Computer aided image interpretation Automatic flaw recognition	

SMART WINDER - WinDR53

Smart Winder (WinDR53) is the first product in the world designed specifically for use in industry radiography inspired by researchers from the LENDT group, Malaysian nuclear agency, Dr. Mohd Noorul Ikhsan bin Mohamed. It is the result of a joint study and development of Dr. Ikhsan along with several other researchers in nuclear Malaysia. They have received a grant under the Smart Challenge Fund fully funded by the Ministry of Science, Technology and Innovation (MSTI).

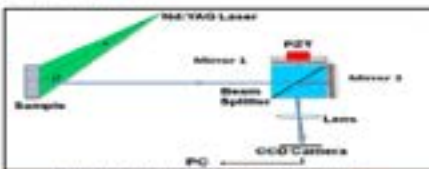
WinDR53, is a wireless remote control system for use in industrial radiography testing. It works to control the movement of radioactive sources from the Gamma projector during the radiographic testing. The main purpose of the production of WinDR53 is to reduce the risk of radiation exposure among workers and thus improve their safety and work environment. In addition, the system can also improve productivity and quality in industrial radiography work, which has been produced with certain features that allow radiographic work to be done faster with better quality results.

PORTABLE LASER SHEAROGRAPHY

The Portable Laser Shearography System is a fully compact and robust measurement system used for quality control, Non-Destructive Testing (NDT) of advanced non-homogeneous materials. The system consisting of a high-resolution CCD camera built into a miniaturized shearographic interferometer with controllable shearing optics. The portable Laser Shearography Sensor is the lightest and smallest of its kind. The integrated light array source of solidstate Nd:YAG laser gives users full control over illumination optimization.

ADVANTAGES

- Portable for field application
- Non-contact NDT technology with real time analysis
- The result is save 1 for every frame rate of images
- Applicable for any form of solid samples
- Sensitive for stress detection in a unit of micron meter
- Provide fast and high sensitivity inspection
- Low in cost
- User-friendly software



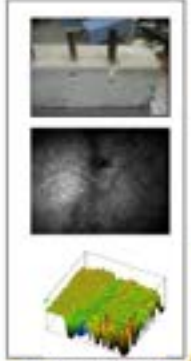
System setup diagram for digital shearography system



Portable Laser Shearography System



Laser speckle obtained by the CCD camera



Reinforce bar in concrete

Contact Information:
 Dr. Mohd Noorul Ikhsan bin Mohamed
 Manager LENDT Group
 Malaysian Nuclear Agency
 43000 Kajang, Selangor
 Tel: +603-8911 1221
 Fax: +603-8911 2154
 Email: nikit@nuker.gov.my

NON-IONISING RADIATION GROUP

RADIATION HEALTH AND SAFETY DIVISION, MALAYSIAN NUCLEAR AGENCY

Activities:
 CONSULTANCY SERVICES NIR
 PUBLIC AWARENESS PROGRAM
 TRAINING COURSE
 RESEARCH & DEVELOPMENT & COMMERCIALIZATION

RESEARCH AND DEVELOPMENT

NIR group conduct various research in NIR fields as follows:

- 5G RF EMF Exposure Study in Malaysia (2021-2024)
- RF EMF Compliance study radiocommunication infrastructure in Malaysia (2021-2022)
- Profiling RF radiation exposure emitted by telecommunication structure in Terengganu (2020-2022)
- Development of UVGI Product for disinfection of Covid-19 virus
- Development of UV safety measurement and UV exposure study emits by UVGI

R&D ACTIVITIES IN NIR FIELD



COURSE AND TRAINING



PUBLIC ENGAGEMENT AND AWARENESS PROGRAM



CONSULTANCY SERVICES



CONFERENCE AND SEMINAR



NIR GROUP COLLABORATION



NIR Group of Nuclear Malaysia has significant role in managing NIR issues in Malaysia.

We are committed as Technical Support Organisation (TSO) in NIR fields in Malaysia.

Contact Information:
 Dr. Mohd Noorul Ikhsan bin Mohamed
 Manager LENDT Group
 Malaysian Nuclear Agency
 43000 Kajang, Selangor
 Tel: +603-8911 1221
 Fax: +603-8911 2154
 Email: nikit@nuker.gov.my

RADIATION METROLOGY GROUP

by **MEDICAL PHYSICS LABORATORY (MPL)**

INTRODUCTION

Medical Physics Laboratory (MPL) was established early in 1997 mainly to assist healthcare services and development by utilizing nuclear technology in Malaysia. Our objectives are:

- To confirm that irradiating apparatus used in medical field are operated at its optimum performance and to minimize repeat examination
- To establish a secondary laboratory for diagnostic radiology standard
- To promote and conduct research and development (R&D) in the field of medical physics and related technology

CORE ACTIVITIES

Medical Physics Standard Laboratory in Diagnostic Radiology and Nuclear Medicine

Calibration of QC test tool used in Diagnostic Radiology (accredited laboratory- MSO/REC 17025:2005)

Calibration of Dose Calibrator and Tissue Counter used in nuclear medicine facility

Integrity testing measurement including lead equivalent thickness (L.E.) of protective barrier in radiation room/shielding apparatus

Quality Control (QC) in Diagnostic Radiology (all type of irradiating apparatus)

Training and Education in Medical Physics

OUR STRENGTH

- Nationally and internationally accredited, and recognized as the center of excellence in radiation protection more than 20 years
- National custodian of standard in radiation measurements and equipped with a wide range of equipment and test tools standard calibration
- MPL is well structured and supported by highly qualified and experienced personnel
- License H holder by Ministry of Health (MOH) for certifications and testing for medical irradiating apparatus and associated facilities, measurement lead equivalent thickness for irradiation room and shielding apparatus

RESEARCH • DEVELOPMENT • INNOVATION

YEAR-EQUIVALENT THICKNESS GAUGE

PATENT DONE

RADIATION BIOLOGICAL STUDIES IN CANCER TREATMENT AND RADIATION PROTECTION

DEVELOPMENT OF MULTI-SOURCE CERAMIC (MASC) PROTOTYPE

*Cooperation with local institution (Universiti Putra Malaysia, Malaysia and abroad, The National Institute of Radiological Sciences National Institute for Quantum and Radiological Science and Technology (NIRS-QST), Japan.

For further information, please contact:

Director General,
Malaysia Nuclear Agency
Bangkok, 10000 (Kuala Lumpur)
Tel: +603-8911 2201
Fax: +603-8911 2104

AGU:
AGU/REC 17025:2005
AGU/REC 17025:2005

RADIATION METROLOGY GROUP

by **SECONDARY STANDARD DOSIMETRY LABORATORY (SSDL)**

INTRODUCTION

SSDL is one of Designated Institute equivalent status as National Standard Laboratory that responsible to maintain ionization radiation standard. The main objective of SSDL is to maintain the National Reference Standards, i.e. secondary standard for dosimetry in radiation protection, radiotherapy, brachytherapy, and radiation processing. The effectiveness and traceability of the services provided is maintained through the laboratory Accreditation Scheme of Malaysia (SAMM) which meets the requirement of MS ISO/IEC 17025:2005, research and international inter-comparison of radiation measurement.

SERVICES PROVIDED BY SSDL

HIGH DOSE DOSIMETRY	CALIBRATION	PERSONAL & AREA MONITORING	OTHERS
Radiation processing technology involves high-absorbed dose in the range between 0.1 to hundreds of kGy. The reliability and accuracy of the dosimeter system play a vital role in the quality assurance and process control of industrial radiation processing. SSDL provides ceric-cerous and ferrous sulphate (Fricke) dosimeters for process control and quality assurance in radiation processing, utilizing Cobalt-60 gamma irradiation. Calibration for high dose dosimeter is accredited in accordance with the MS ISO/IEC 17025 standards since May 2011.	SSDL is the national centre for the calibration of radiation measuring instruments for dosimeters used in radiotherapy and for the radiation protection. Requirement for calibration of radiation measuring instrument is enshrined under the Atomic Energy Licensing Act 1984 (Act 306). Radiation Protection (Basic Safety Standards) Regulations 1986 (amended 2010). The SSDL Calibration laboratory has been accredited in accordance with the MS ISO/IEC 17025:2005 standard since July 2004. All measurement and calibration are traceable to the primary and international standard laboratories.	SSDL also offering services for individual and workplace monitoring. This service is important for assessment of the exposure dose of radiation workers as well as monitoring of the workplace safety with particular concern on the ionizing radiation hazard. There are two types of dosimeter offered by SSDL, namely Optically Stimulated Luminescence dosimeter (OSLD) and Thermoluminescence dosimeter (TLD). Both dosimeters can be used for whole body assessment or area monitoring.	a. RAD - in enhancing standard radiation measurement in Malaysia. b. Standardization of radiation measurement for x-ray, gamma, beta and neutron. c. Training (national and international) in standardization and Radiation Metrology. d. International inter-comparison through SSDL, IAEA/WHO, Network and Asia-Pacific Metrological Programme (APMP). e. IAEA Expert Mission in Standardization and Radiation Metrology. f. Dose mapping gamma plant irradiators. g. Consultation in radiation metrology.
Impact full dose mapping using Fricke dosimeter	Various types of dosimeters to be calibrated	Optically Stimulated Luminescence Dosimeter (OSLD)	Online international training
Calibration of TLD and OSLD dosimeter using Gamma Cell	Gamma Calibration Facility	Thermoluminescence Dosimeter (TLD)	IAEA Expert Mission in Australia
Production of TLD and OSLD dosimeter using Gamma Cell	Gamma Calibration Facility	Training Equipment dosimeter	IAEA Expert Mission

For further information, please contact:

Director General,
Malaysia Nuclear Agency
Bangkok, 10000 (Kuala Lumpur)
Tel: +603-8911 2201
Fax: +603-8911 2104

AGU:
AGU/REC 17025:2005
AGU/REC 17025:2005

KUMPULAN TEKNOLOGI PENGELUARAN RADIOISOTOP

Anwar Kesholah, Siti Selina Abdul Hamid, Mohamed Zafar Ali Mohamed Annuoudine, Radhiah Razanah Shuhri, Muhammad Abd Mohd Bakr, Zakaria Ibrahim, Muhamad Fakri Abdul Wahid, Mohd Hafiz Isahak, Wan Mohd Firdaus Wan Isahak

PENGENALAN

Kumpulan Teknologi Pengeluaran Radioisotop diberi tanggungjawab untuk membangunkan kaedah pengeluaran radioisotop berasaskan reaktor dan siklotron bagi kegunaan perubatan, perindustrian, pertanian dan penyelidikan.

Tc-99m	Ho-166	Au-198	Cu-64	H-3
I-131	Br-82	Na-24	K-42	Ag-110m
P-32	Zn-65	Fe-59	Sm-153	Ir-192

AKTIVITI PENYELIDIKAN & PERKHIDMATAN

Pengeluaran radioisotop

Samarium (Sm-153)	¹⁵³ Sm-EDTMP membantu melegakan kesakitan tulang bagi pesakit yang menghadapi penyakit kanser tahap kronik (terminal).
Iodine (I-131)	Pengesanan dan rawatan penyakit yang berkaitan dengan kelenjar tiroid seperti kanser tiroid dan hipertroid.
Technetium (Tc-99m)	^{99m}Tc-MDP : pengimejan tulang ^{99m}Tc-MAA : pengimejan paru-paru ^{99m}Tc-DTPA : pengimejan buah pinggang
Chromium (Cr-51)	⁵¹ Cr digunakan untuk melabel sel darah merah dan platelet.
Holmium (Ho-166)	¹⁶⁶ Ho digunakan dalam rawatan kanser hati.
Lutetium (Lu-177)	¹⁷⁷ Lu-PSMA digunakan dalam rawatan kanser prostat.
Iridium (Ir-192)	Ujian tanpa musnah bagi mengenalpasti kerebakkan paip dalam sektor industri minyak dan gas.

Sel aktif untuk pengeluaran ¹⁵³Sm

Kit ¹⁵³Sm-EDTMP

Pemilikan Lesen A & Amalan Perkilangan Baik

- Pengeluaran radiofarmaseutikal di Agensi Nuklear Malaysia berdaftar dengan Kementerian Kesihatan Malaysia. Fasiliti yang digunakan memenuhi Amalan Perkilangan Baik (APB) bagi memastikan penghasilan produk yang berkualiti dan konsisten mengikut piawaian kualiti yang telah ditetapkan.
- Lesen A dikeluarkan oleh Bahagian Penguatkuasaan Farnasi di bawah Seksyen 26(2)(a), Akta Racun 1952. Lesen ini membolehkan produk radiofarmaseutikal seperti Sm-153 dan I-131 yang dihasilkan memenuhi dan mematuhi Akta Racun 1952.

KOLABORASI

- Pengeluaran radioisotop
- Fasiliti kemudahan radioisotop

Proses penghasilan radioisotop

Proses pelabelan dengan radioisotop

Proses pengeluaran kapsul I-131

For further information, please contact:
 Director General,
 Malaysian Nuclear Agency
 Building 400, Kuala Lumpur
 62000
 Tel: 03-8953 1011
 Fax: 03-8953 1017
 E-mail: mna@nuklear.gov.my

PRODUK RADIOISOTOP DAN RADIOFARMASEUTIKAL DI BAHAGIAN TEKNOLOGI PERUBATAN

Samarium-153 EDTMP

Singkatan: **Sm-153 EDTMP**
 Nama kimia: **Samarium-153-ethylenediamine tetramethylene phosphonate**

Trivia
 Samarium-153 EDTMP digunakan untuk membantu melegakan kesakitan tulang (metastatic bone pain relief palliation) bagi pesakit yang menghadapi penyakit kanser tahap kronik (terminal). Di U.S. Ia telah diluluskan oleh U.S. FDA sebagai "bone palliative treatment".

Kelebihan Sm-153 EDTMP

- Perambatkan ketara skor kesakitan.
- Pengurangan ketara dalam penggunaan analgesik narkotik.
- Selamat digunakan.

2 bahan utama Sm-153 EDTMP

- Samarium-153 Radioisotop**
 - Zarah beta yang berfungsi untuk mengurangkan sakit tulang akibat kanser.
 - Sinar gamma bertindak sebagai ejen pengimejan membolehkan pesakit melakukan pengimejan melalui kamera gamma.
- Kit EDTMP (Ethylenediamine tetra methylene phosphonate)**
 - Bertindak sebagai pembawa Sm-153 ke tulang.

Kapsul Iodin-131 (I-131)

Tempoh separuh hayat I-131 ialah 8 hari.
 Proses Penyusutan I-131 akan membebaskan dua jenis sinaran iaitu:

BETA 364 keV (89%)
GAMMA 364 keV (81%)

Kegunaan Iodin-131

- Digunakan untuk merawat hipertroid dan kanser tiroid.
- Sinaran dari radioaktif Iodin akan memusnahkan sel kelenjar tiroid yang hipertroid.
- Dos radiasi yang tinggi dapat membunuh sel kanser tiroid.
- Kadar pengambilan Iodin-131 oleh kelenjar tiroid membantu doktor mengenal pasti kanser tiroid.

Kelebihan KAPSUL Iodin-131

- Senang untuk diendalkan.
- Tidak menyebarkan tumpahan radioaktif semasa rawatan.
- Memudahkan pesakit untuk menelan radioaktif Iodin.

Kit diethylenetriaminepentacetate (DTPA)

Kegunaan kit DTPA
 Pengimejan menggunakan perubatan nuklear dalam menilai struktur, fungsi dan prestasi buah pinggang.

Mekanisma

- Ligan aktif diethylenetriaminepentacetate (DTPA) dicampurkan dengan larutan sodium perklorat (NaClO_4) membentuk kompleks ^{99m}Tc -DTPA.
- DTPA bertindak sebagai agen pembawa maklumat ^{99m}Tc menghasilkan sinar gamma bertindak sebagai agen pengimejan.
- Pengimejan dilakukan dengan menggunakan peralatan SPECT/CT atau kamera gamma.

Chemical Structure of DTPA:
 $\text{HOOC}-\text{CH}_2-\text{N}(\text{CH}_2\text{CH}_2\text{N}(\text{CH}_2\text{CH}_2\text{COOH}))_2-\text{CH}_2\text{CH}_2\text{COOH}$

Technetium (99m) DTPA

For further information, please contact:
 Director General,
 Malaysian Nuclear Agency
 Building 400, Kuala Lumpur
 62000
 Tel: 03-8953 1011
 Fax: 03-8953 1017
 E-mail: mna@nuklear.gov.my



KUMPULAN TEKNOLOGI FARMASEUTIKAL

Zariah Adam, Daryl Jesus Acapoc, Rozinda Razali, Adang Abdul Rahim Ossen, Hummah Mohamed Shafie, Adnan Haniff Abd Aziz, Nur Adzrah Maridhi

PENGENALAN

Kumpulan Teknologi Farmaseutikal (KTF) terdiri daripada enam orang pegawai penyelidik dan tiga orang kakitangan pelaksana. Fungsi utama KTF adalah untuk membangunkan agen terapeutik dan bahan sintetik dan bahan semulajadi untuk rawatan penyakit dan juga membangunkan agen radiagnostik untuk digunakan dalam pengesanan penyakit berjangkit. Aktiviti utama KTF adalah menjalankan penyelidikan dan pembangunan teknologi dan produk selaras dengan Wawasan Nuklear Malaysia 2030, Teras strategik 2, inisiatif 3 dan 7. Selain projek penyelidikan, KTF terlibat dengan projek IAEA iaitu projek Technical cooperation (TC) dan program ZODIAC untuk pembangunan kepakaran dan modal insan. KTF juga terlibat dalam menjalankan khidmat analisis kepada pelanggan Nuklear Malaysia. Selain daripada itu, KTF juga ada menjalankan kolaborasi penyelidikan dengan agensi luar Nuklear Malaysia. Kumpulan Teknologi Farmaseutikal bertanggungjawab untuk menyelia tujuh buah makmal penyelidikan, satu sistem akuarium zebrafish dan sebuah loji fitofarmaseutikal. Kesemua makmal-makmal dan fasiliti ini telah dilengkapi dengan peralatan-peralatan saintifik yang boleh digunakan dalam kerja-kerja penyelidikan serta khidmat analisis.

AKTIVITI PENYELIDIKAN & PEMBANGUNAN

KAJIAN SINTESIS SEBATIAN KIMIA

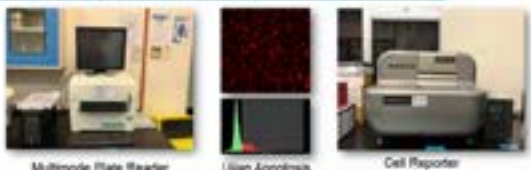
Kajian sintesis kimia adalah pembinaan struktur kompleks molekul organik daripada sebatian yang ringkas dan melibatkan pembelahan ikatan sedia ada dan pembentukan ikatan baru. Kajian ini bertujuan untuk menghasilkan sebatian kimia baru yang mempunyai aktiviti biologi serta penentuan hubungan antara struktur sebatian yang disintesis dan aktiviti biologinya.



Preparative Liquid Chromatography (Prep-LC) High Performance Thin Layer Chromatography (HPTLC) Liquid Chromatography Mass Spectrometry (LC/MS/MS)

KAJIAN EFIKASI SECARA IN VITRO

Kajian efikasi secara in vitro adalah kajian diperingkat awal untuk mendapatkan Proof of Concept (POC) tentang kebolehtaksanaan sesuatu projek sebelum kajian efikasi pra-klinikal dijalankan. Antara kajian POC yang dijalankan di KTF adalah ujian anti-kanser, ujian anti-oksidan dan ujian anti-diabetik dan lain-lain.



Multimode Plate Reader Ujian Apoptosis Cell Reporter

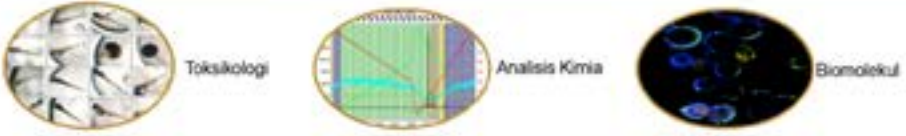
KAJIAN TOKSISITI

Kajian toksisiti adalah ujian untuk menentukan tahap ketoksikan sesuatu sampel atau agen sebelum hanya boleh dibangunkan sebagai agen terapeutik. Di KTF, ujian toksisiti dijalankan menggunakan organisma peringkat rendah iaitu kultur sel, anak udang dan embrio ikan zebrafish.



Ujian ketoksikan menggunakan anak udang Ujian ketoksikan menggunakan kultur sel Ujian ketoksikan menggunakan embrio zebrafish

BIDANG KOLABORASI



Toksikologi Analisis Kimia Biomolekul

For further information, please contact:
 Director Research, Malaysian Nuclear Agency
 61000, 43000, 43000
 03-89561000

For further information, please contact:
 Director Research, Malaysian Nuclear Agency
 61000, 43000, 43000
 03-89561000

KUMPULAN TEKNOLOGI KAWALAN PRODUK & BIODOSIMETRI

Rafimah Abdul Rahim, Muhammad Haniffi Mohamad Mokhtar, Noranayah Mohd Yusof, Juliana Mahamad Napsiah, Nurul Nazreenah Juarni, Norhafizah Othman, Ahmad Adhwa Asyraf Hashim, Nuraini Anni Ruber Abdullah, Muhammad Syazwan Zubir

PENGENALAN

Kumpulan Teknologi Kawalan Produk & Biodosimetri (TKP&B) ditubuhkan selari dengan keperluan pengesanan kualiti produk yang dihasilkan oleh Bahagian Teknologi Perubatan (BTP). Fokus utama kumpulan ini adalah menjalankan aktiviti kawalan mutu serta penyelidikan dan pembangunan ke atas produk yang dihasilkan di BTP. Terdapat tiga bidang utama dalam aktiviti penyelidikan dan pembangunan iaitu bidang kimia/radiokimia, mikrobiologi dan biodosimetri.

AKTIVITI PENYELIDIKAN

PENYELIDIKAN KIMIA/RADIOKIMIA

- Menjalankan penyelidikan Kawalan Mutu Kimia/Radiokimia ke atas produk serta bahan mula yang digunakan dalam menghasilkan produk radiokimia dan kit farmaseutikal.
- Antara penyelidikan yang dijalankan:
 - Development of quality control methods on methylene diphosphonate (MDP) kit production for purity assessment and Good Manufacturing Practice (GMP) compliance.
 - Production and Quality Control of chromium-51 to form Cr-51 EDTA for determining of glomerular filtration.

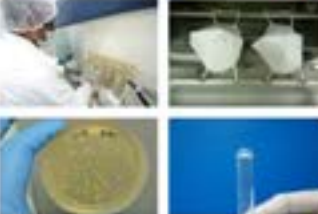


PENYELIDIKAN MIKROBIOLOGI

Menjalankan penyelidikan dalam pembangunan Kawalan Mutu Produk, Penghasilan Radioisotope serta Kit Farmaseutikal.

Antara penyelidikan yang dijalankan:

- Radiation Sterilization of PPE – NM-R&D-20-05.
- Projek kerjasama pembangunan & pengkomersilan teknologi "Ultraviolet Germicidal Irradiation" (UVGI).
- Optimization and validation of sterilization process using biological indicator.
- Radiation Sterilization of Reusable Personal Protective Equipment.



PENYELIDIKAN BIODOSIMETRI

- Menjalankan penyelidikan teknik Ujian Aberasi Kromosom dan teknik FISH (Fluorescence In Situ Hybridization).
- Antara penyelidikan yang dijalankan:
 - Chromosome Aberration in Interventional Radiology Staff Occupationally Exposed To Low Dose Ionizing Radiation.
 - Establishment of reference Dose-Response Calibration Curve for Dicentric Chromosome Aberration to assess accidental radiation exposure in Malaysia.
 - Assessing the effects of low dose ionizing radiation on healthcare workers in interventional radiology by cytogenetic analysis using fluorescent in situ hybridization (FISH) (penyelidik bersama bagi projek kerjasama dengan IMR-NMRR-18-230-40243).



POTENSI KOLABORASI

- Penyelidikan kawalan mutu ke atas produk radiofarmaseutikal
- Penyelidikan dalam bidang biodosimetri untuk pekerja sinaran serta kemalangan sinaran.
- Emergency preparedness and response – Biological Dosimetry

For further information, please contact:
 Director Research, Malaysian Nuclear Agency
 61000, 43000, 43000
 03-89561000

For further information, please contact:
 Director Research, Malaysian Nuclear Agency
 61000, 43000, 43000
 03-89561000

IRRADIATION FOR FOOD SAFETY & SECURITY

Ahmad Zainuri, M. D., Ros Anita, A. R. & Seri Chempaka, M Y

Food Irradiation: A Safe Process

Food irradiation is an environmentally safe processing technology where food is exposed to ionizing energy such as x-rays or accelerated electron beams, both generated by electricity or gamma radiation emitted by cobalt-60. Energy is transferred in a controlled manner in order to reduce post-harvest losses or to make food safe from foodborne illnesses as well as quarantine control. This technology has been widely used as the process does not change the temperature or aspect of the food and leaves no residues. Various foods are treated by irradiation in nearly 80 countries and represents only a relatively small proportion of overall global food traded annually. On average, 400-800 tonnes of food, various types of spices, herbs and supplements have been irradiated in Nuklear Malaysia annually.



Typical Multipurpose Radiation Processing Facility

Weight sample Screening PSL

A (herbs, spices, others)
Photon counts

0	700	5000
-ve	Intermediate	+ve

Detection: Photostimulated luminescence technique (PSL)

Photostimulated luminescence is a radiation specific phenomenon resulting from energy stored by trapped charge carriers, the release of which by optical stimulation can result in a detectable luminescence signal. Nuklear Malaysia with the expertise availability in PSL technique was appointed by MOH as the agency responsible to conduct detection analysis of irradiated food to meet the requirements of this regulation. PSL system is particularly suited to investigate wide range of foods with minerals such as herbs, spices, seasonings, shellfish, cereals, bulb and tubers. This technique is beneficial and relevant for application of food irradiation towards improving food safety and security in Malaysia

One Process: Multiple Uses

- Sprout Inhibition:** Onion, Potato, Ginger, Garlic
- Insect Disinfestation:** Cereals, Pulses, Dry fruits
- Shelf-life Extension:** Chicken, Meat, Fish
- Pathogen Reduction:** Spices, Fresh fruits
- Quarantine:** Fruits

SURRC PPSL Irradiated Food Screening System



Microbial Bioprocessing Using Radiation Technology

By: Everina N, Elly Ellyna R, Hing JN, Ahmad Zainuri MD, Liew PWY, Jong BC, Shaiful Azuar M

Introduction

The main activities involved are mutation breeding in solid state fermentation as well as submerged culture fermentation. The microbes were irradiated to produce new varieties of mushroom and bacteria. Then, in solid state fermentation, various mushroom related bioprocessing are being carried out to produce solid seed, liquid seeds, mushroom powder and its related functional food products such as food seasoning, mushroom tea and so-on. Besides that, bioactive compounds (metabolites) are being generated in submerged culture fermentation, to cater for biotechnological needs of industry. New strains of bacteria are being produced to be applied in the water quality related field as well as producing bioplastics materials.

Applications

Pharmaceuticals, Cosmeceuticals, Nutraceuticals

Products

Mushroom, Bacteria

Characterisation

Production

Optimisation

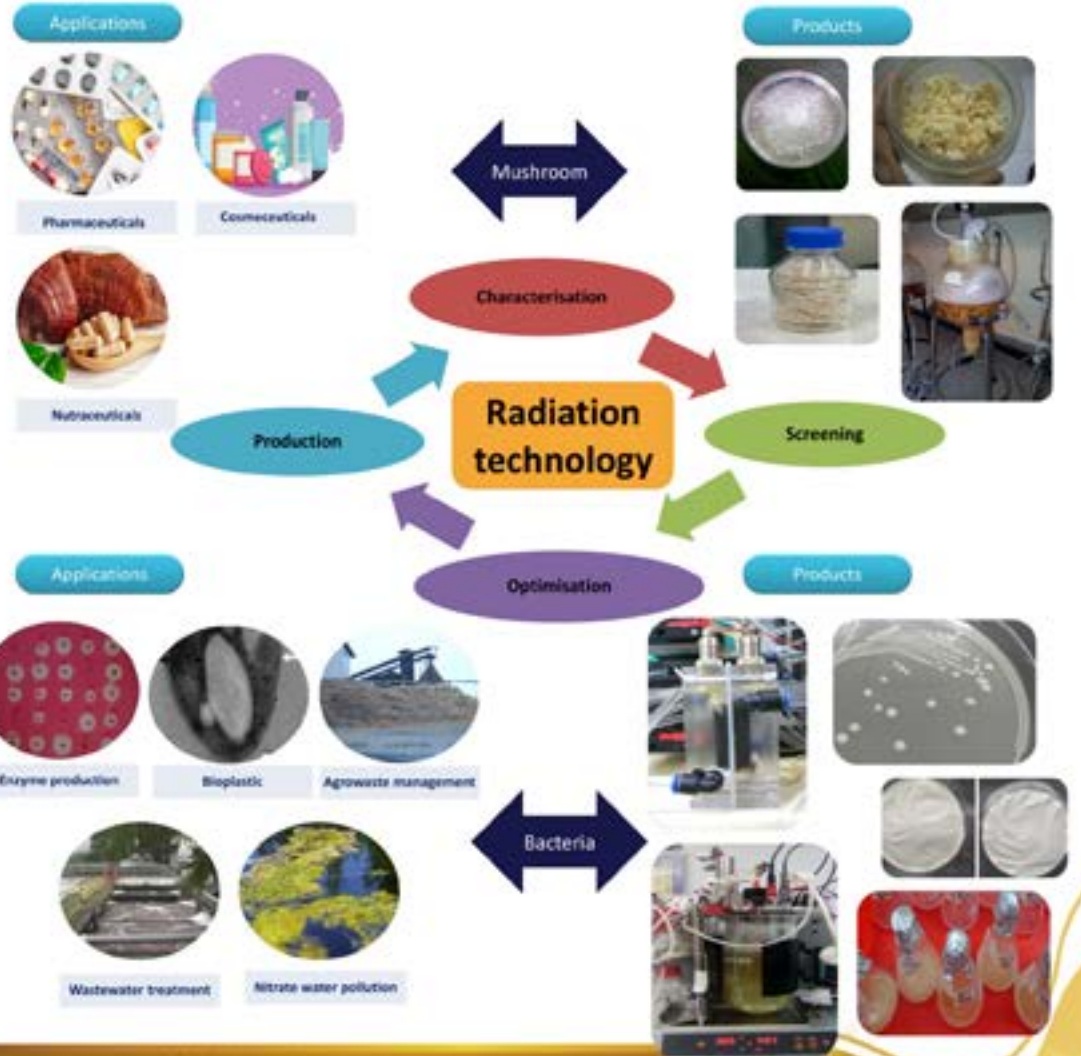
Screening

Radiation technology

Applications

Enzyme production, Bioplastic, Agrowaste management, Wastewater treatment, Nitrate water pollution

Products



MUTATION BREEDING OF KENAF FOR HIGH FIBRE

Mustapha A. Zaiton A., Affrida AH, Shakinah S., Faiz A., Ahmad Nazrul AW & Mohd Noor Hidayat A.

The main objective of this research project is to develop new kenaf mutant varieties with high fibre characteristic

INTRODUCTION

Kenaf (*Hibiscus cannabinus* L.) which belongs to Malvaceae family is a herbaceous annual plant. Currently, kenaf-based products are getting higher demand from local and international market. It has generated around RM350million revenue in local market. The yield of kenaf in Malaysia is still very low which is around 5 to 10 tonne per hectare. The highest yield achieved was about 9.8 tonne per hectare from V36 variety. **Mutation induction is the best way to develop new varieties with the desirable traits in a short time compared to conventional breeding.** The mutation breeding program was performed using acute gamma (BioBeam GM8000) and chronic gamma (Gamma Greenhouse) irradiation. The field plots for breeding studies were located in Perlis state (Beseri and Titi Tinggi) and the marginal soil plot in Terengganu state (Setiu). In addition to breeding, **soil, nutrient and water management studies** were also carried out to evaluate nutrient and water use efficiency in kenaf mutant lines

METHODOLOGY

Seeds of V36 variety were irradiated at Gamma Greenhouse (for chronic irradiation) and using BioBeam (for acute irradiation)

Radicalsensitivity test was carried out to determine the optimum dose for mutation induction

Screening and selection of high fibre mutants were done at test plots in Perlis and Terengganu

RESULTS

No	Mutant Code	Dose (Gy)	Characters
1	ML1	200	High seed pods
2	ML2	200	Tall plant
3	ML4	300	Tall plant
4	ML5	300	High Fiber
5	ML9	300	Flower and leaves variation (palmate leaves)
6	ML10	300	High fiber
7	36-3	300	High fiber, tall plant
8	36-8	300	High fiber, tall plant
9	36-11	300	High fiber, tall plant
10	36-20	800	High fiber
11	36-21	800	High seed pods
12	36-24	1300	High fiber, tall plant
13	36-25	1300	High fiber, tall plant

Mutant 36-24
Tall plant and high fiber

Mutant ML5
Variation in leaf shape, flower colour, tall plant and high fiber

Mutant 36-11
Tall plant and high fiber

FUNDING AND COLLABORATION

This project was funded under MOSTI Special Allocation Grant entitled "Gamma-radiation induced mutagenesis for the production of high yielding and late-maturing (photoperiod insensitive) varieties of Kenaf (*Hibiscus cannabinus*) (PKA0514D031) and was carried out in collaboration with National Kenaf and Tobacco Board (NKTB).

Land preparation, planting and seed harvesting

FOOD TRACEABILITY AND AUTHENTICITY THROUGH APPLICATION OF NUCLEAR AND RELATED TECHNIQUES

By: Nur Hafizati A. H., M. N. Hidayat A., Salmah M., Siti Aminah O., Hazlina A., Maizatul Akmal M. N. and Rafiah M. R.

INTRODUCTION

There is abundance of fake food products which can cause harm to human's health, labeling fraud that affects consumer safety and price manipulation based on the origin of the food in the domestic market. For example, the addition of sugar in honey, grade fraud for premium fruits such as Harumanis's mango and Musang King's durian, as well as fraud on the origin of edible bird's nest and the nitrate content in them. The scientific system of authenticating food authenticity and geographical tracking in Malaysia using **stable isotope analysis techniques** is an efficient forensic application for the investigation of food product fraud. This technique is able to distinguish foods according to the characterization of stable isotope values that vary according to agricultural practices for plant-based products and also the food chain for animal-based products.

FOOD ISSUES

FOOD FRAUD
cost industry USD 30-40 billion/year

AWAS!
MADU TIRUAN!

Food fraud occurs when products are deliberately:

- Substituted
- Mislabelled or misdescribed
- Tampered with
- Substituted with another product

WORKFLOW

Sample Sampling

Multi elements analysis using ICP-MS

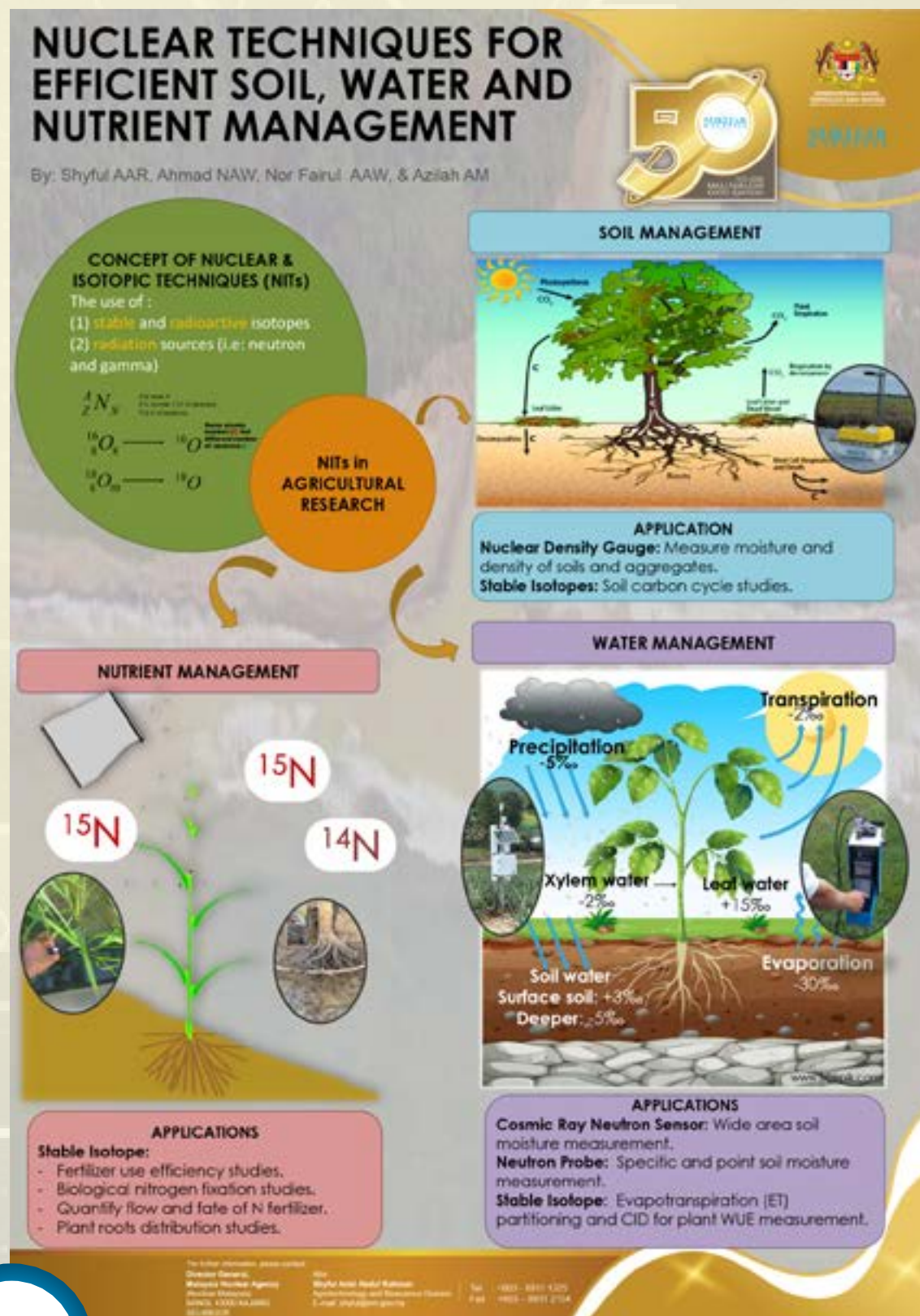
Stable isotope analysis using IRMS

Metabolites profiling using NMR Analysis

Traceability and authenticity database and model

ADVANTAGES

- Scientific technique traces actual product not packaging
- Trace farm to fork
- Cannot be counterfeited-measure product intrinsic properties. Present paper-based system using barcodes, product labels – information inputs by producers prone to fraud

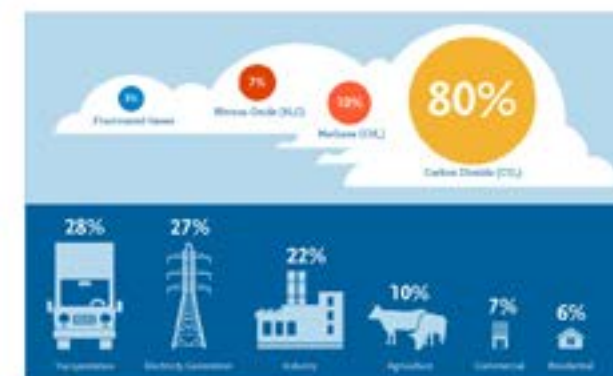


Greenhouse Gas Emission and Mitigation Through Climate Smart Agricultural Practices

By: Ahmad Nazrul AW, Salmah M, Shyful Azizi AR, Mohd Noor Hidayat A, Hazlina A, Malizatul Akram MN, Abdul Razak R, Nor Fairul Azam AW and Azania Shazlin MR.

Climate Change

Climate change is the single biggest health threat facing humanity. The impacts are already harming health through air pollution, disease, extreme weather events, forced displacement, food insecurity and pressures on mental health. Climate change refers to long-term shifts in temperatures and weather patterns. These shifts may be natural, such as through variations in the solar cycle. Global warming is a phenomenon of climate change characterized by a general increase in average temperatures of the earth, which modifies the weather balances and ecosystems for a long time.



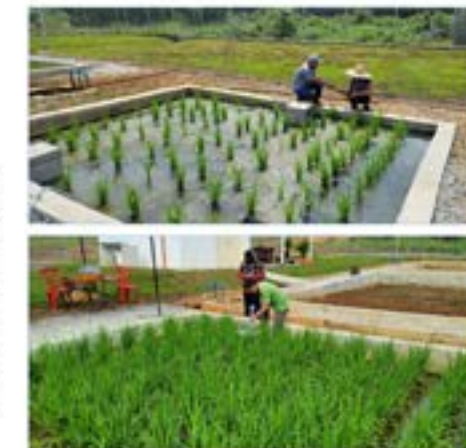
Greenhouse Effect



Greenhouse gases from human activities are the most significant driver of observed climate change since the mid-20th century. The most common and most talked about greenhouse gases are carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). Greenhouse gases in the atmosphere can cause the greenhouse effect that led to global warming. Greenhouse effect occurs in the troposphere (the lower atmosphere layer), where life and weather occur. Greenhouse gases are those gaseous constituents of the atmosphere that absorb and emit radiation in the thermal infrared range.

Greenhouse Gases Emission Mitigation

Greenhouse gas emissions from agriculture sector come mostly from cultivation of crops, livestock and deforestation. In crop cultivation, rice field act as a source of CH₄ and N₂O emissions. Malaysian Nuclear Agency in collaboration with IAEA has conducted a study related to climate smart agriculture practices (CSAP) to reduce greenhouse gas emissions in paddy fields. Among of the CSAP methods used in the study are alternate wetting and drying irrigation (AWD) and biochar application. Studies have shown a 48% reduction in CH₄ emissions on AWD irrigation and 20% on biochar application.



IS21 New Rice Seeds of Nuclear Technology

By: Abdul Rahim H. Sabli H., Zaiton A. Affida AH, Faiz A. Aima A., Siti Nurwahida H., Mund Shafkawi A., Siti Nurdiana Y., Muhammad Adib Nigri J., Muhammad Ruzvi Ali, James Markender S., Wan Norhazira B.Y.

Rice project was honored to be visited by His Majesty Sultan Ibrahim ibn Almarhum Sultan Iskandar, Sultan of Johor.

New rice variety IS21 is produced through mutation breeding method by induction of variety MR219 rice using gamma radiation technology. IS21 is an abbreviation for the name of the ninth Prime Minister of Malaysia, Dato' Seri Ismail Sabri bin Yusakob.

While the number 21 represents the year 2021. This new variety has been registered (Plant Variety Protection) at the Malaysia's Department of Agriculture as NMR152.

The multi-location trial for IS21 was initiated in 2016 and 2017 at various rice granary areas in the Peninsular Malaysia.

IS21 has been planted in major rice granaries throughout Peninsular Malaysia such as in the integrated agriculture development area (IADA) northwest of Selangor, Kerian, Seberang Perak and MADA in Kedah.

It is also highly responsive to nitrogen fertilizer uptake and resistant to several major rice diseases.

Local Verification Trials (LVT) were conducted in 2018 to 2020 on farmers' plots in several rice granary areas. This variety shows high and stable yields in various environments and is suitable for cultivation in different soil series.

The average yield can reach up to **9 tons/Ha**

IS21 Characteristics

- Flowering : 82 days
- Culm height : 82 cm
- Panicle length : 30 cm
- Number of panicle per plant : 17
- Number of tiller per plant : 20
- Maturity : 100-110 days
- Weight of 1000 grains : 31.1 g
- Length of grain : 11.1 mm
- Width of grain : 2.75 mm

IS21 Quality

- Percentage of brown rice : 75.76 %
- Percentage of milled rice : 65.33 %
- Percentage of head rice : 80.09 %
- Percentage of broken rice : 8.9 %
- Broken rice (animal feed) : 0.59 %
- Moisture : 10.1 %

IS21 Physicochemical Properties

- Amylose : 20.3 %
- Water content : 8.6 %
- pH : 6.67
- Whiteness : 60.26 %
- Length of rice : 7.14 mm
- Width of rice : 1.95 mm
- Length width ratio : 3.67
- Length of cooked rice : 11.7 mm
- Kernel elongation ratio : 1.75
- ASV : 3

IS21 Nutritional Properties

- Protein g/100 g : 8.0
- Fat g/100 g : 2.1
- Carbohydrate g/100 g : 76.5
- Ash g/100 g : 1.1
- Moisture g/100 g : 12.3
- Energy kcal/100 g : 357 (1499 kJ)

For further information, please contact:
Dr. Abdul Rahim H. Sabli H.
Director General
Nuclear Science Agency
Ministry of Science, Technology and Innovation
61000 KUALA KEMPAS
JALAHAR

Dr. Zaiton A. Affida AH
Deputy Director General
Nuclear Science Agency
Ministry of Science, Technology and Innovation
61000 KUALA KEMPAS
JALAHAR

Tel : +603 - 8915 1230
Fax : +603 - 8915 1375

BIOBAJA

Oleh: Dr. Phua Choo Ewe Hae, Nur Hamidah Lau M. Abdullah, Ahmad Nazrul B. Abd Wahid, Chong Saw Peng, Mohd. Noor Hidayat B. Adnan, Dr. Ahmad Zamir Mohamad Domic, Rosnani Bt. Abdul Rahim, Mariani Bt. Deraman, Abdul Razaq B. Yuslan, Hazina Bt. Abdullah, Maizatul Akram Bt. Mohd. Nasir, Norella Bt. Bahari, Shahrul Bt. Salleh, Nur Farid Azam B. Abdul Wahid, Azzah Ibrahim M. Mohamed Raziq, Balah M. Mohamed Raziq dan Mohd Hafiz Ridzwan

Produk biobaja mengandungi mikroorganisma berfaedah pelbagai fungsi, termasuk keupayaan pengkutan nitrogen atmosfera, penguraian fosfat dan penguraian kalium. Selain itu, terdapat juga fungsi lain untuk setiap jenis biobaja seperti berfungsi penghasilan hormon penggalak tumbuhan, kawalan biologi penyakit layu bakteria, penghasilan rizosfera sihat dan probiotik yang menghasilkan imunisasi terhadap penyakit.

Dalam R&D biobaja, isotop stabil nitrogen (N-15) telah digunakan sebagai penunjuk untuk menestutikan secara kuantitatif sumbangan kandungan nutrisi nitrogen dalam tanaman daripada pengikat nitrogen biobaja.

Melalui geran penyelidikan ScienceFund Kementerian Sains, Teknologi dan Inovasi (MOSTI) pada tahun 2017 hingga 2021, Nuklear Malaysia berjaya mengkomersialkan empat produk biobaja hasil R&D iaitu Bioliqfert, GoGrow BioNPK Biobaja, Migrofas M99 dan Bioliqfert M100 melalui kerjasama dengan syarikat yang berpotensi.

Agensi Nuklear Malaysia (Nuklear Malaysia) terlibat dalam penyelidikan dan pembangunan (R&D) biobaja termasuk melalui Projek Biobaja dalam program kerjasama serantau Forum for Nuclear Cooperation in Asia (FNCA) semasa tahun 2002.

KELEBIHAN BIOBAJA

- Mesra alam
- Jimat kos
- Tanah sihat
- Hasil tanaman tinggi

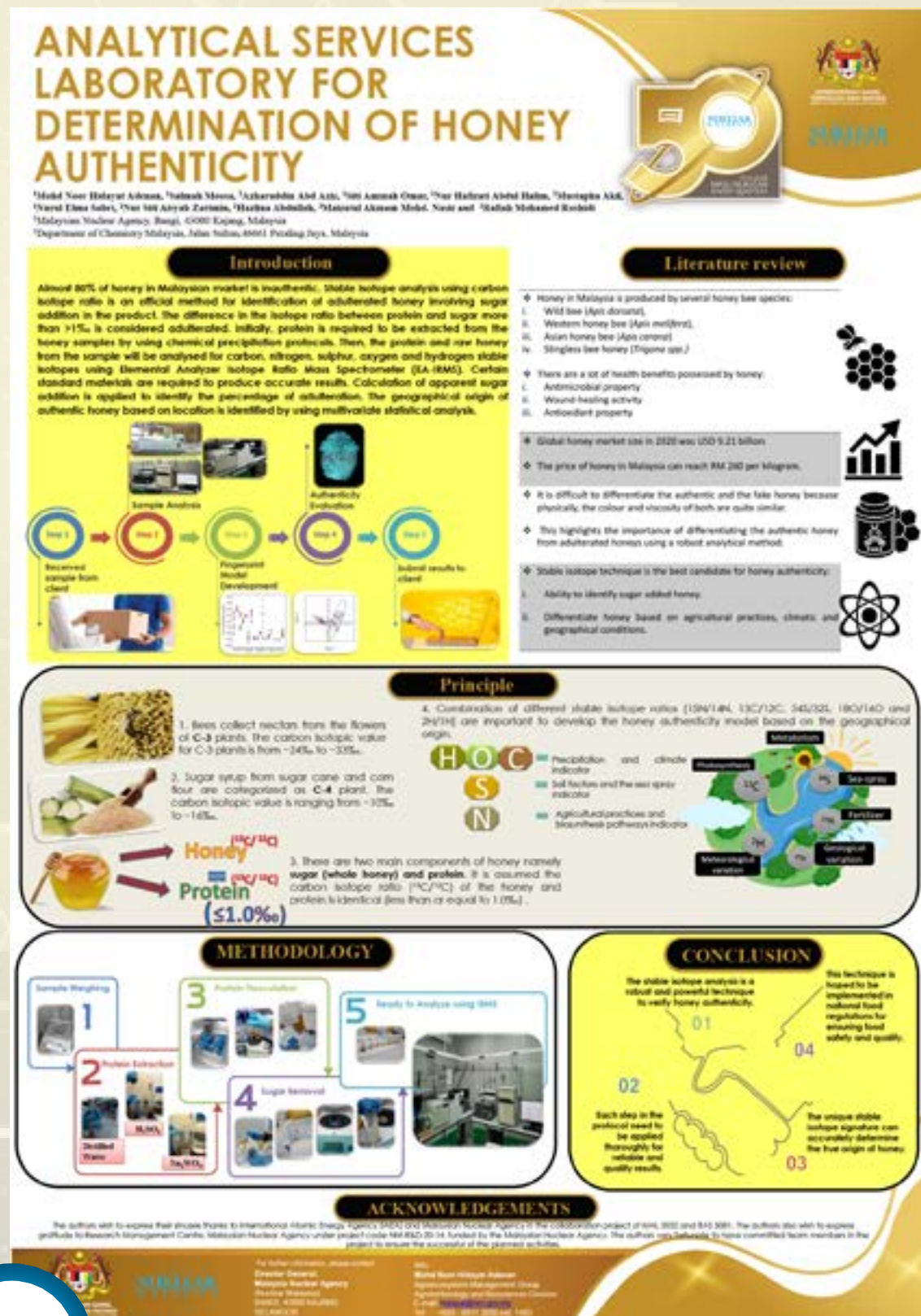
KEUPAYAAN BIOBAJA

- Pengikatan nitrogen (N)
- Penguraian fosfat (P)
- Penguraian kalium (K)
- Penghasilan rizosfera sihat
- Penghasilan hormon penggalak tumbuhan
- Kawalan biologi penyakit layu bakteria
- Probiotik yang menghasilkan imunisasi terhadap penyakit

For further information, please contact:
Dr. Phua Choo Ewe Hae
Director General
Nuclear Science Agency
Ministry of Science, Technology and Innovation
61000 KUALA KEMPAS
JALAHAR

Dr. Ahmad Zamir Mohamad Domic
Deputy Director General
Nuclear Science Agency
Ministry of Science, Technology and Innovation
61000 KUALA KEMPAS
JALAHAR

Tel : +603 - 8915 1230
Fax : +603 - 8915 1375



Mutation breeding technology for crop improvement

Zaiton A, Afrida AH, Chong SP, Sobri H, Norazlina N, Salahbiah AM, Shakinah S, Faiz A, Mustapha A, Munirah MS, Wan Dalila WC, Azhar M & Abdul Rahim H.

What is plant mutational breeding?

Two forms of mutation breeding based on how the mutation is induced:

- Spontaneous Mutation**: The frequency rate is rather too low. Difficult to exploit by the plant breeder.
- Induced mutation**:
 - Physical Mutagens**: X-rays, Alpha rays, Gamma rays, Neutrons, Beta rays.
 - Chemical Mutagens**: EMS, EES, BMS, DEN.

Mutation breeding or mutagenesis is the deliberate development of mutations and their use to create new crop kinds. It is the process of exposing the seeds to radiation or chemical to generate mutants with desirable traits. Usually, the improvement of crop variety takes place by changing the genotype/ genetic structure. Mutation breeding is built on mutation induction and mutation detection. It is cost effective, quick, proven and robust. It is also transferrable, ubiquitously applicable, non-hazardous and environmentally friendly. More than 3,200 mutant varieties – including numerous crops, ornamentals and trees – have officially been released for commercial use in more than 210 plant species from over 70 countries (Source: FAO/IAEA Mutant Varieties Database).

Mutation Breeding Project in Malaysian Nuclear Agency

Desirable properties achieved by mutation breeding:

- Increase Yield
- Improved seeds quality
- Resistance to climate change
- Shortened maturity time
- Improved agronomic trait
- Disease resistance

Mutation Breeding Help to Sustain Food Security

Rice, Kenaf, Napier, Banana, Pineapple, Cassava, Stevia, Sorghum, Ornamental, Mushroom.

For further information, please contact:
 Director General,
 Malaysian Nuclear Agency
 (MAMNUC), 61000 Kajang,
 Selangor, Malaysia.
 Tel: +603-8951 2000
 Fax: +603-8951 2114
 E-mail: info@mamnuk.gov.my

FACILITIES FOR PLANT IMPROVEMENT

GAMMA GREENHOUSE

Gamma Greenhouse (GGH) is a chronic irradiation facility located at the Kompleks Jalan Dengkil. It became fully operational in 2008. GGH is used for mutation induction on plants and other biological samples. It consists of a 15 meter radius greenhouse, a control room and an irradiator. Samples are exposed to low-dose gamma radiation over a long period of time depending on the type and sensitivity of the sample. GGH has been appointed as IAEA Collaborating Center (ICC) for the duration of 4 years (from 2019 to 2023). Apart from research activities, as an ICC, GGH receives trainees to undergo training in the field of plant mutation breeding.

PLANT TISSUE CULTURE INCUBATOR LABORATORY

This facility serves as a pre-commercial plant tissue culture laboratory for large-scale production of seedlings using in vitro technique since 2010. It is equipped with aseptic culture room with 7 units of laminar air flow cabinet, media preparation room, washing area and incubation rooms that can hold 80,000 plant tissue cultures at a time with a production capacity of approximately 1.0 million plants per year. There is also a hardening area equipped with automated sprinkler system that can accommodate up to 3,000 seedlings at a time. With this facility, Nuclear Malaysia is able to facilitate interested industries/companies with consultation on large-scale production of plant tissue culture seedlings, transfer of technology (tissue culture procedure/process) and hands-on training.

FloraViro LABORATORY

FloraViro Laboratory (MFV) is a commercial laboratory of tissue culture for the production of seedlings by the in vitro method. It is equipped with offices, meeting rooms, media preparation rooms and washing areas as well as an aseptic/clean area consisting of a large evacuation room and three incubation rooms. The incubation room can hold 300,000 plant tissue cultures at a time with a production capacity of approximately 1.8 million plants per year. This laboratory has been fully operational since June 2002 and provides consulting services on large-scale in vitro seedling production.

ACUTE GAMMA IRRADIATION FACILITY

The BioBeam GM8000 gamma acute irradiation chamber began its operation in 2012. It is used to induce mutation on agricultural samples such as seeds, cuttings, bulbs and in vitro culture; as well as to study the biological effects on microbes, insects, animal and human cells, calibration of low dose range dosimeter and basic insect disinfection study.

For further information, please contact:
 Director General,
 Malaysian Nuclear Agency
 (MAMNUC), 61000 Kajang,
 Selangor, Malaysia.
 Tel: +603-8951 2000
 Fax: +603-8951 2114
 E-mail: info@mamnuk.gov.my

Seminar R&D 2022

4-6 Oktober 2022

SEMINAR R&D 2022



PHYSICAL PROPERTIES OF ROCK FROM MICRO-CT IMAGE FOR SUBSURFACE INVESTIGATION AREA

By: Azmi Ibrahim, Roslan Yahya, Nazran Harun, Dr Liskam Mejus, Mohd Mutamil Mohd Hashim, Mohamad Syahiran Mustafa




ABSTRACT

A possible method for more comprehensive, less expensive, and quicker rock property characterization using images acquired of rock samples is called digital rock physics. To actually realize this capacity, we must accurately understand the digitally created attributes in the context of the restrictions imposed by imaging limits. To this end, we demonstrate how the current micro-Computed Tomography (micro-CT) technology produces imaging with a finite field of view, a limited image resolution, and distorted segmentation of images with coarse resolution, all of which result in a systematic estimate of porosity.

INTRODUCTION

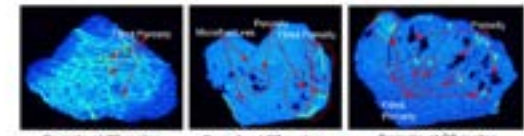
The characteristics of geomaterial pore structures are important in analysing petrophysical and transport parameters such as porosity, specific surface area, permeability, and capillary pressure (Dren and Bakke, 2003; Al-Raoush and Wilson, 2005). Using high resolution CT images, 3D reconstruction techniques provide efficient approaches for investigating such common parameters. The ability to visualise 3D pore structures accelerates the reliability and comprehension of CT-based calculation results (Ams et al., 2004; Olafuyi et al., 2006). Due to the interference from the resolution of CT images, a suitable method for generating a 3D pore network model and describing the pore structure of geomaterials should be considered. In this paper, 2D realizations based on direct outputs from a 2D CT scanning tool are used to characterise physical properties of rock at the subsurface investigation area. The primary goal of this paper is to determining porosity and pore space morphology of sandstone discovered during site investigation borehole drilling.

STUDY AREA

The study area as shown in Figure 1 is located on undulating topography with the hilly landform occupy the western and northern part. The highest point is 74 m located at the eastern part of the study area. The western part of the area is relatively lower ground, about 40 m height above mean sea level. The top soil is thicker in the low ground or valley areas, and relatively thinner on top of the hilly areas. These might be due to the active erosional processes in the hilly areas, where the weathered materials being eroded and transported down-slope by gravity (N. Harun et al., 2022).



RESULT & DISCUSSION



Sample at 26 meter Sample at 27 meter Sample at 28 meter

METHODOLOGY

1. μ CT Measurement and Data Acquisition

The sample for the μ CT measurement is exposed to the incident X-ray beam and rotated through 180° during acquisition to obtain a number of projections (typically between 600 to 3600 projections). These projections are then reconstructed to produce 2D slices of the measured volume (projection images).

2. Image processing

The use of computed tomography (CT) imaging to characterize porous media is based on grayscale value. Porous rock samples contain voids or porespace, whereas composites are made up of several different materials, each with a reasonably uniform density represented by a different CT number. The standard approach in geological studies for dealing with CT images is to use image processing techniques to obtain different rock properties such as porosity and surface area.



CONCLUSION

Based on this work, we can conclude that the sample is mostly composed of pores that are isolated from one another. The physical properties identified using microCT are porosity, microfracture, and filled porosity based on the density obtained. MicroCT is also a useful tool for comparative analysis, allowing researchers to examine rocks before and after certain tests and draw conclusions based on the results.

ACKNOWLEDGEMENT

The financial supports from the Malaysia Nuclear Agency (Nuklear Malaysia) (Project No. NMR&D-20-20) is gratefully acknowledged.

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The Author Information: please contact

Director General,
Malaysia Nuclear Agency
Jalan Puncak
63000 KUALA
KELANG

Agg:
Azmi Ibrahim
Mobile & Development Technology Division
E-mail: azmi@nuklear.gov.my

Tel: +603-8911 8220
Fax: +603-8911 2194

CORRELATION OF SOIL MOISTURE CONTENT AND ELECTRIC RESISTIVITY FOR SUBSURFACE INVESTIGATION AREA

By: Azmi Ibrahim, Dr Lakam Mejar, Nazran Harun, Mohd Muzamil Mohd Hashim, Mohamad Syahrin Mustafa, Mohd Zahruddin Jaafar, Mohd Naimuliah Ab Razak, Mohd Hafiz Zukurnain, Mohamad Wafiq Abdul Wahab, Nur Nadhirah Noorhazal & Nurul Afqah Yusri

ABSTRACT
A density and amount of water content of geotechnical parameters are important because they affect various engineering structures. The most precise and direct method of soil characterization is conventional borehole, but it is also the most time-consuming and expensive. While the electrical resistivity method is a fast, non-invasive, and low-cost method for predicting geotechnical parameters. The primary goal of this research is to establish a quantitative relationship between resistivity and moisture content in sandy and silty soils using borehole data. Moisture content and electrical resistivity values obtained in the field and laboratory show a non-linear relationship trend.
Keywords: Water content, borehole investigation, electric resistivity, subsurface investigation

INTRODUCTION
The variation of soil water content has a significant effect on the bearing capacity, soil deformation characteristics and consequently, the impact on the stability of earth structures, subduction and groundwater flow. Seasonal variations in moisture content can affect seasonal pore pressure which affects soil strength, so water content is an important factor when looking at the long-term stability and long-term serviceability of engineered earth structures. In this paper, a drilling borehole and electrical resistivity are used to understand the relationships between the electrical resistivity and the water content in the subsurface investigation area at Blok 30 & 31. The effects of water content and soil structure on the electrical conductivity of soil are analyzed as well.

STUDY AREA
The study area as shown in Figure 1 is located on undulating topography with the hilly landform: occupy the western and northern part. The highest point is 74 m located at the eastern part of the study area. The western part of the area is relatively lower ground; about 40 m height above mean sea level. The top soil is thicker in the low ground or valley areas, and relatively thinner on top of the hilly areas. These might be due to the active erosional processes in the hilly areas, where the weathered materials being eroded and transported down-slope by gravity (N. Harun et al, 2022).

METHODOLOGY
Figure 2. Borehole Drilling
Figure 3. Disturbed Soil Sampling
Figure 4. Drying Samples

Soil Sampling
Disturbed soil samples as shown in figure 3 were recovered from the boreholes by using a split barrel tube sampler, 450mm in length in conjunction with standard penetration test. Meanwhile a 63.50mm diameter thin walled sampling tube, 610mm in length were in obtaining undisturbed samples. Representative ground water samples (upon request) were collected in water tight containers from boreholes for subsequent chemical test.

RESULT & DISCUSSION
Figure 5. Graph of water content against electrical resistivity values for borehole 1 and 2
Figure 6. Graph of water content against depth for borehole 1 and 2
According to the water content obtain for borehole 1, the highest water content is 21.6% at 4.5 meter and the lowest water content is 12.4% at 9.00 meter depth. For borehole 2, the highest water content is 20.4% at 10.5 meter and the lowest water content is 11.3% at 18.00 meter depth. The graph of depth against water content as shown in Figure 8.

CONCLUSION
The electrical resistivity is significantly influenced by water content. When the soil is well saturated, the average resistivity of soil is closely related to the free water. If the soil is not entirely saturated, the liquid phase is then largely connected by bound water (H. R. Roodposhi et. al, 2019) [5]. The average resistivity is related to the thickness of the bound water. The fast and accurate estimation of water content in the field is still a subject of considerable debate. In this research, a soil sample were perform to find the interaction between water content and electrical resistivity values to understand the subsurface profile at Nuclear Malaysia facilities.

ACKNOWLEDGEMENT
The financial supports from the Malaysia Nuclear Agency (Nuklear Malaysia) (Project No. NMR&D-20-20) is gratefully acknowledged.

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DEVELOPMENT OF DIGITAL SURFACE MODEL FROM DIGITAL AERIAL IMAGES FOR SUBSURFACE STUDY AREA

By: Azmi Ibrahim & Nazran Harun

ABSTRACT
Unmanned Aerial Vehicle (UAV) is one of the most recent technologies for high spatial resolution 3D Earth modelling. The goals of this study are to evaluate low-cost UAV data using image radiometric transformation techniques and investigate the effects on global and local accuracy of the Digital Surface Model (DSM). This research UAV Drone data was collected from a flying height of 60 metres. UAV images from a flying height of 60 metres are processed to create a 3D point cloud and DSM.
Keywords: Digital Surface Model (DSM), Photogrammetry, Slope Hazard, Mapping

INTRODUCTION
The Digital Surface Model (DSM) is an elevation model that displays surface height, as well as any existing surface shapes such as tree height, buildings, and any object on the ground. Geodetic surveying, optical or radar satellite imagery, classic or Unmanned Aerial Vehicle aerial photographs, and terrestrial or aerial laser scanning can all be used to collect data for DSM generation. DSM is currently one of the most important and fundamental photogrammetric data products used in a variety of applications. This paper describes the use of unmanned aerial vehicles to generate DSM to detect landslides and hazards around building 30, 31 and hutan lipur at Nuclear Malaysia. It provides a better understanding of the surrounding site conditions and assists geotechnical engineers in determining the coverage area of slope protection against future landslides.

STUDY AREA
The study area as shown in Figure 1 is located on undulating topography with the hilly landform: occupy the western and northern part. The highest point is 74 m located at the eastern part of the study area. The western part of the area is relatively lower ground; about 40 m height above mean sea level. The top soil is thicker in the low ground or valley areas, and relatively thinner on top of the hilly areas. These might be due to the active erosional processes in the hilly areas, where the weathered materials being eroded and transported down-slope by gravity (N. Harun et al, 2022).

METHODOLOGY
Figure 2: Process to generate DSM

RESULT & DISCUSSION
Figure 3: Image of DSM generated
UAV technology as a type of aerial remote sensing is increasingly being used for the generation of DSM relatively in small areas as shown in Figure 3. This study demonstrates not only the potential of the .dng format, which is a non compressed image format, but also the inherent capabilities of image transformation, enhancement, and GIS techniques. The number of tie points and 3D point cloud density govern the accuracy of UAV-based DSM, with more points with homogeneous distribution across images resulting in accurate triangulation and DSM generation.

CONCLUSION
Photogrammetric processing of UAV images is of great interest to researchers who use UAV images for specific geosciences applications. It presents a significant challenge to conventional photogrammetric processing workflows. The results of the study can be applied to future research to investigate the effects of various image enhancement techniques on high resolution UAV data to improve the quality and area coverage of topographic products. Future research is looking into UAV image data application in water bodies, particularly contaminated water, where image enhancement can be more effectively used.

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[3] ...
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[5] ...

DIGITAL ELEVATION MODEL (DEM) GENERATION WITH UAV PHOTOGRAMMETRY

By: Azmi Ibrahim, Nazran Harun

ABSTRACT

Aerial photographs have been evaluated manually by the operators for a long time for the extraction of the contour line and DEM data. Computer technology and digital image processing technologies have been developed and this development provides to perform these extraction processes automatically or semi automatically. Many researches are made about the production of digital elevation models from different data sources and with different methods. In all of the studies, digital elevation models having different resolutions and different data sources are produced and the accuracies of digital elevation models are investigated. The results of these studies vary according to the source data, resolution, production method and topography from Unmanned Aerial Vehicles (UAV).

Keywords: Digital Elevation Model (DEM), photogrammetry

INTRODUCTION

Digital Elevation Model (DEM) is a terrain model consisting of elevation data and representing the bare earth surface free from vegetation and buildings. DEM is used in the production of contour maps and for rectifying aerial photographs into ortho-photomaps. Photogrammetric methods of deriving elevation data are mostly used for systematic mapping and can produce DEMs in a wide range of scales.

STUDY AREA

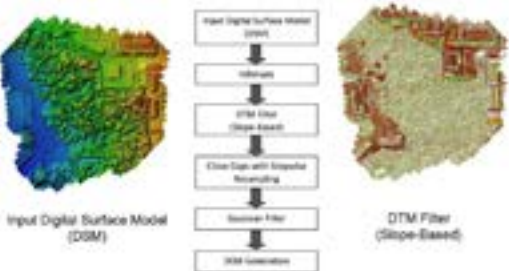
The study area as shown in Figure 1 is located on undulating topography with the hilly landform occupy the western and northern part. The highest point is 74 m located at the eastern part of the study area. The western part of the area is relatively lower ground; about 40 m height above mean sea level. The top soil is thicker in the low ground or valley areas, and relatively thinner on top of the hilly areas. These might be due to the active erosional processes in the hilly areas, where the weathered materials being eroded and transported down-slope by gravity (N. Harun et al., 2022).



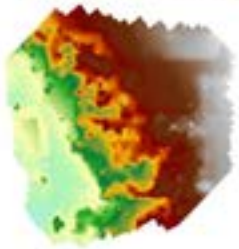
Figure 1. Study area

METHODOLOGY

Data processing and DEM generation



RESULT & DISCUSSION



Digital Elevation Model (DEM)

The aim of the use of UAV data to obtain a Digital Elevation Model of the study area, starting from the DSM, analysing and eliminating objects surfaces, and finally generating a DEM. DEM are produced from 1:10 scale aerial photographs by image matching and contour line capturing. The results show that DEMs produced from contour lines is approximately ± 10 centimeter. The result is not enough appreciate, despite high input values, because of the internal area of removed object profiles that are still tree and building mass.

CONCLUSION

This article indicates the capability of UAVs, which are an alternative data collection technology, in a geomatic application in a small area by means of DEM generation with. In fact, the UAV systems have lots of advantages (low-cost, real time, high temporal and spatial resolution data, etc.) which are very important for not only Geomatic but also various disciplines. The application indicates that the UAV combined digital camera systems can allow to collect usable data for geomatic applications such as DEM. For a small area relative to UAV specifications, it can be a supplement or a replacement alternative of terrestrial methods for image acquisition.

For further information, please contact:

Dr. Azmi Ibrahim, Senior Lecturer	Dr. Nazran Harun, Senior Lecturer
Geomatics Research Agency	Geomatics Research Agency
Nuclear Malaysia	Nuclear Malaysia
NOVA, 43000 KUALA NEGARA	NOVA, 43000 KUALA NEGARA
Tel: +603 - 8911 1231	Tel: +603 - 8911 1231
Fax: +603 - 8911 2154	Fax: +603 - 8911 2154
E-mail: azmi@nuklear.gov.my	E-mail: nazran@nuklear.gov.my

GIS-AIDED SIMULATION OF SPATIAL DISTRIBUTION OF SOME ELEMENTS AT SUBSURFACE INVESTIGATION AREA

By: Azmi Ibrahim, Nazran Harun, Dr. Lakam Mejus, Mohd Muzamil Mohd Hashim, Mohamad Syahiran Mustafa, Mohd Zahiruddin Jaster, Mohd Na'imullah Ab Razak, Mohd Hafiz Zulkurnain, Mohamad Wafiq Abdul Wahab, Mahzhan Abdul Majid, Umi Zurina Shuib, Nur Nadhirah Noorhaizal & Nurul Afiqah Yusni

ABSTRACT

The cause of slope collapse is difficult to identify as it is associated with various causes. One of the causes identified in this study is due to groundwater factors. A method has been developed to integrate and analyze groundwater systems with the help of scientific software. The elements in the water were analyzed to determine the distribution of the elements in the study area. This paper will prove the distribution of elements in the study area has groundwater flow pattern with the help of simulation from GIS.

Keywords: Distribution system, geographic information systems

INTRODUCTION

This study describes the creation of a knowledge-representation GIS-based tool for the analysis and integration of distribution system data. The tool is a component of the "integrated strategy," which has been put forth for the purpose of explaining and preventing contaminant occurrences in water distribution systems (Besner et al., 2001). The paper will then demonstrate the tool's ability to integrate multiple sources of data from various parameter, as well as provide some results. Data integration result will be discussed as the most essential topic in this paper due to the difficulties issue provides for conducting the investigation.

STUDY AREA

The study area as shown in Figure 1 is located on undulating topography with the hilly landform occupy the western and northern part. The highest point is 74 m located at the eastern part of the study area. The western part of the area is relatively lower ground; about 40 m height above mean sea level. The top soil is thicker in the low ground or valley areas, and relatively thinner on top of the hilly areas. These might be due to the active erosional processes in the hilly areas, where the weathered materials being eroded and transported down-slope by gravity (N. Harun et al., 2022).



Figure 1. Study area

RESULT & DISCUSSION

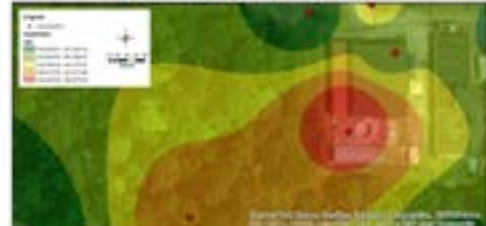


Figure 2. Map of Aluminium Distribution

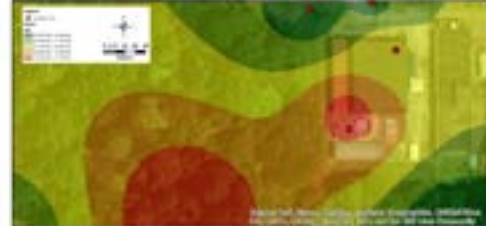


Figure 3. Map of Nickel Distribution

Base on the simulation as shown in Figure 2, aluminium element concentrated at holding pond to the hutan lipur. This distribution proved the pattern obtain from resistivity method. The direction of flow pattern direct to the southwest from block 31. The highest value for aluminium concentration is 409.86 $\mu\text{m/L}$ and the lowest value of aluminium concentration is 195 $\mu\text{m/L}$. Figure 3, shown the concentration of nickel at holding pond to the hutan lipur. The direction of flow pattern is also to the southwest from block 31. The highest value for nickel concentration is 117.14 $\mu\text{m/L}$ and the lowest value of nickel concentration is 52.56 $\mu\text{m/L}$.

METHODOLOGY

Data processing using Inverse Distance Weighted (IDW)

Inverse distance weighted (IDW) interpolation determines cell values using a linearly weighted combination of a set of sample points. The weight is a function of inverse distance. The surface being interpolated should be that of a locationally dependent variable. This method assumes that the variable being mapped decreases in influence with distance from its sampled location. Inverse Distance Weighted Interpolation (IDW) interpolation is an exact method that enforces that the estimated value of a point is influenced more by nearby known points than those farther away. For this study, the point represent the sampling point as shown in Figure 2 & 3. Eight sampling point identified for this purposes.

CONCLUSION

The challenge of integrating data on distribution systems requires again for strong commitment of numerous data in a water distribution system. The GIS-based tool created for this project provides a flexible method that has been used because to its lightweight simulation. This started out as a tool to precisely identify the causes of water quality issues has evolved into a tool for integrating many other types of information on distribution elements and is soon proved to be valuable for broader environmental management purposes.

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For further information, please contact:

Dr. Azmi Ibrahim, Senior Lecturer	Dr. Nazran Harun, Senior Lecturer
Geomatics Research Agency	Geomatics Research Agency
Nuclear Malaysia	Nuclear Malaysia
NOVA, 43000 KUALA NEGARA	NOVA, 43000 KUALA NEGARA
Tel: +603 - 8911 1231	Tel: +603 - 8911 1231
Fax: +603 - 8911 2154	Fax: +603 - 8911 2154
E-mail: azmi@nuklear.gov.my	E-mail: nazran@nuklear.gov.my



COMPARISON OF DEM GENERATED BY GEODESIC METHOD AND PHOTOGRAMMETRY

By: Azmi Ibrahim, Nazran Harun, Nurul Afqah Yusri & Nur Nadhirah Noorhazal




ABSTRACT

A variety of different methods are used to generate the Digital Elevation Model. These models can be generated from topographic maps obtained with ground measurements, photogrammetric flight data or remote sensory technology. This paper will make a comparison of which method is better. Two types of DEM have been used. The first DEM was produced by the Department of Survey and Mapping Malaysia (JUPEM), while the second DEM was produced from photogrammetry via unmanned aircraft. In this study, all DEMs were compared individually based on selected references. The results found that the DEM produced by the photogrammetric method has better accuracy for open, flat and forest areas than the DEM produced from topographic maps.

Keywords: Distribution system, geographic Digital Elevation Model (DEM), UAV

INTRODUCTION

Digital Elevation Models (DEM) are very important in surveying and used in a wide range of applications. Many different engineering disciplines also use these models for various purposes. As a consequence, the accuracy of a Digital Elevation Model becomes significant. The important point is the required accuracy for some applications, the accuracy should not be precise, but for others, it should be. If 10m accuracy is sufficient for your study, a remote sensing DEM can be used. However, if 10cm accuracy is required, a photogrammetric or geodesic DEM should be used. There are numerous DEM generation techniques in use today, each with varying accuracies and representing different purposes. In this paper, principle DEM generation methods have been identified, and the accuracy of each method has been examined. First, a brief description of DEMs was given, followed by the realization of generation methodologies and a comparison of accuracy.

STUDY AREA

The study area as shown in Figure 1 is located on undulating topography with the hilly landform. occupy the western and northern part. The highest point is 74 m located at the eastern part of the study area. The western part of the area is relatively lower ground; about 40 m height above mean sea level. The top soil is thicker in the low ground or valley areas, and relatively thinner on top of the hilly areas. These might be due to the active erosional processes in the hilly areas, where the weathered materials being eroded and transported down-slope by gravity (N. Harun et al., 2022).

METHODOLOGY

By using a contour-grid transfer, this method converts the vector data from such maps into digital data. Figure 2 shows the DEM generated from topographic map by geodesic method for subsurface investigation area that created by Surveying And Mapping Department of Malaysia (JUPEM). Figure 3 shows the DEM produced by Photogrammetry method for subsurface investigation area. This DEM was created by subsurface investigation flight project and has a 10cm grid size.

RESULT & DISCUSSION

Figure 4. Hydrological Model using DEM generated by geodesic measurements. Figure 5. Hydrological Model using DEM generated by Photogrammetry method.

By using DEM generated by geodesic measurement, only large drainage will be produced. In addition, the sub-basin area also indicates a larger area as shown in Figure 4. In contrast to the DEM produced by the photogrammetry method, we find that the drainage produced is so detailed as shown in Figure 5, in fact the water that only passes when its rains is also produced with this DEM. Then, the produced sub-basin is also more detailed and smaller. This shows that more specific areas can be obtained from the process of using this DEM.

CONCLUSION

DEM generated by photogrammetric method is a great interest to researchers who use UAV images for specific geosciences applications. While DEM generated by geodesic measurement suitable for a regional and general study of geosciences application. These two methods have difference result of hydrological model because of the resolution of the image collected. The scale of these two methods is difference with geodesic unit in meter and photogrammetric unit in centimeter. The results of the study can be applied to future research to investigate the effects of various image enhancement techniques on high resolution UAV data to improve the quality and area coverage of topographic products. If 10 meter accuracy is enough for your study you can use a DEM generated by remote sensing but if you want 10cm accuracy you should use a DEM obtained by photogrammetric or geodesic methods.

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For further information, please contact:

Azmi Ibrahim
Geomatics Engineer
Malaysia Surveying Agency
Nurul Afqah Yusri
Nurul Nadhirah Noorhazal

Tel: +603-8911 1231
Fax: +603-8911 2154
Email: azmi@msa.gov.my

Nur Nadhirah Noorhazal
Geomatics Engineer
Malaysia Surveying Agency
Nurul Afqah Yusri
Nurul Nadhirah Noorhazal

Tel: +603-8911 1231
Fax: +603-8911 2154
Email: nurulnadhirah@msa.gov.my



KAJIAN TERHADAP KANDUNGAN UDARA DI KAWASAN PERINDUSTRIAN LEMBAH KLANG MENGGUNAKAN DAUN POKOK AKASIA DENGAN KAEDAH ANALISIS PENGAKTIFAN NEUTRON (APN)

Azlan Hashim, Muhammad Agfir Azman, Zelina Laili, Md Suhaimi Elias, Shukrah Abd. Shukor, Nuzairatul Ashifa Abdulrahman, Siti Amnah Omar, Nurul Ashikin Rudi, Mohd Khushairi Awang, Ewelita Saruni, Ewelita Endin Put, Sharifah Naziyah Syed Asri, Muhammad Farhan Ridwan, Muhammad Hafizah Mohamed Haniffa, Hasmadayu Hashim

Email: azlan@nustecmofazila.gov.my




ABSTRAK

Lembah Klang merupakan antara kawasan yang padat dengan perindustrian berat dan sederhana serta mempunyai kepadatan penduduk yang tinggi. Dengan menggunakan sumber biota sebagai indikator, pokok akasia, (*Acacia auriculiformis*) telah dipilih dalam kajian ini memandangkan tumbuhan ini banyak ditanam sekitar kawasan perindustrian sebagai tumbuhan hiasan. Tahap kepekatan unsur dalam udara ditentukan dengan mengukur sampel-sampel dari daun pokok akasia yang dikurap dalam radius 500 m dari kawasan perindustrian. Pengukuran unsur dalam sampel kajian ini adalah menggunakan teknik Analisis Pengaktifan Neutron (APN). Daripada data yang diperoleh, setiap kawasan perindustrian memberikan data nilai unsur major yang berbeza di kawasan kajian bergantung kepada jenis perindustrian di kawasan tersebut. Namun bagi unsur surih, tiada nilai perbezaan yang ketara antara kawasan perindustrian yang dipilih.

Kata Kunci/Keyword: Air pollution, Acacia tree, Neutron activation analysis (NAA)

PENGANTARAN

- Pencemaran udara boleh mendatangkan masalah kesihatan yang serius seperti yang berlaku di kawasan perindustrian Pasir Gudang, Johor.
- Logam boleh memendap pada tumbuhan sebagai tanah atau dalam titisan hujan. Akibat daripada itu logam boleh meresap merentasi kutikula atau stomata atau boleh terkumpul pada permukaan daun.
- Pokok akasia dijadikan sampel dalam kajian ini memandangkan ungu banyak ditanam sebagai tumbuhan hiasan di sekitar kawasan perindustrian berat. Pokok ini juga mempunyai rintangan yang tinggi terhadap penyakit dan cuaca ekstrem.

Gambarajah 1: Pokok akasia yang ditanam semasa penempatan sampel

- Walaupun secara dasarnya Malaysia mempunyai beberapa stesen pemantauan udara bagi penempatan udara, namun dalam keadaan kecemasan penyempitan sampel akan dijalankan secara rawak, dan akan bergantung jenis tumbuhan yang ada di sekitar lokasi.
- Untuk itu dalam kajian ini, pemilihan pokok jenis akasia yang banyak ditanam sebagai tumbuhan hiasan di kawasan perindustrian berat sekitar Lembah Klang akan menjadikannya sebagai satu sumber yang boleh dijadikan rujukan untuk satu garis panduan data sekiranya berlaku pencemaran di kawasan perindustrian.

METODOLOGI

Gambarajah 2: Peta lokasi penempatan di kawasan perindustrian berat Lembah Klang

Kawasan penempatan di Lembah Klang telah dibahagikan kepada 3 pecahan wilayah untuk menjalankan penempatan sampel daun pokok akasia seperti yang ditunjukkan dalam rajah di atas.

- Wilayah 1 - Kawasan Berat Lembah Klang meliputi kawasan perindustrian dari Shah Alam hingga ke Kapar, Klang.
- Wilayah 2 - meliputi kawasan Tengah Lembah Klang iaitu kawasan perindustrian Puchong hingga ke Shah Alam dan.
- Wilayah 3 - kawasan perindustrian di Timur Bahagian Lembah Klang, iaitu kawasan sekitar Serdang dan Balakong, Cheras.

Gambarajah 3: Aliran prosedur penyediaan sampel mentah sehingga ke proses pemprosesan dan penyaluran sampel dengan spektrometri gamma.

KEPUTUSAN & PERBINCANGAN

- Keputusan analisis dengan kaedah APN ditunjukkan dalam Jadual 1.
- Kepekatan Al, Fe, Zn, Mn, As, Co, Pb, Cu, Ni, Cd, Co dan Sb yang dlesen dalam sampel daun akasia adalah dari julat < 0.05 ~ 388 mg/Kg.
- Julat bagi sampel daun pokok akasia ini adalah lebih rendah berbanding unsur berkenaan yang diambil sampel dari kawasan pencemaran di Pasir Gudang, iaitu dari julat 0.586 ~ 482 mg/Kg.
- Bacaan yang agak ketara perbezaan adalah daripada unsur major dan perbezaan ini adalah bergantung kepada jenis perindustrian yang menjalankan aktiviti di kawasan yang terbabit, manakala bagi unsur surih tiada perbezaan yang ketara antara kawasan perindustrian berkenaan.
- Keputusan analisis bagi kebanyakan unsur adalah di dalam julat yang sesuai bagi tumbuhan (Me et al., 1997).

KESIMPULAN

Daripada data kajian ini, dapat disimpulkan bahawa nilai kepekatan unsur yang diperoleh adalah dalam julat yang normal bagi tumbuhan. Sekiranya berlaku pencemaran di kawasan berkaitan, data kajian ini boleh menjadi asas kepada pengukuran tahap cemar udara.

For further information, please contact:

Azlan Hashim
Geomatics Engineer
Malaysia Surveying Agency
Nurul Afqah Yusri
Nurul Nadhirah Noorhazal

Tel: +603-8911 1231
Fax: +603-8911 2154
Email: azlan@msa.gov.my

Nur Nadhirah Noorhazal
Geomatics Engineer
Malaysia Surveying Agency
Nurul Afqah Yusri
Nurul Nadhirah Noorhazal

Tel: +603-8911 1231
Fax: +603-8911 2154
Email: nurulnadhirah@msa.gov.my



KEPEKATAN RADIONUKLID DALAM MAKANAN DAN KESAN DOS BERKESAN SERTA RISIKO KANSER KEPADA MANUSIA – SATU KAJIAN KES KE ATAS SEORANG PELAJAR PGEC DARI MONGOLIA

Olivia Yili Mei-Wo dan Ugaanbaatar Boldar




ABSTRAK

Satu kajian kes dilakukan ke atas diet seorang pelajar PGEC sepanjang tempoh beliau menghadiri kursus PGEC di Malaysia. Makanan kerap diambil beliau telah dikumpul dan dilakukan pengukuran keaktifan radionuklid. Menurut kajian, tiga sumber air yang selalu diambil, iaitu air mineral, air paip dan air Coway didapati mempunyai nilai keaktifan kurang daripada had pengesanan peralatan makmal. Manakala lima makanan utama diambil oleh beliau iaitu beras, ubi kentang, susu segar, sayur campuran dan daging ayam juga mempunyai nilai keaktifan gros alfa, gros beta, ^{40}K , ^{224}Ra , ^{228}Ra , ^{134}Cs dan ^{137}Cs yang rendah. Berdasarkan cara permakanan beliau, dos berkesan jangkaan dan risiko kebarangkalian kanser telah dikira dan dibincangkan dalam kertas kerja ini.

PENGESALAN

Radionuklid berasal dari sumber tabii (^{40}K , ^{226}Ra dan ^{238}U) dan buatan manusia (^{137}Cs dan ^{134}Cs). Ia memasuki badan manusia melalui pernafasan atau pengambilan makanan tercemar dan merupakan penyumbang utama dedahan dos dalaman kepada manusia. Kanser dan kesan boleh diwarisi adalah masalah kesihatan manusia paling ketara akibat dedahan kepada sinaran mengion pada dos kumulatif aras rendah. Suruhanjaya Antarabangsa Perlindungan Sinaran (ICRP) mengesyorkan nilai 1 mSv sebagai had dos berkesan tahunan untuk orang awam akibat dari operasi kemudahan nuklear dan aplikasi sinaran dan radionuklid. Kajian ini merupakan sebahagian daripada projek mini seorang pelajar PGEC dari Mongolia. Kertas kerja ini membincangkan dapatan pengukuran keaktifan radionuklid dalam makanan rutin diambil oleh beliau sepanjang tempoh berada di Malaysia, jangkaan dos berkesan tahunan dan risiko kanser.

PERBINCANGAN

Kepekatan radionuklid dalam air dan makanan dikesan hadir pada paras rendah. Untuk sampel air, paras keaktifan berada di bawah had pengesanan alat. Untuk sampel makanan, ia berada pada aras minima, ^{40}K berada dalam julat 12-117 Bq/kg, ^{224}Ra dan ^{228}Ra masing-masing dalam julat 0.50-0.87 Bq/kg dan 0.50-2.4 Bq/kg, manakala ^{134}Cs dan ^{137}Cs kurang dari 1.0 Bq/kg. Berdasarkan diet permakanan, dan faktor penukaran dos ICRP, jumlah maksimum dos berkesan tahunan adalah sebanyak 378 $\mu\text{Sv}/\text{t}$, di bawah aras rujukan 1,000 $\mu\text{Sv}/\text{t}$ cadangan ICRP. Risiko kanser seumur hidup pada kebarangkalian 132 kes dalam setiap 100,000 kejadian.

KESIMPULAN

Hasil kajian mendapati kepekatan radionuklid dalam sampel-sampel makanan adalah rendah dan sebahagian besarnya berada di bawah had pengukuran peralatan makmal. Berdasarkan nilai keaktifan dan corak permakanan, jumlah dos berkesan tahunan dikira dan didapati sekitar 378 $\mu\text{Sv}/\text{t}$, setara dengan kebarangkalian kejadian risiko kanser 1 per 756, atau kurang dari 0.15%. Nilai dos tersebut adalah berada di bawah had 1 mSv/t disyorkan oleh WHO dan ICRP.

EKSPERIMEN

SAMPEL AIR DAN MAKANAN

PENYEDIAAN SAMPEL

PENGUKURAN SAMPEL

PENGHARGAAN

1. Staf Kumpulan Radiokimia dan Alam Sekitar
2. Koordinator program PGEC, Pn. Majidah Mohd Taib
3. Koordinator Projek mini PGEC, Dr. Susan Maria Spawen

Untuk maklumat lanjut, sila hubungi:
Ketua Pengarah,
Agensi Nuklear Malaysia
Jalan Malakoff,
10460 KUALANG
KUCU

Penyediaan:
Dr. Yili Mei-Wo
Kumpulan Radiokimia dan Alam Sekitar
80000
Tel: +603-8911 2128

Alamat Penerima:
Bahagian Teknologi Jarak dan Alam Sekitar, Agensi Nuklear Malaysia,
43000 KUALANG, MALAKA
Worship@CNRMalaysia@rediffmail.com, Gencor Agency for Specialized Inspection,
WWW.HCCB.SILANGBANTAR, MONGOLIA





KAJIAN TERHADAP KANDUNGAN UDARA DI KAWASAN PERINDUSTRIAN LEMBAH KLANG MENGGUNAKAN DAUN POKOK AKASIA DENGAN KAEDAH ANALISIS PENGAKTIFAN NEUTRON (APN)

Azlan Hashim¹, Mohamad Azhar Azman, Zakaria Laili, Md Sahpuri Elias, Shahrul Azee Shahrul, Nazratul Adhwa Abdullah Salim, Siti Amarah Omar, Nurul Ashwin Rusdi, Mohd Khushairi Awang, Enzaia Sanusi, Ezzati Endan Put, Sharifah Nazura Syed Ali, Muhammad Farhan Ridwan, Muhammad Haffiz Mohamed Haniffa, Hasnadaayu Hashim
Email: azlan@nucb.com.my

Kumpulan Aplikasi Kimia Analisa (KACA),
Bahagian Teknologi Ska & Alam Sekitar (BAS)




ABSTRAK

Lembah Klang merupakan antara kawasan yang padat dengan perindustrian berat dan sederhana serta mempunyai kepadatan penduduk yang tinggi. Dengan mengambatkan analisis data mengenai indikator, polutasi udara, (muatan aerosol/termal) telah dipelajari dalam kajian ini untuk memahami sumber polutan di kawasan perindustrian sebagai sumber polutan. Tahap kepekatan unsur dalam udara ditentukan dengan mengukur sampel-sampel dari daun pokok akasia yang diletakkan dalam radius 500 m dari kawasan perindustrian. Pengukuran unsur dalam sampel kajian ini adalah menggunakan teknik Analisis Pengaktifan Neutron (APN). Dapatan data yang diperoleh, setiap kawasan perindustrian memberikan data nilai unsur major yang berbeza di kawasan kajian bergantung kepada jenis perindustrian di kawasan tersebut. Namun bagi unsur surih, tiada nilai perbezaan yang ketara antara kawasan perindustrian yang dipelajari.

Kata Kunci/Keyword: Air pollution, Akasia tree, Neutron activation analysis (NAA)

PENGESALAN

Sebenarnya udara telah dimanfaatkan manusia untuk keperluan yang pelbagai yang berlaku di kawasan perindustrian Pasir Gudang, Johor.

Lagipula boleh memendap pada tumbuhan sebagai bahan atau dalam tiffan hujan. Akibat daripada itu lokasi boleh merasa merentas kutikula atau stomata atau boleh terkumpul pada permukaan daun.

Pokok akasia dijadikan sampel dalam kajian ini memandangkan jenis banyak ditanam sebagai tumbuhan hiasan di sekitar kawasan perindustrian berat. Pokok ini juga mempunyai rintangan yang tinggi terhadap penyakit dan cuaca ekstrem.

Walaupun secara dalaman Malaysia mempunyai beberapa stesen pemantauan udara bagi pemantauan udara, namun dalam keadaan keadaan pencemaran sampel akan dijangka secara rawak, dan akan bergantung jenis tumbuhan yang ada di sekitar lokasi.

Untuk itu dalam kajian ini, pemilihan pokok jenis akasia yang banyak ditanam sebagai tumbuhan hiasan di kawasan perindustrian berat sekitar Lembah Klang akan menjadikannya sebagai satu sumber yang boleh dijadikan rujukan untuk satu jenis panduan data sekiranya berlaku pencemaran di kawasan perindustrian.

METODOLOGI

Sampel daun akasia yang diambil untuk sampel kajian

Kawasan perindustrian di Lembah Klang telah dibahagikan kepada 3 zon atau wilayah untuk menjalankan persampelan sampel daun pokok akasia seperti yang ditunjukkan dalam rajah di atas.

- Wilayah 1 - Kawasan Barat Lembah Klang meliputi kawasan perindustrian dari Shah Alam hingga ke Kapar, Klang.
- Wilayah 2 - meliputi kawasan Tengah Lembah Klang iaitu kawasan perindustrian di Seremban hingga ke Shah Alam dan.
- Wilayah 3 - kawasan perindustrian di Timur Bahagian Lembah Klang, iaitu kawasan sekitar Seremban dan Baling, Cheras.

Diagram alir proses penyediaan sampel untuk analisis APN

Diagram alir proses penyediaan sampel untuk analisis APN

KEPUTUSAN & PERBINCANGAN

Keputusan analisis dengan kaedah APN ditunjukkan dalam jadual 1.

Kepekatan Al, Fe, Zn, Mn, As, Cr, Pb, Cu, Ni, Cd, Co dan Sb yang dikesan dalam sampel daun akasia adalah dari julat <0.05 – 388 mg/kg.

Julat bagi sampel daun pokok akasia ini adalah lebih rendah berbanding unsur berkesan yang diambil sampel dari kawasan pencemaran di Pasir Gudang, iaitu dari julat 0.005 – 482 mg/kg.

Bocoran yang agak ketara perbezaan adalah daripada unsur major dan perbezaan ini adalah bergantung kepada jenis perindustrian yang menjalankan aktiviti di kawasan yang terbit, manakala bagi unsur surih tiada perbezaan yang ketara antara kawasan perindustrian berbeza.

Keputusan analisis bagi habamahan unsur adalah di dalam julat yang sesuai bagi tumbuhan (Ma et al., 1997).

KESIMPULAN

Dapatan data kajian ini, dapat disimpulkan bahawa nilai kepekatan unsur yang diperoleh adalah dalam julat yang rendah bagi pencemaran. Sekiranya berlaku pencemaran di kawasan berkaitan, data kajian ini boleh menjadi asas kepada pengukuran tahap pencemaran.

Unsur	Wilayah 1	Wilayah 2	Wilayah 3
Al	12.5	15.2	18.7
Fe	15.8	18.3	21.5
Zn	18.2	21.5	24.8
Mn	21.5	24.8	28.1
As	24.8	28.1	31.4
Cr	28.1	31.4	34.7
Pb	31.4	34.7	38.0
Cu	34.7	38.0	41.3
Ni	38.0	41.3	44.6
Cd	41.3	44.6	47.9
Co	44.6	47.9	51.2
Sb	47.9	51.2	54.5

114

115



T_{ref}	+402.8871 0.120
T_{ref}	+403.1 0.077 0.716

CONCLUSION

- Most of the studies were done on European countries, specifically Italy due to the mandatory environmental monitoring policies in urban cities are frequently monitored using transplantation method with lichens and mosses collected from rural areas.
- For the determination of the trace element concentrations, common instruments used are ICP-OES, ICP-MS, AAS, IHAAs and TOBS. It is clear from the analysis of the existing literature that there are a number of research gaps and concerns that need to be addressed in order to fully achieve the potential of lichens and moss as biomonitoring approaches.

KERADIOAKTIFAN GROS ALFA DAN GROS BETA DALAM AIR MINUMAN DI MALAYSIA

Nooradilah Abdulrah*, Norfakal Mohamed, Mohd Zuhairi Mohd Sami, Salahuddin Muhamad, Muhamad Noh Saman, Muhammad Izzat Muammer Ramli, Nur Hafizah Aliqah Norhazam, Siti Noor Hayati Mohd Noor dan Fariz Iskandar Mohd Yazid

ABSTRAK

Makmal Radiokimia dan Alam Sekitar (RAS) telah menerima sampel air mineral semulajadi (AMS) dan air minuman berbungkus (AMB) dari seluruh Malaysia daripada Kementerian Kesihatan Malaysia (KKM). Sampel ini perlu menjalani analisis keradioaktifan gros alfa dan gros beta yang merupakan sebahagian daripada keperluan perlesenan air minuman di Malaysia. Sebanyak 83 sampel telah diterima pada tahun 2020 dan telah dijalankan analisis. Hasil analisis mendapati kesemua sampel mematuhi keperluan standard mandatori yang telah ditetapkan oleh KKM iaitu tidak melebihi 0.1 Bq/L bagi keaktifan gros alfa dan 1.0 Bq/L bagi keaktifan gros beta.

PENGENALAN

Kehadiran radionuklid dalam bekalan air minuman wujud secara semulajadi dan juga buatan manusia. Kehadiran radionuklid secara buatan masuk ke dalam persekitaran melalui pelepasan radionuklid daripada kemudahan nuklear, ujian senjata nuklear, aktiviti perlombongan dan sebagainya. Radionuklid pemancar alfa semulajadi yang menjadi penyumbang utama dalam keradioaktifan gros alfa terhasil daripada siri pereputan semula jadi U-238 dan Th-232 serta progeninya U-234, Th-230, Ra-226, Po-210 dan Th-228. Keaktifan gros beta semulajadi pula terhasil daripada kehadiran radionuklid K-40, Ra-226 dan Pb-210 [Pillie et al., 2014]. Berdasarkan Akta Makanan 1983, had maksimum yang dibenarkan bagi radioaktiviti gros alfa adalah 0.1 Bq/L manakala 1.0 Bq/L bagi gros beta.

METODOLOGI

Penyediaan 2L sampel air pada suhu < 100°C

Pemendakan sampel air ke dalam larutan asid dan pengeringan sampel di bawah lampu infra merah

Sampel diterima daripada KKM mengikut negeri

Pengukuran keradioaktifan gros alfa dan gros beta menggunakan Sistem Pembacaan Gros Alfa/Gros Beta Berbilang Belakang Rendah

KEPUTUSAN DAN PERBINCANGAN

Keradioaktifan Gros Alfa & Gros Beta dalam Air Minuman Berbungkus (AMB)

Keradioaktifan Gros Alfa & Gros Beta dalam Air Mineral Semulajadi (AMS)

Aktiviti boleh kesan minimum (MDA):

	AMB	AMS
Gros Alfa	0.0011 – 0.0014	0.0013 – 0.0094
Gros Beta	0.0034 – 0.0040	0.0034 – 0.0040

Penemuan sampel yang memberikan bacaan melebihi MDA bagi AMS adalah lebih tinggi berbanding AMB (28.4 % alfa dan 71.4 % beta). Kehadiran mineral yang mengandungi radionuklid secara semulajadi di dalam AMS menyumbang kepada keradioaktifan gros alfa dan gros beta di dalam sampel tersebut namun masih tidak melebihi had maksimum. Walau bagaimanapun, penemuan ini memerlukan kajian lebih lanjut kerana jumlah sampel AMS yang jauh lebih sedikit berbanding sampel AMB harus menyebabkan penemuan sampel AMS yang memberikan bacaan melebihi MDA adalah lebih tinggi.

KESIMPULAN

Hasil keputusan analisis gros alfa dan gros beta ke atas semua sampel AMB dan AMS yang diterima daripada KKM pada tahun 2020 menunjukkan nilai yang diperolehi adalah di bawah had maksimum yang ditetapkan, iaitu 0.1 Bq/L bagi gros alfa dan 1.0 Bq/L bagi gros beta. Ini menunjukkan dedahan sinaran yang diterima daripada AMB dan AMS yang dipasarkan di Malaysia adalah di paras yang selamat.

For further information, please contact:

Dr. Nooradilah Abdulrah
Radiation Research Agency
Nuclear Malaysia
WANG 43300 KUALA
TRINGGIR

Tele: +603-8911 2208
Fax: +603-8911 2204
E-mail: nooradilah@nra.gov.my

DEVELOPMENT OF WEB-BASED DATABASE MANAGEMENT SYSTEM (DBMS) FOR R&D PROJECT MANAGEMENT & MONITORING MODULES FOR E-TAG (BAS)

By: Mohd Faizun K., Dr. Rahman Y., Dr. Kamarudin S., Dr. Lakam M.

ABSTRACT

The purpose of this Web-Based DBMS is to be developed as an online platform that facilitates E-Tag Researchers in organize and manages details of progress and achievement of their R&D projects with more efficiently. This Web-Based DBMS also helps E-Tag Manager and BAS Director to monitor the latest progress and achievement of R&D projects. There is two main modules will be provided for the use of BAS Director, E-Tag Manager and Researchers. The first module is R&D Projects Management Module. This module is for Researcher to report about the latest progress and achievement in MySQL database. The second module is R&D Projects Monitoring Module and fill in review on the latest progress and achievement updated by Researchers. Both modules will be developed and tested by using Hypertext Processor (PHP) Programming Language. XAMPP application is used as server software that comprises on PHP and MySQL. Rapid Application Development (RAD) Methodology has been selected as a guideline for this Web-Based DBMS development. RAD Methodology comprises on 4 phases that is Requirement Engineering, User Design, Construction and Cutover.

Keyword: Web-Based DBMS, PHP, MySQL, XAMPP, RAD Methodology

Phases of RAD Methodology

XAMPP APPLICATION

Figure 1 indicates XAMPP Application v3.2.4 is used as a single server software for this Web-Based DBMS development. This application is using Apache to connects both of PHP Programming and MySQL Database.

Figure 1: XAMPP APPLICATION v3.2.4

R&D PROJECT MANAGEMENT MODULE

Figure 2 indicates the homepage of R&D Project Management Module. This module is developed for E-Tag Researchers to manage and organize the details directly on progress and achievement of their R&D project. Details of R&D project are comprises on title project, background, problem statement, objectives, scope, milestone and activities. And the project achievement are focuses on result of particular milestone and also the publications that produced by E-Tag Researchers.

Figure 2: R&D Project Management Module

R&D PROJECT MONITORING MODULE

Figure 3 indicates the homepage of R&D Project Monitoring Module. This module is developed for E-Tag Manager and BAS Director to monitor and review progress and achievement of R&D project that conducted by E-Tag Researchers. They can view and download the result and publications that uploaded by E-Tag Researchers.

Figure 3: R&D Project Monitoring Module

CONCLUSION

As for conclusion, both modules of this Web-Based DBMS are highly needed especially for researchers who employed under E-Tag. Basically, this system provides technical support in online database management and monitoring system. This system will be developed as the first version of prototype. In the future, this prototype will be continually enhanced by improving its functionalities as well as fulfilling user needs.

AWARD

Won a Bronze Medal during Hari Inovasi & Kreativiti Nuklear Malaysia (HINKNM) 2022, on 13th – 14th September 2022.

For further information, please contact:

Dr. Mohd Faizun K.
Radiation Research Agency
Nuclear Malaysia
WANG 43300 KUALA
TRINGGIR

Tele: +603-8911 2208
Fax: +603-8911 2204
E-mail: faizun@nra.gov.my

ROBUSTNESS OF POLONIUM-210 TEST METHOD IN TERMS OF PHYSICAL AND CHEMICAL ASPECTS

Nurul Assyikeen Md. Jaffary*, Muhammad Hafiz Kamarozaman, Jalal Sharib@Sarip, Chriacius Anthonius, Mohd Tamliz Ishak, Zulkifli Daud, Nurul Zakila Azlan

(ABSTRACT)

This study is carried out to validate the ^{210}Po test method in terms of robustness including physical and chemical aspects. The physical parameter involves different counting geometry and deposition time, while chemical aspects include iron content in the sample that may affect the adequacy of hydroxylamine hydrochloride, HAC. This study found that this method is robust.

INTRODUCTION

Polonium-210 (^{210}Po) is a major contributor to the natural radiation dose received by all living organisms. Determination of ^{210}Po in the environment is required for the assessment of the potential hazards in the case of accident release or routine monitoring. Reliable and accurate radiochemical separation and detection techniques are essential to determine ^{210}Po using an alpha spectrometry system.

METHODOLOGY

Table 1: Reference materials used in this study

Certified reference material	Certified value (Bq/kg)	Expanded uncertainty (Bq/kg)
IAEA 364 Radionuclides in longshore sediment	11.8	0.8
IAEA 385 Radionuclides in fish sed. sediment	29	2
IAEA 410 Radionuclides in plant ARA sediment	215	11
IAEA 412 Radionuclides in Po-210 Ocean sediment	89.7	3.8

Figure 1: Po-210 sample analysis procedure

- [1] Sample digestion (10ml HNO_3 + 10ml HClO_4) and drying
- [2] Sample digestion (10ml HNO_3 + 1ml H_2O_2) and drying
- [3] Sample dissolution using 3.3ml conc. HCl
- [4] Auto-deposition on silver plate (add H^+ carrier + HAC)
- [5] Measurement of ^{210}Po by alpha spectrometry
- [6] Sample analysis using AlphaVision Software

RESULTS AND DISCUSSION

[1] Variations in Fe content that may affect the adequacy of hydroxylamine hydrochloride, HAC

$$\text{Fe}^{3+}(\text{aq}) + \text{e}^- \rightarrow \text{Fe}^{2+}(\text{aq})$$

Table 2: Po-210 radioactivity data and u-score using CRM IAEA-364, IAEA-385, IAEA-410, and IAEA-412, with 1g hydroxylamine chloride added during auto-deposition process

CRM	Fe conc (PPM) *measured using NAA	Exp No.	Radioactivity (Bq/kg)	Unc	U-score
IAEA 364	94.42	1	12.24	0.50	0.33
		2	12.16	0.50	
		3	12.22	0.50	
AVERAGE		12.21	0.87		
IAEA 385	30615.03	1	28.58	1.27	0.38
		2	27.52	1.23	
		3	27.77	1.24	
AVERAGE		27.89	2.14		
IAEA 410	4487.51	1	222.44	9.94	0.13
		2	208.59	9.31	
		3	222.70	9.94	
AVERAGE		217.58	14.85		
IAEA 412	39262.64	1	95.91	2.05	0.01
		2	92.27	2.01	
		3	86.82	3.87	
AVERAGE		89.67	4.90		

Table 3: Radioactivity and FWHM of CRM IAEA-385 measured with different deposition time

Contact time	Average Po-210 activity (Bq/kg) N=3	Average FWHM Po-209	Average FWHM Po-210
2hrs	24.00	39.17	34.85
4hrs	27.38	30.12	30.57
8hrs	20.21	35.48	39.24
16hrs	39.55	65.80	64.74

Table 4: Set of CRM data using different geometry of silver disk

Silver disk geometry	Po-210 activity (Bq/kg)
Sample No. 1	28.00
2	28.81
3	27.81
4	27.26
Mean	27.9963
Standard Deviation	0.5237

CONCLUSION

[1] 1g of HAC added through the plating procedure was enough and robust for all sediment samples to reduce Fe^{3+} to Fe^{2+} resulting Po^{2+} ion successfully deposited on the silver disk.
 [2] The best deposition time for alpha polonium deposition is 4 h, and, in this process, thin, uniform alpha sources with very good peak resolution (30 keV) are produced.
 [3] Data using square and round shape counting disk geometry recording the activity concentration (Bq/kg) within the certified range value.

SYNTHESIS AND CHARACTERIZATION OF CHALCONE DERIVATIVE

Rosniza Razali¹, Daryl Jesus Anapao¹, Zainah Adam¹, Wan Hamzah Bahrin Wan Kamal¹, Khong Khai Choong², Azang Abdul Rahim Ossen³, Namaziah Mohammad Shale¹, Azfar Hanif Abd Aziz¹, Nor Azidah Mansiddi¹, Hazlina Ahmad Hassali¹

¹Pharmaceutical Technology Group, Medical Technology Division, Malaysian Nuclear Agency, Bangi 43000 Kajang, Selangor, Malaysia
²National Cancer Institute, 4, Jalan P.T. Pengeri, 62250 Putrajaya, Wilayah Persekutuan Putrajaya
³Norwood Medical, 30, Puchong Jaya (Daghi) Jln, Seksyen 12, 50632 Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur

ABSTRACT

Chalcone and their derivatives has been widely used in a large number of biological active compounds or synthetic origin exhibiting diverse pharmacological activities. It is considered as naturally occurring compounds and precursors of flavonoids and isoflavonoids based compound that showed various of biological activities including anticancer, antituberculosis, anti-HIV, anti-inflammatory, tyrosinase inhibition, antibacterial and antifungal. Chalcone derivative was synthesized and its structure also confirmed. In this paper, the compound was synthesized by Claisen-Schmidt condensation of aromatic ketone, 3-methylacetophenone with aromatic aldehyde, 4-methylbenzaldehyde. The structure of the synthesized compound which is 1-m-tolyl-3-p-tolyl-propenone were confirmed by Thin Layer Chromatography (TLC), Fourier Transform Infra-red (FTIR) and Liquid Chromatography Mass Spectrometry/ Mass Spectrometry (LCMS/MS).

INTRODUCTION

- Chalcone is a new compound produced from aldehyde and ketone derivatives reactions via Claisen-Schmidt condensation method.
- Physical nature of this compound is a light yellow powder with chemical formula $\text{C}_{17}\text{H}_{14}\text{O}$.
- Chemical characteristic of Chalcone has been confirmed using TLC, FTIR and LCMS/MS methods.
- Chalcone have numerous biological activities such as anticancer [1], antitumor, antifungal, antibacterial, antioxidant [2], anti-HIV [3], and anti-inflammatory [4].

METHODOLOGY

1. Prepare 5.01 mol of aldehyde and ketone derivative
2. Mix in Ethanol
3. Add 10 mL of NaOH solution
4. Continuous stirring for 3 hours
5. Keep in refrigerator for 24 hours
6. Dilute with 40 mL of ice cold water
7. Filter and washes well with ice cold water
8. Recrystallized with MeOH and anhydrous
9. Run TLC using Hexane: Ethyl Acetate (9:1)
10. Purified the compound using Prep-LC
11. Run TLC using Hexane: Ethyl Acetate (9:1)
12. Analyzed the compound using LCMS/MS & FTIR

RESULT & DISCUSSION

Figure 1 shows the spectrum obtained from FTIR of the synthesized compound. The functional groups present in this compound are listed in Table 1. The IR signal at 2917 cm^{-1} indicates the presence of C-H (stretch). The IR peak at 1656 cm^{-1} indicates the existence of C=O, while the IR peak at 1593 cm^{-1} indicates the presence of C=C. Figure 2 and 3 show the fragment ion chromatogram from LCMS/MS. Table 2 displays the results of mass spectrometry, which was used to determine the molecular weight of the synthesized compounds. The results show that this material produces a molecular ion peak value consistent with the molecular weight of the proposed compound which is 236. The molecular weight of the synthesized product can be confirmed by the m/z values at 235 and 237, respectively, in the negative and positive modes.

CONCLUSION

The synthesized compound was characterized by TLC, FTIR and LCMS/MS. The results obtained confirmed that the product has formed.

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OPTIMIZATION OF GAMMA IRRADIATION DOSE FOR MAS COTEK AS RAW MATERIALS FOR PHYTOPHARMACEUTICAL PRODUCT USES

Daryll Jesus Arapoc ^{1*}, Rosniza Razali ², Zainah Adam ³, Azfar Hanif Bin Abd Aziz ¹, Nurmaziah Binti Mohammad Shafie ¹, Abang Abdul Rahim Ossen¹ and Veshalini Kasiraja ⁴.

¹Medical Technology Group, Malaysian Nuclear Agency, 43000 Kajang, Selangor, MALAYSIA.
²Faculty of Medicine, Universiti Sultan Zainal Abidin, Medical Campus, 20400 Kuala Terengganu, Terengganu, MALAYSIA.

ABSTRACT

Microbial contamination in final product prone to occur in herbal raw material due to the presence of microorganisms in the environment, which shorten the shelf life of the products and induced undesirable effects on consumers. Mas Cotek, scientifically known as *Ficus deltoidea*, is used as a medication for several medical conditions throughout the Malay Archipelago. This study was conducted to identify the optimum gamma irradiation dose for sterilization of Mas Cotek raw material to achieve the acceptable microbiological limits without affecting the quality of raw materials. The content of vitamin in Mas Cotek with different gamma irradiation dose were evaluated using Ultra High-Performance Liquid Chromatography (UHPLC). Controlled exposure of gamma irradiation (0 kGy, 1 kGy, 5 kGy, 9 kGy and 12 kGy) were exposed to the raw material. The specified dose is expected to reduce the *Molobden* to the desired level concurrently minimizing the effect on the product. Upon irradiation process, the raw materials were extracted and assessments on antioxidant status, phenolic content, total antioxidant content, and total yeast content were done. The results showed no significant differences in phytochemical component and antioxidant activity status. Total aerobic microbial count (TAMC) and total yeast microbial count (TYMC) showed a significant result between non-irradiated and irradiated raw material. The vitamin content were found varies depending on the gamma irradiation doses. In conclusion, gamma irradiation on raw material will decrease the number of microbial burdens, but different dose have varies impact on the content of vitamin in Mas Cotek.

INTRODUCTION

- Mas cotek, or *Ficus deltoidea*, is used as medicine due to its anti-diabetic, anti-inflammatory, anticonvulsive, anti-melanogenic, antiproliferative, antioxidant, antitumorogenic and antibacterial properties (Ruswan et al., 2014).
- There is a serious concern on bacterial and fungi contaminations on raw materials (Aljunied et al., 2021). Decontamination techniques include steam treatment, microwave heating, radiofrequency, heat therapy, electron beam, x-ray, gamma radiation etc. (Molinar et al., 2018).
- Gamma radiation is promising because it can effectively destroy bacteria and fungi, has no chemical residue, hygienic and eco-friendly (Ruswan et al., 2021).
- The problem is gamma radiation can generate reactive oxygen species that can affect plants' natural antioxidant level. Nevertheless, the effects and levels are dose dependent (Ruswan et al., 2021).

OBJECTIVES

- To evaluate the optimal gamma irradiation dose for sterilisation of Mas Cotek raw materials without compromising the quality.
- To determine the antioxidant capacities, total microbial content, yeast content and phenolic content other than vitamin content post irradiation.

MATERIALS & METHODS

Plant collection and authentication: The plant was authenticated by a taxonomist with voucher specimen (K346/2021).

Gamma irradiation and plant extract preparation: The plant was washed, dried and pulverized. The samples were irradiated at dose of 0, 1, 5, 9 and 12 kGy. The control was freeze dried and extracted with authenticated solvent extraction.

Total phenolic content (TPC): The Folin-Ciocalteu method was used for TPC analysis.

Total flavonoid content (TFC): The aluminum chloride colorimetric method was used for TFC analysis.

Microbial burden test: Total Aerobic Microbial Count (TAMC) and Total Yeast & Mold Count (TYMC) were conducted by spread plate method in Tryptic Soy Agar and Sabouraud Dextrose Agar media respectively.

Vitamin analysis: Samples were further extracted and dried. Vitamin content was analysed using UHPLC.

Statistical analysis: The data are presented as mean $\pm$ SD using Microsoft Excel. The significant difference level was set at $p < 0.05$.

CONCLUSION

- Gamma irradiation on the Mas Cotek samples did not affect the quality of raw material and reduce the bioburden significantly.
- Gamma irradiation affects the content of selected targeted compound, vitamin quantitatively.
- The method can ensure the prolong self-life of the product being exposed at an optimum dosage.
- Further studies should perform to determine the effectiveness of medicinal properties of Mas Cotek upon irradiation and examine the radiolysis by product of irradiation in irradiated Mas Cotek samples.

RESULTS

Table 1: Total phenolic and flavonoid content in non-irradiated and gamma irradiated Mas Cotek sample at different irradiation doses.

Irradiation Doses (kGy)	Total Phenolic Content (mg GAE/g Extract)	Total Flavonoid Content (mg QE/g Extract)
0	39.78	282.87
1	41.74	289.31
5	33.74	179.31
9	35.56	249.31
12	35.78	179.38

Table 2: Microbial burden measurements in non-irradiated and gamma irradiated Mas Cotek extract at different irradiation doses.

Irradiation Doses (kGy)	TAMC (CFU/mL)	TYMC (CFU/mL)
0	7.46x10 ⁶	5.14x10 ⁶
1	2.36x10 ⁶	1.86x10 ⁶
5	NA	NA
9	NA	NA
12	NA	NA

Table 3: Concentration of vitamin (µg/mL) in non-irradiated and gamma irradiated Mas Cotek sample at different irradiation doses.

Irradiation Doses (kGy)	Concentration of vitamin (µg/mL)
0	9.12
1	13.14
5	28.80
9	10.40
12	9.40

Figure 1: Effect of gamma irradiation dose on the DPPH scavenging activity of Mas Cotek.

Figure 2: HPLC chromatograms of vitamin concentration (µg/mL) in non-irradiated and gamma irradiated Mas Cotek sample at different irradiation doses. (A) Standard vitamin; (B) Vitamin concentration determined in non-irradiated and gamma irradiated Mas Cotek sample at different irradiation doses.

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TOXICITY ASSESSMENT OF "MELADA PAHIT" EXTRACT ON HeLa CELL LINE AND ZEBRAFISH EMBRYO

Daryll J.A.¹, Zainah A.¹, Rosniza R.¹, Rahim A.A.¹, Anis H.¹ and Nurmaziah M.S.¹
¹ Agency Nuclear Malaysia

ABSTRACT

Brucea javanica is a popular Chinese herbal medicine. It is also commonly known as "melada pahit" in Malaysia. Its fruits and seeds have been shown to offer healing qualities for a variety of medical conditions. This plant's chemical constituents and biological activity have been a focus of interest in plant and chemistry medicine. This study was conducted to evaluate the toxic effect of melada pahit aqueous extract on both in-vitro and in-vivo model. The in-vitro cytotoxic effect of melada pahit aqueous extract was assessed on HeLa cell line by using the MTT [3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide] assay and the optical density values were read at 570 nm to calculate the median lethal concentration (LC₅₀). Meanwhile, the embryotoxicity was evaluated by treating the zebrafish embryo with melada pahit extract. Propanol and ethanol were used as the positive control treatment group. The morphological, functional changes and heart rate were observed in the treated zebrafish embryos for 96 hours post fertilization(hpf). The melada pahit extract has a LC₅₀ value more than 1000 µg/mL. The treatment of this extract on zebrafish embryo did not show any significant morphological, functional changes or abnormalities in locomotor activities. Meanwhile, the morphology or size of the heart of the propanol and ethanol treated embryo was smaller in size and the heart rates were slower than the untreated embryo at 72 hpf and 96 hpf. Edema was found only in the 1% propanol treated zebrafish embryo. The embryo treated with 0.75% propanol displays little locomotor activity at 72hpf while the embryos treated with 1% propanol were immobile. The embryos that treated with ethanol found dead as early as 24 hpf after the ethanol exposure. These findings indicated that melada pahit extract did not exhibit any toxic effect on both HeLa cell lines and zebrafish embryo model.

Keywords:

Brucea javanica, HeLa Cell Line, Cytotoxicity, Zebrafish, Embryotoxicity, Melada Pahit Extract

INTRODUCTION

- "Melada pahit" scientifically known as *Brucea javanica* existed mainly in the tropical and subtropical zones of China, including Guangdong, Guangxi, Yunnan, and Fujian.
- Modern pharmacological research has demonstrated that tetracyclic terpenoid quassinoids are the active ingredients in *Brucea javanica* and that the potential mechanism for antitumor efficacy lies in induction of apoptosis and decreasing cell proliferation by inducing expression of the Bcl-2 gene. *Brucea javanica* also enhances immune function.
- Toxicity is the degree to which a chemical substance or a particular mixture of substances can damage an organism. Traditional medicine should be evaluated for toxic effect by using toxicity testing assays to demonstrate its safety and encourage use (Thapaporn et al., 2019).
- The toxicity assessment was performed using zebrafish embryos and HeLa Chang liver cell line.

OBJECTIVES

- To test the toxicity of Melada pahit on HeLa cell and zebrafish embryos.
- To observe the morphological and functional changes on zebrafish embryos treated with alcohol and plant extracts.

RESULTS

Median lethal concentration (LC₅₀) of melada pahit extract on HeLa Chang liver cell line

Extracts	LC ₅₀	R ²
Melada Pahit	>1000 µg/mL	0.95

Morphology of zebrafish embryo treated water, melada pahit extract and propanol.

Hours/Hrs	Control (Treated water)	Melada pahit Extract	0.50% Propanol	0.75% Propanol	1% Propanol
0	Fertilized Embryo	Fertilized Embryo	Fertilized Embryo	Fertilized Embryo	Fertilized Embryo
24 (Pharyngula Stage)	No Abnormalities	No Abnormalities	No Abnormalities	No Abnormalities	No Abnormalities
48 (Hatching Stage)	No Abnormalities	No Abnormalities	No Abnormalities	No Abnormalities	Edema presence
72 (Early Larvae Stage)	No Abnormalities	Slight Dark Pigmentation	No Abnormalities	Slightly Edema	Edema Presence
96 (Full Form Stage)	Full Form (Normal Movement)	Full Form (Normal Movement)	No Abnormalities (Slow Movement)	Slight Edema Presence (Slower Movement)	Enlargement of Edema (Immobile)

Morphology of zebrafish embryo treated with ethanol at 24 hours.

Hours	0%	0.5%	0.75%	1%
24 (Pharyngula Stage)	No Abnormalities	Dead	Dead	Dead

Heart beats of zebrafish embryo treated water, melada pahit extract and propanol at 96 hrs

Control	Melada Pahit	0.5% Propanol	0.75% Propanol	1% Propanol
140/Min	122/Min	153/Min	100/Min	81/Min

*normal heartbeat: 120-180 per min

METHODS

Collection and Identification of Sample → Drying and Grinding of Sample → Extraction of Sample → Spray Dry Sample

Toxicological Assessment: Cytotoxicity of Melada pahit extract in HeLa Chang liver cell lines (MTT Assay, Read optical density, Calculate LC₅₀) at 72 Hours.

Zebrafish embryotoxicity of Melada pahit extract: Treatment on Embryo → Morphological Observation → Behavioral Observation at 24, 48, 72, 96 Hours.

DISCUSSION & CONCLUSION

In conclusion, no LC₅₀ measured up to 1000 µg/mL concentration of the melada pahit as it also does not exhibit any toxic effect. There were no deformities or morphological changes observed in embryo treated with melada pahit extracts but there were deformities observed in embryo that were exposed to propanol samples. The size of the fins that exposed to propanol were smaller compared and the movement of larvae exposed to propanol almost immobilized at the higher concentration, as the higher concentration may lead to CNS depression. While, the embryos that treated with ethanol found dead as early as 24 hpf after the ethanol exposure. The ethanol is very toxic to the embryo which interrupts the embryo development. Alcohol exposure could cause morphology and functional defects due to phenotypes of fetal alcohol syndrome (FAS). Thus, there were no sign of toxicity of melada pahit extracts on the function or morphology of zebrafish embryo. Further studies should be performed on the phytochemical content and antioxidant properties to determine its effectiveness to be proposed as alternative medicine to targeted disease.

For further information, please contact:
 Daryll Jesus Arapoc
 Malaysian Nuclear Agency
 (Pusat Riset Nuklear)
 JALAN 8

At:
 Daryll Jesus Arapoc
 Phytochemical Technology Group
 Nuclear Science Division
 43000 Kajang
 Tel: +603-8941-1221
 Fax: +603-8915-2134

At:
 Daryll Jesus Arapoc
 Phytochemical Technology Group
 Nuclear Science Division
 43000 Kajang
 Tel: +603-8941-1221
 Fax: +603-8915-2134

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TOXICITY EVALUATION OF CASSIA ALATA USING ZEBRAFISH EMBRYO

Daryl J.A.¹, Zainah A.¹, Rosnira R.¹, Rahim A.A.², Azfar H.¹, Ance S.B.S.¹, Muhammad A.A.²
¹ Agency Nuclear Malaysia ² KPI Healthcare University College

ABSTRACT

Cassia alata, commonly known as "gelegang" among Malaysian is a pantropical ornamental shrub and belongs to the family of caesapiaceae. It is often referred as emperor's candlesticks due the erect flower spikes in bud, that resemble yellow candle. A multitude of diseases have been treated with various parts of this plant. Since gelegang is riched with bioactive compounds, it possesses abundant medicinal properties. However, the concern on its toxicity has been raised as the predictive compounds may exhibit lower toxicity. In this study, zebrafish embryos were utilized as an in-vivo model to evaluate the toxicity of gelegang extract, as an alternative to fish acute toxicity assay. The behavior, morphological and physiological changes of zebrafish embryos were observed as it is treated with gelegang extracts for 96 hours. Azithal (propanol), was used as the positive control treatment group. Based on the observation, the gelegang extract treatment on zebrafish embryo does not exhibit deformities in developmental stages besides showing a normal heart rate and locomotion. Nevertheless, there were slightly dark coloration compare to positive control but this does not indicate toxic effect of the gelegang extract. However, the propanol treatment exhibits toxic effects on the morphological and development stages of the zebrafish embryo compared to the gelegang treatment on the zebrafish embryo. As the treatment concentration of propanol increases on zebrafish embryos, more severe toxic effect such as presence of edema and decrease locomotion were observed. Furthermore, higher survival rate is observed in zebrafish embryo treated with gelegang extract as the embryos were alive throughout the treatment with the extracts. In conclusion, this study signifies that there was no toxic effect observed among zebrafish embryos treated with gelegang extract. Hence, although the gelegang extract did not showed embryotoxic effect, further studies required on the cytotoxic effect of extract on in-vitro models to confirm its safety in consumption even at a higher concentration.

Keywords: Cassia alata, Zebrafish, Embryotoxicity, Gelegang Extract

INTRODUCTION

- Traditional medicine should be evaluated for toxic effect by using toxicity testing assays to demonstrate its safety and encourage use (Chingsojan et al., 2019).

- Currently, zebrafish has being recognized as an important animal model for toxicological assays. It is a highly successful model for toxicity assessments due to its low cost, quick cycle, higher fecundity, demand of low quantities of test compounds, and high throughput screening. Consequently, embryos are chosen for toxicological evaluations due to their optical transparency, that enables direct observation of the model's developmental stages without the need for surgery (Jayaraman & Jayaraman, 2019).

- Gelegang also known as Cassia alata, belongs to the family of Caesapiaceae, found wild almost throughout India due to multiple medicinal properties. It is also known as diuretic due to its effective in curing the ringworm disease. In this study, gelegang extract were chosen to study its toxicological effect on zebrafish embryos.

- This test performed by exposing embryos to extracts for 96 hours and later will be observed through four optical observations as toxicity indicators.

METHODS

Collection of Sample
 • Collection of gelegang sample in Labu, Negeri Sembilan.

Identification of Sample
 • Sent to Universiti Putra Malaysia (UPM) for identification.

Drying of Sample
 • Drying in hot air oven with 50°C temperature, overnight.

Grind and Extraction of Sample
 • Grind the dried samples.
 • By using Accelerated Solvent Extractor (ASE) for extraction.

Freeze Dry Sample
 • Samples will be freeze dried in freeze dryer for overnight.

Zebrafish Embryo Toxicity Test Preparation

Male Zebrafish
 • Torpedo shape.
 • Gold stripe between blue stripe.

Female Zebrafish
 • Bigger whitish belly.
 • Silver stripes.

Breeding of Zebrafish
 • Zebrafish were bred in Aquanewer tank system.

Collection of Embryo
 • The embryos will be collected from the tank by using microneedle.

Treatment of Embryo
 • The wells filled with:
 • Treated water as negative control.
 • "Gelegang" extracts.
 • Propanol with concentration of 0.5, 0.75 and 1.0% as positive control.

Fish Embryo Toxicity Test
 • The embryos are exposed to chemicals/ extracts for 96 hours.
 • Observation will be done through four optical observations as lethality indicators.

RESULTS & DISCUSSION

Zebrafish embryo toxicity table of treated water, gelegang extract and propanol.

Hours/Mins	Control	Gelegang Extract	0.50% Propanol	0.75% Propanol	1% Propanol
0	Fertilized Embryo	Fertilized Embryo	Fertilized Embryo	Fertilized Embryo	Fertilized Embryo
24 (Pharyngula Stage)	No Abnormalities	No Abnormalities	No Abnormalities	No Abnormalities	No Abnormalities
48 (Hatching Stage)	No Abnormalities	No Abnormalities	No Abnormalities	No Abnormalities	Edema presence
72 (Early Larvae Stage)	No Abnormalities	Slight Dark Pigmentation	No Abnormalities	Slightly Edema	Edema Presence
96 (Full Form Stage)	Full Form (Normal Movement)	Full Form (Normal Movement)	No Abnormalities (Slow Movement)	Slight Edema Presence (Slower Movement)	Enlargement of Edema (Immobile)

CONCLUSION

In conclusion, there were no deformities or morphological changes observed in embryo treated with gelegang extracts but there were deformities observed in embryos that were exposed to propanol samples. The size of the free that exposed to propanol were smaller compared to free that exposed to gelegang extracts. Besides, the movement of free exposed to propanol almost immobilized at the higher concentration, as the higher concentration may lead to CHD depression. The severe toxicity effect were observed among the embryo treated with propanol, as the treatment concentration of propanol increases. There were slight dark coloration in embryos that exposed to gelegang extracts but it did not affect any function or morphology of the embryo. Thus, there were no sign of toxicity of gelegang extracts on the function or morphology of zebrafish embryo. Further studies should be performed on in-vitro model to evaluate the cytotoxicity of gelegang.

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THE EFFECT OF GAMMA RADIATION ON ANTIOXIDANT ACTIVITIES OF PIPER BETLE

Daryl J.A.¹, Azfar H.¹, Rosnira R.¹, Zainah A.¹, Ance S.B.S.¹, Rahim A.A.², Imran J.M.D.²
¹ Agency Nuclear Malaysia ² KPI Healthcare University College

ABSTRACT

Piper betle L., belonging to the family of Piperaceae is an evergreen perennial creeper that is being utilized widely in Asian countries as a medicinal plant. Due to its multiple therapeutic characteristics, plant leaves have been utilized as a traditional medicine for treating a variety of illnesses. This study was conducted to determine the effects of gamma radiation on antioxidant activity and microbial burden of Piper betle. Piper betle leaves were finely grounded and irradiated at the dose of 0, 3, 6, 9 and 12 kGy. The leaves were then tested for total aerobic microbial count (TAMC) and total yeast microbial count (TYMC) to evaluate the microbial burden among the samples. Meanwhile, the irradiated and non-irradiated leaves samples were also extracted using accelerated solvent extraction (ASE) to access the antioxidant capacities. The microbial burden test showed that the microbial burden was significantly higher in non-irradiated sample compared to irradiate samples in both total aerobic microbial count (TAMC) and total yeast microbial count (TYMC). Besides, the result of TAMC for non-irradiated sample are 7x10⁶ CFU/g for (TAMC) and 3x10⁶ CFU/g for total yeast microbial count (TYMC) while irradiated samples showed negative results for both tests. Based on the results obtained, there were no effect on the quality of samples upon gamma irradiation. There were no significant differences shown in the total phenolic content (TPC), total flavonoid content (TFC) and free radical scavenging activities (DPPH) of the irradiation dosages on Piper betle leaves aqueous extract. In conclusion, these findings indicated that gamma irradiation can retain quality of the Piper betle despite its capability to eradicate and lowered microbial and yeast count.

Keywords: Piper betle, Antioxidant, Gamma Radiation, Free Radical Scavenger, Total Phenolic Content, Total Flavonoid Content

INTRODUCTION

-Piper betle is a tropical and native plant from central, eastern part of peninsular Malaysia (Jin et al., 2010).

-The lipid oxidation in foods are the dominant factor for microbial contamination development, which might be harmful to health. The food industry used antioxidant as a catalyst to delay the oxidation process (Ismail-Wilms, 1995).

-According to Jayaprakash et al. (2007), antioxidant properties in Piper betle potentially could be high due the presence of phenolic substances.

-Currently, gamma radiation and microwave are being utilized broadly and frequently to eradicate the microbial contaminations in several countries (Iman et al., 1995).

-Numerous researches have performed to evaluate the effect of gamma and microwave irradiation on antioxidant and antimicrobial activities of some of the plant materials (Jin and Manjaya, 2007).

-Therefore, gamma and microwave irradiation have various effect on antioxidant properties according to variety of plant have been studied.

PLANT PROFILE

Plant Name : Piper betle
 Family : Piperaceae
 Vernacular Name : Sirih (Malay)
 Vetrilai (Tamil)
 Chu chiang (Chinese)



Fig. 1 Piper betle leaves

OBJECTIVES

a) To analyze the antioxidant activity and microbial burden of Piper betle leaf extract before and after gamma radiation.
 b) To obtain the aqueous extract of the Piper betle leaf.
 c) To determine free radical scavenging activity, total phenolic and flavonoid content of Piper betle extracts before and after gamma radiation.
 d) To determine TAMC and TYMC between irradiated and non-irradiated Piper betle leaf.

METHODS

PLANT COLLECTION AND AUTHENTICATION
 Piper betle plant was obtained from Yik Poh Ling Tropical Herbal Farm in Nila, Negeri Sembilan, and authenticated at Faculty of Forestry, Universiti Putra Malaysia.

PREPARATION EXTRACTS
 The leaves of Piper betle was washed, dried, pulverized, and sent for irradiation, where the sample were exposed to Cobalt-60 irradiation at (0, 3, 6, 9 and 12 kGy). The sample (leaf 20g) were place in the ASE for extraction at 60°C for 20 minutes and sample were freeze dried at -80 to -20 overnight for 12 hours.

PLANT COLLECTION AND AUTHENTICATION
 Plant Material in hot air oven
 Filtration of plant material
 Concentrating extracts
 Collection of plant materials
 Freeze dried overnight for concentrated extracts

Antioxidant Assay
 TPC, TFC, DPPH

Microbial Burden Test
 TYMC, TAMC

RESULTS & DISCUSSION

Irradiation Doses	TAMC (CFU/g or CFU/ml)	TYMC (CFU/g or CFU/ml)	Total aerobic microbial count (TAMC) and total yeast and mould count (TYMC) result shows that gamma irradiation kills microorganisms. Based from the result, it showed that no microbial growth starting 6kGy onwards compared to non-irradiated material (7x10 ⁶ CFU/g) and 3kGy (2.39x10 ⁶ CFU/g).
0 kGy	7x10 ⁶	3x10 ⁶	
3 kGy	2.39x10 ⁶	Null	
6 kGy	Null	Null	
9 kGy	Null	Null	
12 kGy	Null	Null	

Irradiation Doses	0 kGy	3 kGy	6 kGy	9 kGy	12 kGy
TPC (mg GAE/ 100g)	560 ± 12	568 ± 2	488 ± 10	523 ± 0.5	553 ± 1
TFC (mg QE/ 100g)	71 ± 2	71 ± 1	75 ± 3.5	71 ± 1	70 ± 3

There are no significant difference in dosage for TPC and TFC in the extent of the DPPH radical scavenging starting 6kGy onwards compare to non-irradiated material (560mg GAE/ 100g ± 12) and 3 kGy (568 mg GAE/ 100g ± 2) for TPC and non-irradiated material (71mg QE/100g ± 2) and 3 kGy (71mg QE/ 100g ± 1) for TFC respectively.

DPPH

Percentage of Inhibition of Ascorbic Acid	0 kGy	3 kGy	6 kGy	9 kGy	12 kGy
87.96	83.44	84.65	84.91	80	79.94

DPPH result shows that gamma irradiation does not effect the free radical scavenging activity of the extract. The percentage of the inhibition is 87.96 %, 83.44 %, 84.65 %, 84.91 %, 80 % and 79.94 % respectively for irradiation doses at 0 kGy, 3 kGy, 6 kGy, 9 kGy and 12 kGy. Hence, there is no difference in irradiated and non irradiated samples. Therefore, gamma irradiation does not affect the quality of sample up to the highest dose.

CONCLUSION

□ In this study, gamma irradiation retain quality of the product with longer shelf life despite its capability to eradicate and lowered microbial and yeast count.
 □ Therefore, the present results showed that the raw material of irradiated and non-irradiated Piper betle does not affect the antioxidant activity properties and could serve as free radical scavengers.
 □ Thus, nuclear technology are one of efficient method to sustain the shelf life materials and product.

Formulation and Mechanical Properties of Free Film Coated Samples using Carboxymethyl Starch of Sago and Pvp

By: Deryl JA, Zainah A, Rosniza R, Azfar H, Nurmahziah MS, Abang ARI, Ibrahim I & Veslintha PS

ABSTRACT

Aqueous-based coating system in film coating technology can reduce the usage of harmful chemicals. This study used Carboxymethyl Starch (CMS) of Sago starch as polymer and Polyvinyl pyrrolidone (PVP) to develop film coatings. In this film preparation, CMS-Sago starch was used as the polymer and PVP as the plasticizer with different concentration such as 0%, 15%, 20%, 25%, 30%, 40% and 50% PVP. CMS-Sago starch and PVP were poured into a beaker. 50ml water was added to it and the beaker was placed on the stirring hot plate at 800rpm at 60°C for 60 minutes. The solution left to be cool for a few minutes. Then, 5ml of the warm solution was measured and taken using pipette Eppendorf and poured on two film mould plates. Then, the film mould plates were placed into the drying oven for 24 hours at 60°C. The effect of PVP as a plasticizer with different concentrations (0%, 15%, 20%, 25%, 30%, 40%, 50%) on the mechanical properties of CMS-Sago starch was evaluated. The tensile strength of plasticized CMS-Sago starch film decreased whereas their elongation at break increased as the PVP were raised. From the result obtained, 0% PVP and 15% PVP showed brittle and tacky film due to high tensile strength. 40% PVP and 50% PVP showed a reduction in elongation at break result in excessive plasticizer migration from the film matrix and increase the starch-starch molecule interaction. In addition, 50% PVP showed unsatisfactory appearance like irregular spots. However, 20% PVP, 25% PVP and 30% PVP exhibited the strong and flexible film coatings as their tensile strength decreases and elongation at break increases as the concentration of PVP increased.

INTRODUCTION

Film coating technology has been used widely in the pharmaceutical industry. Film coating is the process whereby a tablet or capsule is surrounded by a thin layer of polymeric material (Gaur P, et al., 2014). Most of the film-coated pharmaceutical tablets are produced using a highly volatile organic solvent, an aqueous-based coating system can reduce the usage of these harmful chemicals (Vikram, 2009) (Yohari, 2020). On that note, Carboxymethyl Starch (CMS) of Sago starch (natural source) was used to develop a film coat in this research. Sago is a type of starch derived from palm stem which is known as sago palm or Metroxylon Sago. A single sago palm can contain a large amount of starch and the productivity can be four times the paddy field rice (Karni, A., et al., 2008). Sago palm is native to some of the countries in the world like Malaysia, Indonesia, the Philippines, and Papua New Guinea. Sago starches are carbohydrates that consist of glucose molecules and most likely to be used in food industries. It can be in two forms: flour and pearls (Rayan Ramani, 2019). Carboxymethyl starch (CMS) is a chemically modified starch. Nature starches have a lack of unique properties which is not very suitable for the development of new products. On the other hand, modified starches have played a major role in the food and pharmaceutical industries as an auxiliary agent over the past few decades (Rattapornwattana, N., 2009).

METHODOLOGY

Tensile test was determined using Universal Tester Machine-25AN. All the free film samples were cut into dumbbell shape with 30mm x 5mm size. Each sample was marked about 7mm from the edge at both sides of the sample as specified in the procedure and was loaded into tensile grips of Universal Tester Machine-25AN.

Thickness test was performed using a Digital Thickness Gauge. The thickness of the entire free samples of all three batches were recorded. Mean thickness value has been obtained from each formulation and proceeded to the tensile test.

RESULTS

Figure 1: Tensile strength (MPa) vs. PVP concentration (%). The graph shows a general downward trend in tensile strength as PVP concentration increases.

Figure 2: Elongation at break (%) vs. PVP concentration (%). The graph shows an upward trend in elongation at break as PVP concentration increases.

CONCLUSION & DISCUSSION

In conclusion, in the observation from 20% PVP to 50% PVP, the film sample showed satisfactory appearance such as strong and flexible. However, 50% PVP showed some thickness and irregular spots. Besides, this research clearly showed the tensile strength of the film significantly decreased as the concentration of PVP increases from 20% PVP to 50% PVP. This is because of the weak hydrogen bond between the amylose-amylopectin structures in starch due to plasticizing effect by PVP. Nevertheless, 40% PVP and 50% PVP showed a reduction in elongation at break result in excessive plasticizer migration from the film matrix and increase the starch-starch molecule interaction. This can be also due to the anti-plasticization effect. The stress-strain curve graph exhibits the overall reading of the tensile test. From the result obtained, 20% PVP to 30% PVP exhibit the best results so far in this research. Plasticized starch film, outside the range of 20% to 45% plasticizer are either too brittle or tacky which is not favourable.

PRELIMINARY SCREENING, DETERMINATION OF PHYTOCHEMICALS AND ITS ANTIOXIDANT CAPACITIES OF ABELMOSCHUS ESCULENTUS

Deryl J.A¹, Veshalmi K¹, Zainah A¹, Rosniza R¹, Rahim A.A¹, Nurmahziah M.S¹, Azfar H.A.A¹, Arsin S¹, Arlina A.A¹
¹ Agency Nuclear Malaysia¹ Universiti Sultan Zainal Abidin

ABSTRACT

Abelmoschus esculentus (L.) Moench (*A. esculentus*) also known as okra is a commercial vegetable crop that is being consumed as nutritional supplement in various countries. It is well-known for its palatability in various regions, as it has diverse culinary applications. Besides, the plant has numerous therapeutic properties and being utilised to treat number of diseases. The present study was conducted to identify the phytochemical component and antioxidant activities exhibited by hexane extract (HE), chloroform extract (CE), methanol extract (ME), and aqueous extract (AE) of *A. esculentus* cultivated in Malaysia. The phytochemical constituents of *A. esculentus* extracts were evaluated by performing qualitative phytochemical screening, total phenolic content and total flavonoid content. The 1,1-diphenyl-2-picrylhydrazyl (DPPH) and the reducing power assay were conducted to assess its antioxidant capabilities. The qualitative phytochemical screening revealed the presence of flavonoids, tannins, phenols, alkaloids, anthraquinones, saponins, and reducing sugars in *A. esculentus* extracts. Amongst the extracts, CE showed highest phenolic content with 143.85 µg (GAE)/mg extract. While, the highest flavonoid content was depicted by HE at 63.76 µg (QE)/mg extract. ME demonstrated the highest free radical scavenging activity at 28.86 % and reducing power at 0.271, in both DPPH and reducing power assay at 1000 µg/ml, respectively. These findings provide a comprehensive database of medicinal bioactivity of *A. esculentus* extracts cultivated in Malaysia, as it's constituted with diverse range of phytochemicals and antioxidant activities. Thus, isolation, standardisation and clinical evaluation of phytochemicals in *A. esculentus* extracts are necessities to obtain target bioactive component for therapeutic drug discovery.

Keywords: *Abelmoschus esculentus*, antioxidant activities, phytochemical content, phenol, flavonoid.

INTRODUCTION

Abelmoschus esculentus (L.) Moench (*A. esculentus*) is among the regularly used species of a flowering plant belonging to Malvaceae family and it is commonly known as okra (Dunias et al., 2019; El-Hage et al., 2019).

- A. esculentus* is also frequently used as ethnomedicine in a variety of cultures (Chowdhury et al., 2019).
- A. esculentus* also possesses powerful pharmacological activities such as antioxidant, neuroprotective, anti-inflammatory, antidiabetic, antihyperlipidemic, and anti-fatigue effects (Gomede et al., 2016; Chamsawang et al., 2018).
- A. esculentus* is known for its higher antioxidant properties due to the presence of a significant amount of phenolic compounds.
- Qualitative and quantitative analysis of phenolic compounds of *A. esculentus* fruits from various cultivars are crucial and required for their biological features identification (Fai et al., 2014; Lu et al., 2016).
- Thus, it is vital to study the phenolic compounds and the bioactivities of *A. esculentus* fruits cultivated in Malaysia.

METHOD

RESULTS & DISCUSSION

Table 1: Preliminary phytochemical screening of *A. esculentus* extracts.

Phytochemical Constituents	HE	CE	ME	AE
Anthraquinone	+	+	+++	++
Terpenoids	++	+	+++	++
Flavonoids	+++	+	+++	++
Saponins	+	++	+++	+
Tannins	++	+++	+++	+++
Phlobaphenins	-	-	-	-
Alkaloids	++	++	+++	+
Cardiac glycosides	-	+	-	-
Glycosides	-	+	-	-
Reducing sugar	+	+	+++	+++
Steroids	-	-	++	-
Triterpenes	-	-	+++	++
Lipids	+	-	+++	++
Phenols	+++	+++	+++	+++
Coumarins	-	-	+++	++
Carbohydrate	-	-	+++	++
Protein	-	-	+++	++
Amino acids	-	-	+++	++
Diterpenes	+	++	+++	++
Carotenoids	-	+++	+	-
Anthocyanins	-	-	-	-
Betacyanins	-	-	++	+++

Table 2: The total phenolic content and total flavonoid content in 1000 µg/ml, different extract of *A. esculentus*.

Extract of <i>A. esculentus</i>	Total Phenolic Content µg (GAE)/mg extract	Total Flavonoid Content µg (QE)/mg extract
HE	106.56 ± 0.44 ^a	63.76 ± 1.56 ^a
CE	143.85 ± 2.21 ^a	31.30 ± 0.17 ^a
ME	127.88 ± 2.38 ^a	36.76 ± 0.56 ^a
AE	121.08 ± 2.04 ^a	33.44 ± 0.36 ^a

^a The total phenolic/flavonoid content are significantly different (p<0.05) between the different extract of *A. esculentus* at the concentration of 1000 µg/ml.

Table 3: The antioxidant activities in 1000 µg/ml, different extract of *A. esculentus*.

Extract of <i>A. esculentus</i>	Scavenging Activity of DPPH assay	Reducing Power Assay
HE	17.31 ^a	0.155 ^a
CE	26.69 ^a	0.216 ^a
ME	28.86 ^a	0.272 ^a
AE	94.61 ^a	0.372 ^a

^a The antioxidant activities are significantly different (p<0.05) between the different extract of *A. esculentus* at the concentration of 1000 µg/ml.

ME has better scavenging capacity than other extracts. ME's capacity to reduce Fe³⁺ to Fe²⁺ is significant (Monyong et al., 2020; Wang et al., 2020).

-Variation in TPC may be the primary contributor to variation in the antioxidant capabilities of plants. Extrinsic and intrinsic factors, (soil/water, maturity, and environmental circumstances) have a direct impact on plant phenolic profiles (Garcia, 2016; Prasad et al., 2020).

CONCLUSION

HE has signifying TPC than ME in *A. esculentus* pod oil extract at Okara & Ceylan, 2016).

ME exhibited a greater TPC compared to ethanol and distilled water extract of *A. esculentus* (Jahromi & Sedaghi, 2015).

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Characterization of Stevioside and Rebaudioside A from Leaves of *Stevia rebaudiana* (Bertoni) Mutants using UHPLC

Mustapha Akil, Nur Hafizati Abdul Halim, Rosniza Razali, Chong Saw Peng, Noreliia Bahari

ABSTRACT

Stevia has been used for a variety of purposes around the world since the dawn of time, such as in medication and as sweetener. Since we now know that *Stevia* plants' leaves might offer superior qualities to many other high-potency sweeteners, it is probably going to play a significant role in the future supply of high-potency sweeteners for the expanding natural food market. Two major diterpene glycosides in *Stevia* are Stevioside and Rebaudioside A where these two metabolites have similar structure and become the most interesting steviol glycosides sugar-substitutes substances. In this study, the presence and quantification of both compound in two mutants of *Stevia rebaudiana* (Bertoni), S10A and S40C were characterized using Agilent 1290 Infinity LC System Ultra High-Performance Liquid Chromatography (UHPLC). It shows that S10A has higher content of Rebaudioside A (60%) while S40C shows a little reduction about 9% in comparison with control. While for Stevioside content in both mutants, it shows a very significant reduction of about 77% compared to control. Rebaudioside A is the sweetest and most stable steviol glycoside, and it is less bitter than Stevioside. It is the most used steviol glycoside as a sugar substitute in food and beverage due to its high content in *Stevia* leaves. Therefore, in *Stevia* products, a high proportion of Rebaudioside A is desirable and, in this case, S10A fulfilled these criteria.

INTRODUCTION

Stevia that is widely used as a food sweetener is *Stevia* from the *Rebaudiana* type. It is also known as sweetleaf, sugarleaf or sweet herb. The leaves of *Stevia* contain a few diterpene glycosides such as Stevioside, Rebaudioside A-F, dulcoside and many more (Panghal, 2018). But among all that glycosides, Stevioside and Rebaudioside A are the main sweetener components in *Stevia*, where the sweetening effect is 150-300 and 200-400 times much higher compared to sugar can respectively (Ashwell, 2015). In this study, chemical profiling for evaluating the quality of new *Stevia* varieties was conducted using Agilent 1290 Infinity LC System Ultra High-Performance Liquid Chromatography (UHPLC).

METHODOLOGY

Agilent 1290 Infinity LC System Ultra High-Performance Liquid Chromatography (UHPLC)

Detector: Photodiode array detector (DEBAF01173) - 210 nm wavelength

Mobile phase: 10 mmol analytical grade of Sodium Phosphate and HPLC grade Acetonitrile (Merck) - isocratic mode with 70 (10 mmol Sodium Phosphate):30 (acetonitrile) and the flow rate was set at 0.3 ml/min

Stationary phase: Accucore™ C18 column (4.6 x 150 mm)

Standard: Rebaudioside A (CAS: 58543-16-1) and Stevioside (CAS: 57617-89-7)

RESULTS & DISCUSSIONS

Variety	Reb A	Stevioside
S10A	Increased 60%	Reduced 77%
S40C	Reduced 9%	Reduced 77%

Rebaudioside A is the sweetest and most stable steviol glycoside, and it is less bitter than Stevioside (Goyal et al, 2010). It is the most used steviol glycoside as a sugar substitute in food and beverage due to its high content in *Stevia* leaves.

CONCLUSION

From this study, it shows that different variety from the same species of *Stevia* contained different concentration of steviol glycosides. Because of Rebaudioside A is the sweetest and most stable steviol glycoside, its high proportion is desirable. From the results obtained, S10A illustrated high proportion of Rebaudioside A and might be a good candidate to be cultivated. However, more research needs to be conducted to investigate the other characteristics before a final conclusion can be made.

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CARBON, NITROGEN AND SULPHUR STABLE ISOTOPES AS TRACERS FOR POLLUTION SOURCE INVESTIGATION IN KUALA SELANGOR NATURE PARK

By: Mohd Noor Hidayat A, Jalal S, Ahmad Nazmul A.W, Rafiah M.R, Mohamad Izwan A.A, Mohd Tarmizi I, Lakam A.M, Nurul Assykeen M.J, Nooradilah A, Shyful Azzi A.R, Jeremy Andy A.D.D, Dainee A.T, Siti Aminah O, Shakirah A.S, Adharuddin A.A & Munirah A.Z.

ABSTRACT

Anthropogenic activities such as changes of land use for coastal development are the major factors affecting the sustainability of mangrove area. Kuala Selangor Nature Park (KSNP) is one of the area that should be monitored for any potential source of pollution by using stable isotopes as important tracers. Vegetation samples from several palm and mangrove species were analysed for $\delta^{13}\text{C}$, $\delta^{15}\text{N}$ and $\delta^{34}\text{S}$ stable isotopes. The samples were collected from nine different locations comprising of KSNP area, water canal, residential area, sluice gate, aquaculture area, landslide area, agriculture area, jetty and river confluence area. The $\delta^{13}\text{C}$, $\delta^{15}\text{N}$ and $\delta^{34}\text{S}$ value in the samples are ranged from -33.05‰ to -13.33‰, +1.69‰ to +9.27‰, and +7.83‰ to +8.50‰ respectively. IsoSource modelling software was used and found that the 50% is the highest source proportion identified in aquaculture location demonstrating that the area is the main pollution source in this study. The findings from this study could be used for further control measures by local authority in order to preserve the flora and fauna in KSNP.

INTRODUCTION

- Stable isotope analysis provides information about anthropogenic activities in environment over time.
- Anthropogenic pollution causes diverse variations of $\delta^{13}\text{C}$, $\delta^{15}\text{N}$, $\delta^{34}\text{S}$ values of plants.
- Carbon, nitrogen and sulphur isotopes provide information on anthropogenic vs. natural and organic vs. inorganic occurrences.
- Mangrove forests play an important role in mitigating eutrophication in coastal settings.
- Disturbances in mangrove areas affect:
 - Change the cycling of C, N and S.
 - Loss of mangrove trees and root structures.
 - Seamounts and oceanic islands rise from the seafloor.
 - Sediment stocks of carbon and nitrogen.

MATERIALS & METHODS

- Location mapping
- Sample collection
- Sample processing
- Stable Isotope Analysis
- IsoSource modelling

RESULTS & DISCUSSION

- Carbon isotope**
 - Pollution caused enrichment in ^{13}C isotopic value.
- Nitrogen isotope**
 - Aquaculture area show the highest $\delta^{15}\text{N}$ value – Excess nutrients.
 - $\delta^{15}\text{N}$ values of around 10‰ are attributable to human and animal sewage.
- Sulphur isotope**
 - The sulphur values are influenced by sedimentary sulphide.
 - Pollution caused cause strong depletion in $\delta^{34}\text{S}$ in sulphide minerals.
- The highest proportion rate is from aquaculture – Main source of pollution in KSNP.

CONCLUSION

- Aquaculture runoff is possible to cause the major pollution problems in KSNP.
- The SIA is proven to be valuable method to determine source of pollution in an area.

SEMINAR R&D **A PRELIMINARY APPROACH TO IDENTIFY IRRADIATED DRIED DATE FRUITS BY PHOTOSTIMULATED LUMINESCENCE (PSL) MEASUREMENTS**

Ros Anita Ahmad Ramli, Nurul Aisyah Syahira Mohd Azli and Mohd Hafiz Abd Nasir
Agrotechnology and Biosciences Division, Malaysian Nuclear Agency, Bangi, 43000 KAJANG, MALAYSIA
*Corresponding author: anita@nuclearmalaysia.gov.my

ABSTRACT

Photostimulated Luminescence (PSL) is one of the physical methods for the identification of irradiated dried dates (seed, stalk and pericarp). The samples were analyzed by PSL as a rapid screening method. The samples were exposed to gamma radiation at doses 1, 3 and 10 kGy using a cobalt-60 gamma source. All samples (including non-irradiated as the control) were stored under dark condition. As a result, the PSL measurements could be an excellent method for the identification of irradiated dried dates, all the samples were correctly distinguished between non-irradiated and irradiated based on photon count (PC) values. The objective of this study was to investigate the effectiveness of PSL measurement in identifying dried dates fruits. The results of this study provide a useful database on the applicability of PSL technique for the detection of irradiated food.

Keywords: food irradiation, detection, dried dates

INTRODUCTION

Date fruits (Phoenix dactylifera) are used as a staple food in the middle East for thousands of years. Dates fruits are the most valuable product in the worldwide market for dried fruits. Various types of dates are found worldwide mainly Ajwa, Sukkari, Seki, Khodry etc. The quality of date fruits is dependent on its postharvest handling and processing. For preventing the degradation and maintenance of the high quality of dates during the storage an appropriate harvest and post-harvest processes are using irradiation treatment. Gamma irradiation can be substantial for the postharvest maintenance of quality dates fruits. The commercially viable advance and updated techniques such as irradiation treatment that can be used to avoid storage losses and problems while keeping fruit quality food irradiation treatment is increasingly being used by many countries to improve food safety, extend shelf life and overcome trade barriers. Dates fruit using irradiation technique as a quarantine treatment for extend shelf life. Thus, method to detect irradiated food is important to enforce legal controls on labeling requirements, facilitate trade of irradiated food and improve consumer confidence. To ensure free consumer choice irradiated food will be labeled (RAD/PSL).

In Malaysia, the photostimulated luminescence technique (PSL) has been developed to identify irradiated from non-irradiated food in compliance with the Food Irradiation Regulations 2011 which requires labeling of irradiated food and irradiated ingredients if it constitutes more than 5 percent of the content blend food.

METHODOLOGY

Dried dates were purchased from supermarket. The samples were exposed to γ -radiation at doses ranging 1 to 10 kGy using a cobalt-60 gamma source (dose rate: 37.4 Gray/min). All samples (non-irradiated and irradiated) were stored under dark condition to confirm the stability of detection parameters.

The PSL of the control and irradiated samples were measured using a PSL Irradiated Food Screening System at Malaysian Nuclear Agency. The PSL measurements were performed according to EN 13751 (2004). Samples (seed, stalk and pericarp) were placed in 50 mm diameter disposable petri dish. The PSL signals (photon counts, PC) of the samples were recorded in the measuring mode at the rate of counts/10s and were presented at PCU/60s. All measurements were done in duplicate.

The signal intensity is compared with two threshold defined from reference data.

RESULT AND DISCUSSION

Figure 1. Photon counts (PCU/60s) for dried dates using PSL technique

From Figure 1, the effect of radiation dose on signal intensity shows a general trend of increasing PCU with increasing doses (Figure 1). According to Sukari et al (2010), trend of increasing PCU with increasing dose of food. The result showed that the detecting irradiation doses is related to the different amounts and kinds of mineral salts that are present in the samples (seed, stalk and pericarp). Through PSL technique, all the samples were correctly distinguished between non-irradiated and irradiated based on PCU values (Ros Anita et al, 2016).

CONCLUSION

The result shows that Photo-luminescence detection method (PSL) can be used to detect the irradiation treatment of the dried date fruits. The PSL signal intensity suitability for detecting dried dates which have long shelf-life. All the samples were correctly distinguished between non-irradiated and irradiated in this study. The results of this study provide a useful database on the applicability of PSL technique in detection of irradiated dates. The availability of the method to detect irradiated food in Malaysia will be useful to the Ministry of Health for enforcing labeling control in Malaysia.

ACKNOWLEDGMENT

The authors wish to express their sincere thanks to Malaysian Nuclear Agency, MOSTI for their support.

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For further information, please contact:
Director General,
Malaysian Nuclear Agency
Agrotechnology & Biosciences Division
43000 KAJANG, MALAYSIA
Tel: +603 - 8911 1221
Fax: +603 - 8911 2154
E-mail: anita@nuclearmalaysia.gov.my

SEMINAR R&D **STUDY ON THE SAFETY ISSUES OF ULTRAVIOLET GERMICIDAL IRRADIANCE (UVGI)**

By: Wan Syazlin binti Wan Yunoh, Roza binti Tukimin, Nur Afiha binti Zainal, Zulkipli bin Yusoff, Muhammad Shahr bin Abu Samah and Aida Suzamin binti Kamaludin

ABSTRACT

International Commission on Non-Ionising Radiation Protection (ICNIRP) classified ultraviolet as non-ionising radiation. However, referring to The Centers for Disease Control and Prevention (CDC) which is a national public health agency of the United States state that ultraviolet band consist of ionising and non-ionising radiation depend on the energy and wavelength of the ultraviolet. Ultraviolet also known to have health effects to the human body, especially towards skin and eye. Despite of having negative effect to the human body, ultraviolet radiation also has the positive effects which is, it stimulates the production of vitamin D and have germicidal capabilities. To balance the positive and negative effects, there should be a guideline to make sure the ultraviolet from man-made sources do have enough safety aspect before placement in the market. Due to the increasing use of UVGI marketed for home use for COVID-19, World Health Organization (WHO) warned about potential hazard of UV radiation and advised against use of UVGI to disinfect hand or skin. In Malaysia, currently, there is no guideline on limiting of use of UVGI. This study aims to highlight the safety issue on the UVGI based on literature review and practice from other countries.

INTRODUCTION

- Radiation from natural and man-made sources exist around us.
- The radiation was divided into ionising and non-ionising radiation.
- Ultraviolet (UV) radiation was in the middle of the spectrum between this two form.
- The dividing line between ionising and non-ionising radiation is not clearly defined but the energy of ionising radiation starts at 10 eV.
- The highest-energy of UV radiation do not have sufficient energy to penetrate deeply into the body.
- The health effect was limited to the skin and eyes.
- It is still a concern, UVGI devices were sold without any safety assessment or guideline in Malaysia.
- There are action on the UVGI device by other country made based on the advised from WHO on UVGI.
- Malaysia shall have a guideline and safety assessment on UVGI to ensure the safety of human towards the health effect by UV radiation.

METHODOLOGY

- Non-ionising Radiation (NIR) Group under the Radiation Health and Safety Division (BKS), Malaysian Nuclear Agency (Nuklear Malaysia) is offering a service for UV Safety Assessment on consumer product.
- The safety assessment consist of measurement of wavelength, irradiance and calculation of permissible exposure duration.
- The Assessment conducted in accordance with the International Ultraviolet Association (IUA) and ICNIRP Guidelines on Limits of Exposure to Ultraviolet Radiation of Wavelengths Between 180nm and 400nm (Incoherent Optical Radiation).

RESULTS & DISCUSSION

- The UV Safety Assessment shall include: UVC verification test - determine whether the wavelength of the source of the UVGI was fall under UVC band, Irradiance level test - test the effectiveness for disinfection. Calculation for effective irradiance - to calculate the maximum permissible exposure duration. This data will determine the conclusion and recommendation for the test product.
- All the test result conducted must be make visible in the safety assessment report and certificate.
- Manufacturer of UVGI must also include the device manual with details of information.
- The instruction to place the hazard warning signs/ labels for UVC exposure, the label of restriction of access and the need for personal protection equipment (PPE); gloves, face shield for UVC must be sharply defined.

CONCLUSION

- Based on this study, NIR Group of Nuklear Malaysia proposed UVGI or equivalence device in Malaysia shall undergo a safety assessment test for UV before placement in the market. This is in line with WHO warned about potential hazard of UV radiation and advised against use of UVGI to disinfect hand or skin. Due to the concerned of UVC hazard, it is suggested that UVGI devices should have a guideline or under some restriction. Currently, the device is being sold without any proper guideline which may cause harm to the public.

OBJECTIVE

- To highlight the safety issue on the usage of Ultraviolet Germicidal Irradiance (UVGI) for home use.
- To develop safety assessment of UVGI before placement in the market.

Figure 1: UV Safety Assessment for Consumer Product

Figure 2: Instrument used in the UV Safety Assessment

For further information, please contact:
Director General,
Malaysian Nuclear Agency
Agrotechnology & Biosciences Division
43000 KAJANG, MALAYSIA
Tel: +603 - 8911 1221
Fax: +603 - 8911 2154
E-mail: anita@nuclearmalaysia.gov.my

UNCERTAINTY EVALUATION IN MEASUREMENT OF THE PERSONAL DOSE EQUIVALENT, $H_p(0.07)$

By: J.K. Sangau, N.F.S.A.Hamid, M.R.Abdullah, A.Jaafar & F.N.Rozman

ABSTRACT

This paper presents the results of the measurement of the uncertainty of personal dose equivalent, $H_p(0.07)$, using an Optically Stimulated Luminescence Dosimeter (OSLD). The measurement of the uncertainty was carried out according to the method used in the Guide to the Expression of Uncertainty in Measurement (GUM) (1). This paper focuses on only three parameters, namely Energy and Angular Dependence (K_{EA}), Fading (K_{fad}) and Temperature Effect (K_{temp}). For Energy and Angular Dependence parameter, the annealed OSLD was irradiated using X-rays with a dose of 3 mSv at an irradiation angle of 0° using qualities N-40, N-60, N-80, N-100, N-150 and N-200. Whereas, for an irradiation angle of 60°, OSLD is irradiated with a dose of 3 mSv using the qualities of N-40, N-60 and N-100. The Fading parameter test is done within a month. It was performed with four different irradiation times for the same setting reading period. Four groups of 10 dosimeters were prepared, and each group was irradiated with a dose of 3 mSv using X-Ray quality N-80. Irradiation is carried out weekly until all groups of dosimeters are irradiated. As for the Temperature Effect parameter, the test is done by keeping the irradiated OSLD with a dose of 1 mSv using X-rays (N-80) at three different conditions, namely room temperature (15 - 25°C), -4°C and 40°C for one week. The measured uncertainty values for the Energy and Angular Dependence, Fading and Temperature Effect parameters are 0.12, 0.033 and 0.076, respectively.

INTRODUCTION

Measurement of the personal dose equivalent $H_p(0.07)$ received by the radiation workers is crucial for ensuring that they meet the dose limit specified in the regulatory. One of the necessities in this measurement is the calculation of the measurement of uncertainty. According to the Guide to the Expression of Uncertainty in Measurement (GUM), the calculation of uncertainty can be done using the following equation:

$$H_p(0.07) = N \cdot K_E \cdot K_{EA} \cdot K_{fad} \cdot K_{temp} \cdot [G - ZeroD] \cdot Bg$$

Where; $Bg = N \cdot K_E \cdot K_{EA} \cdot K_{fad} \cdot K_{temp} \cdot [G_{bg} - ZeroD]$

Based on the GUM analytical method, there are two types of uncertainty:

1. Type A: method of evaluation of uncertainty by the statistical analysis of a series of observations.
2. Type B: method of evaluation of uncertainty by means other than the statistical analysis of a series of observations.

METHODOLOGY

- Equipment: OSL, Water phantom, Bridge, oven and OSL Auto Reader
- Radiation source: X-ray
- Calculation uncertainty based on the GUM method;

Energy and Angular dependence, K_{EA}

Exposure dose: 3 mSv
Distance: 2m
Energy: N-40, N-60, N-80, N-100, N-150, N-200 and N-250
Angle of incidence: 0° and 60°

Fading K_{fad}

Exposure dose: 3 mSv
Energy: N-80
Distance: 2m
Different irradiation times for the same read-out period

Temperature effect on the dosimeters, K_{temp}

Dosimeters were kept in bridge and oven
Exposure dose: 3 mSv
Distance: 2m
Temperature: 15-25°C (room temp), -4°C (cold) and 40°C (heat) for 1 week

RESULTS & DISCUSSION

The uncertainty for three finding parameters is shown in Table 1. The value of each uncertainty is given as an absolute standard uncertainty.

Based on the GUM method,

- the best estimate for K_{EA} and K_{fad} is equal to the average of the K-values (K is the inverse response, 1/R). The absolute standard uncertainty is equal to the half-width of K divided by 3.
- The best estimate for K_{temp} is equal to the average of the normalised K-values (K is inverse response, 1/R). The absolute standard uncertainty is equal to half-width of K divided by $\sqrt{3}$.

CONCLUSION

- The uncertainty in the measurement of the personal dose equivalent $H_p(0.07)$, was calculated using OSL dosimeter.
- This paper just reports the preliminary result in order to find combined uncertainty and expanded uncertainty.

FUTURE STUDIES

- Further experiments and studies will be conducted to determine the other value of the absolute standard uncertainties already identified in the equation.

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ASSESSMENT OF RF EMF EXPOSURE NEAR TELECOMMUNICATION STRUCTURES: A CASE STUDY ON VARIABLE TIME AVERAGING DURATION

By: Shamesh Raj Parthasarathy, Zulkifli Yusof, Nur Afrina Zainal, Thivya Gunalan and Nur Sabrina Shafinar

ABSTRACT

A technical assessment and a study were conducted in order to investigate the effect of the time averaging duration from the Radio Frequency Radiation (RFR) at the vicinity of the Telecommunication Structures (TS). The measurement was conducted in 10 locations where the TS were installed. The assessments were conducted at 3 variable time averaging duration specifically at 1 minute, 6 minutes and 30 minutes for all the stated structures. The results were recorded in terms of power density ($\mu\text{Watt}/\text{cm}^2$) and were compared to the reference level stipulated under the Malaysian Communications and Multimedia Commission (MCMC) 2021 Mandatory Standard and the International Commission on Non-Ionizing Radiation Protection (ICNIRP) 2020 guidelines. Findings from this study showed that the presence of the RFR emitted by the antennas from the telecommunication structures would not lead to any significant radiation exposure received by the public in the area. In addition, with a very slight changes of value between the time averaging duration of 6 minutes and 30 minutes, it can be suggested that in certain cases, the measurement duration can be done at 6 minutes.

INTRODUCTION

The main objective of the measurement was to investigate the effect of the time averaging duration from the RF Radiation from the stated Telecommunication Structure (TS) specifically at 1 minute, 6 minutes and 30 minutes and to analyze the RF Radiation level based on the MCMC Mandatory Standard 2021 and the ICNIRP 2020 Guideline. The sites were named according to the structures and the duration of measurement. As an example, TS_1_01m, denotes the TS number 1, with the measurement conducted at the time averaging duration of 1 minute.

METHODOLOGY

TIME AVERAGING DURATION: 1, 6, 30 minutes

Results recorded in power density ($\mu\text{Watt}/\text{cm}^2$)

Broadband & Narrowband Assessment

RF radiation emitted by the antenna

Telecommunication Structure (TS)

Transmit power <100 Watts

1.5 meter from the ground

RESULT & DISCUSSION

Figure 1: Broadband analysis of the RF EMF for each TS for 1 & 6 mins compared to time averaging duration of 30 mins

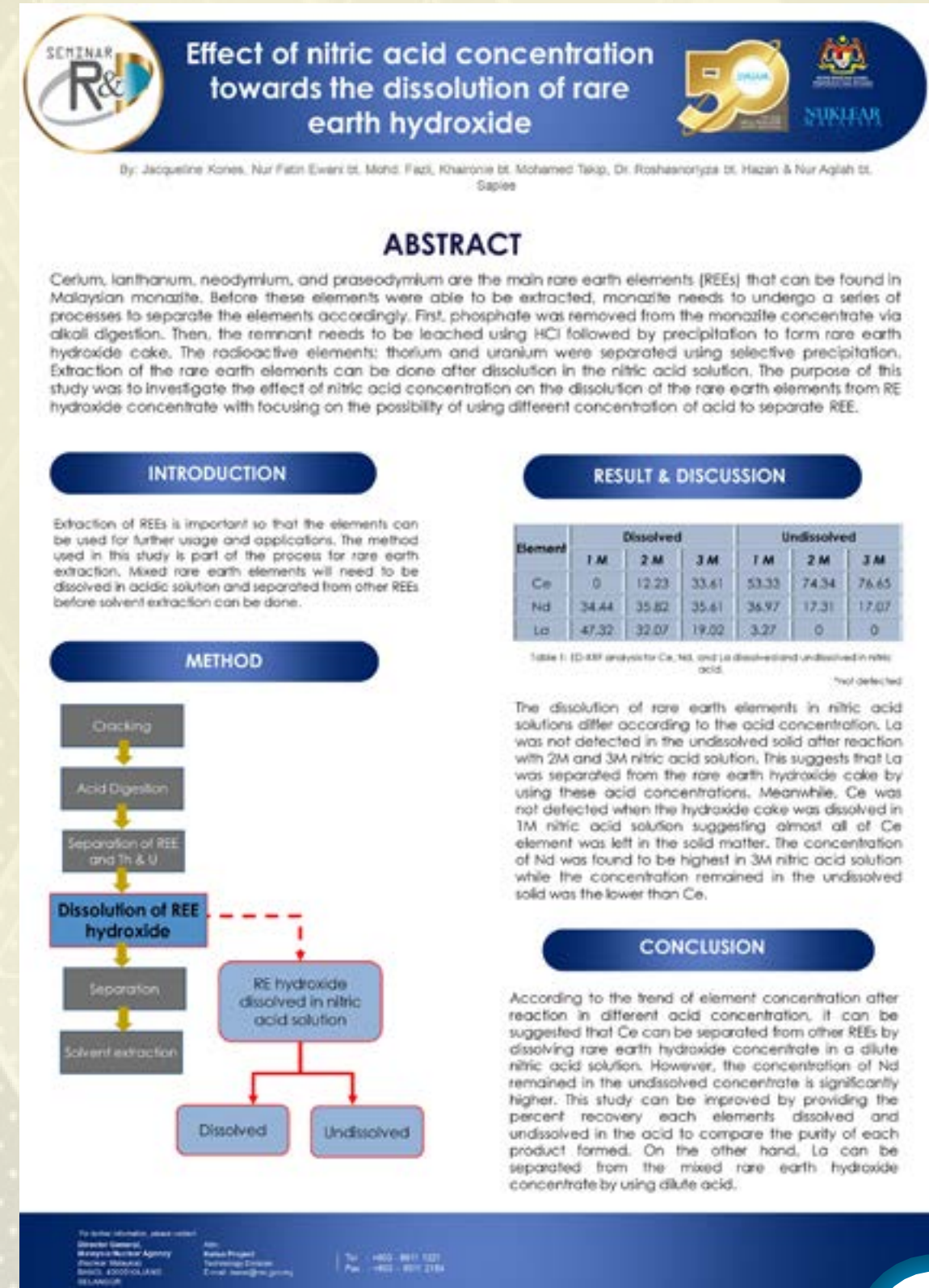
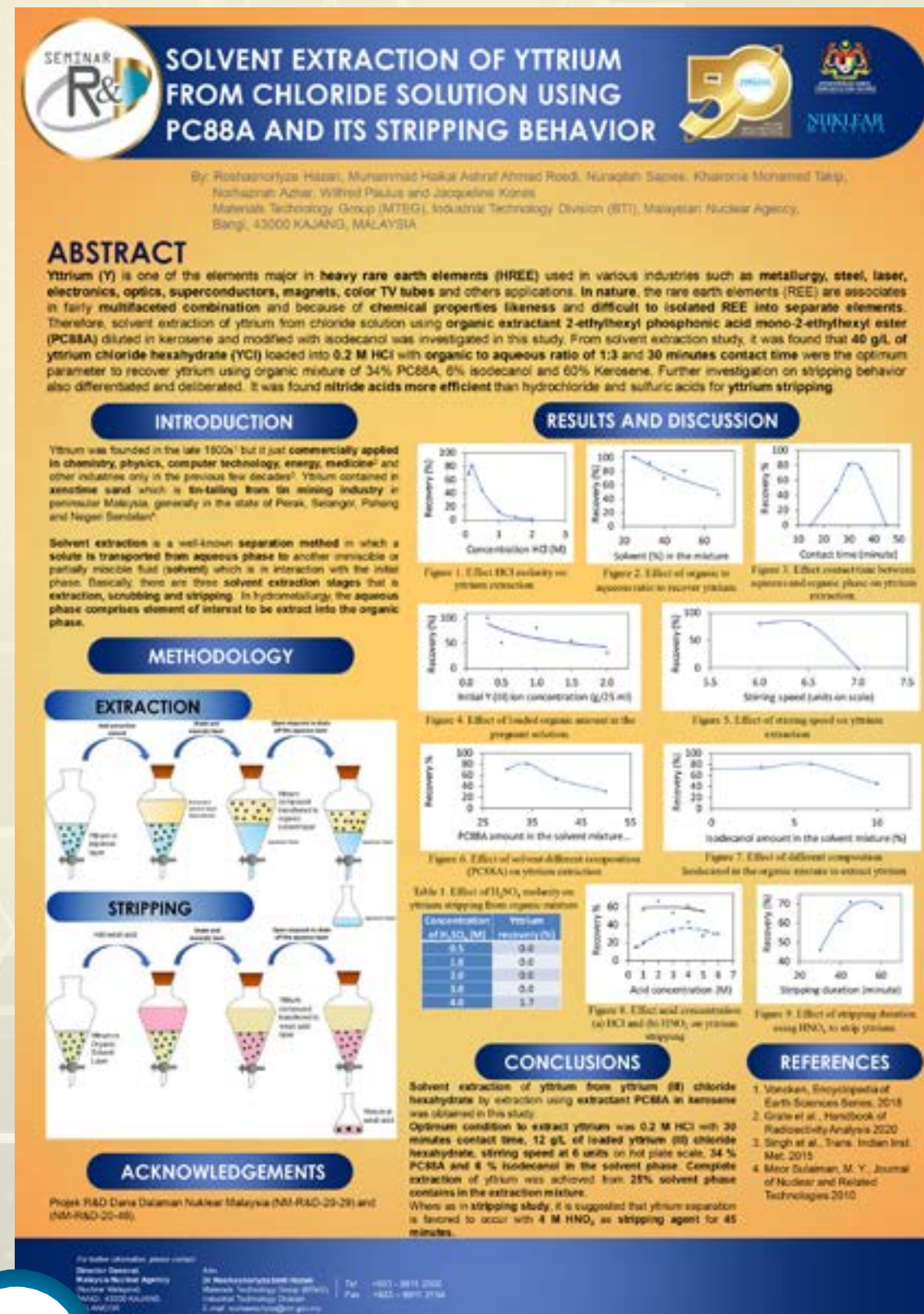
Figure 2: Narrowband analysis of the averaged RF EMF value

Mobile phone signals 22%, Radio 8%, TV 10%

Mobile Signal of interest from the measured Telecommunication Structure (TS) 60%

CONCLUSION

From the broadband analysis, the percentage of differences from the time averaging duration measurement between 6 minutes and 30 minutes was observed from the range of 0% to 1.2%. This low differences in percentage shows that the power density measurement value differs very slightly after the 6 minutes duration. In addition, the RFR measured in all the sites were well below the reference level and comply with the MCMC Mandatory Standard and ICNIRP Guidelines for members of the public. From the narrowband analysis, it was observed that there were other RF signals such as Radio, TV and mobile phone signals present during the assessment. In addition, with a very slight changes of value between the time averaging duration of 6 minutes and 30 minutes, it can be suggested that in certain cases, the measurement duration can be done at 6 minutes instead of 30 minutes. However, more studies and measurements involving more Telecommunication Structures (TS) are required in order to come to this definite measurement duration.



STUDY ON WETTABILITY OF MODIFIED INDUSTRIAL POLYETHYLENE (PE) FILTER CARTRIDGE FOR ADSORPTION

By: Norliza Ishak, Sarasa Selambakkannu, Asliah Fatmah Othman, Ting Teo Ming, Syaza Farnah Samsudin

ABSTRACT

The radiation-induced grafting technique is one of the most popular methods in practice for the surface modification of polymeric materials. In this study, the industrial polyethylene (PE) filter cartridge was modified via a simultaneous radiation-induced grafting process by employing gamma irradiation at a dose of 25 kGy whereby the Glycidyl Methacrylate (GMA) was grafted onto the material followed by subsequent chemical functionalization with amine functional group. Both the unmodified and modified filter cartridges have been subjected to contact angle measurements using the advanced mode contact angle method through an optical contact angle (OCA). The analysis was performed to identify the changes in the hydrophilicity of the material. The result attained revealed that the modified filter cartridge is more likely hydrophilic in comparison to the unmodified filter cartridge.

INTRODUCTION

- 1 Synthetic Polymeric Material as adsorbent for adsorption.**
 - Good mechanical stability
 - Easy modification using various type of functional groups that caters end application
- 2 Industrial Polyethylene (PE) Filter Cartridge**
 - Great chemical stability and cost effective
- 3 Simultaneous Radiation induced grafting (SRIG)**
 - Modification technique to enhance the surface properties of the material
- 4 Advanced Optical Contact Angle**
 - Measure the degree of hydrophilicity for modified industrial PE filter cartridge based on Young Theory and surface roughness

METHODODOLOGY

RESULTS

Material	CA (°)	CCA (°)
Blank	138.88	91.31
p-Ph-GMA	10.76	133.07
p-Ph-GMA-EDA	10.76	122.53
p-Ph-GMA-EDA	10.76	134.01

After modification, the industrial PE filter cartridges become slightly hydrophilic. The constituents of the carbonyl group and amine groups in GMA and EDA/DMA are polar and partially charged, which makes the molecule more hydrophilic. Corrected contact angle (CCA) is measured by considering the surface roughness of the real surface material compared to Contact Angle (CA) which assumes the surface is ideal based on Young's theory.

CONCLUSION

The industrial PE filter cartridge was successfully modified using the SRIG technique, and a slight decrease in the degree of hydrophobicity is observed. An evaluation of the suitability of modified PE filter cartridges as adsorbents for the removal of metal ions should be conducted.

PROBLEM STATEMENT

- 1 Issues in water security in ensuring public health and environmental well-being**
- 2 Limitations of natural polymeric material in term of mechanical properties and availability**
- 3 Nature of PE is hydrophobic and requires surface modification to enhance the wetting properties as adsorbent**

OBJECTIVE

- To modify industrial PE filter cartridge with GMA by simultaneous radiation induced grafting using gamma.
- To evaluate the wetting properties of the modified industrial PE filter cartridge using Advanced Optical Contact Angle mode.

EFFECTS OF NCO/OH RATIO ON THE PROPERTIES OF RADIATION CURABLE WATERBORNE POLYURETHANE

By: Khairul Adhir A. H., Anas Aiman M.F., Rosley C. I., Abdul Mutz M. S. and Naurah M. I.

ABSTRACT

A series of radiation-curable waterborne polyurethane dispersion was synthesized with two different NCO/OH ratios of 1.5 and 2.0. The polyurethane prepolymer was synthesized by reacting polypropylene glycol (MW=2000) with isophorone diisocyanate to produce -NCO end-capped polyurethane prepolymer. The prepolymer chain was then terminated with hydroxyethyl acrylate and dispersed with deionized water to produce polyurethane acrylate (PUA) dispersion. The PUA dispersions were mixed with two types of photoinitiators, Irgacure 500 and Darocur 1173, and cured under a medium pressure mercury ultraviolet lamp with a wavelength of 365 nm to produce PUA films. The effects of NCO/OH ratios and types of photoinitiators on the properties of PUA dispersion and PUA film were studied. Both dispersions of NCO/OH ratio 1.5 and 2.0 shows similar properties for solid content at 40%, pH at around 7, and good dispersion stability with a zeta potential of NCO/OH ratio 1.5 at -60.9 while NCO/OH ratio 2.0 at -48.78. Only the viscosity of the dispersions displayed changes as it increased with the increasing NCO/OH ratio. Meanwhile, the curing speed of PUA dispersion with Irgacure 500 is better than Darocur 1173 at a low film thickness of 50µm at 5 passes, however, as the thickness of the PUA film increased to 100µm, the curing speed for all the dispersions became similar, at 9 passes, regardless of NCO/OH ratio or type of photoinitiators. Pendulum hardness test revealed that the type of photoinitiators does not affect the film hardness, the PUA film hardness, however, was affected by NCO/OH ratio, as it increased with increment in the NCO/OH ratio.

Keywords: Radiation curable, Prepolymer, Dispersion, Polyurethane Acrylate

INTRODUCTION

Waterborne polyurethane (PU) is widely used as coatings because of its nontoxic and environmentally friendly appeal. Conventional PU coating commonly utilizes organic solvents to increase its applicability on various substrates. These solvents, however, usually contain hazardous air pollutants and volatile organic compound that are dangerous towards the environment and health. In addition, most organic solvents are toxic and carcinogenic in nature. Following the increase in environmental awareness, many countries have started to issue various regulations and laws related to the production of coatings. Thus, many water-based coatings have gained rapid development in coatings, adhesives, and textile industry. However, water-based PU takes a longer time to fully cure at room temperature compared to solvent-based PU. Radiation curing technology can be incorporated in the formulation of water-based coating to provide rapid curing speed, cost reduction as well as being environmental and energy-friendly. Polyurethane acrylate (PUA) prepolymers are synthesized by reacting polyols and diisocyanate and terminated with an acrylate which provides C=C site for free radical polymerization when the dispersion is exposed under radiation, to form PUA film. The purpose of this research is to study the effects ratio of NCO:OH on PUA film properties.

RESULTS & DISCUSSION

Curing rate of WPUA 1.5 & 2.0 with varying Photoinitiators

PUA film hardness (WPUA 1.5 & 2.0) with varying Photoinitiators

EXPERIMENTAL

CONCLUSION

The project aimed to study the UV-curable WPUA coating properties at different NCO:OH ratio of 1.5 and 2.0. The PU was synthesized through the reaction of PPG and IPDI to produce -NCO terminated PU prepolymer. Then, HEA and deionized water was added to produce PUA dispersion. Two photoinitiators were used in this study which are Irgacure 500 and Darocur 1173, and the mixed sample undergo curing under medium pressure mercury UV lamp with a 365 nm wavelength to produce PUA films. The WPUA dispersion at NCO:OH ratio 1.5 and 2.0 showed similar properties for solid content at 40%, pH at around 7, and good dispersion stability. Only the viscosity of the dispersion displays changes as it increases with increasing NCO:OH ratio. Meanwhile, the curing speed of PUA dispersion with Irgacure 500 is better than Darocur 1173 at low film thickness of 50 µm, however at film thickness 100 µm, the curing speed for all the dispersions becomes similar, regardless of NCO:OH ratio nor type of photoinitiators. The test indicates that, the type of photoinitiators does not affect the film hardness, however it is affected by NCO:OH ratio, as it increased with increasing NCO:OH ratio.



REMOVAL OF GLICLAZIDE IN SEWAGE TREATMENT PLANT EFFLUENT BY ELECTRON BEAM IRRADIATION

By: Khomsaton Abu Bakara, Sarala Selambakkanu, Ting Teo Ming, Aya Ayuni Manazil, Mohd Danni, Fahrudin, Mukhlis Mokhtar, Mohd Azhar Ahmad, Natasha Isnin




SUMMARY

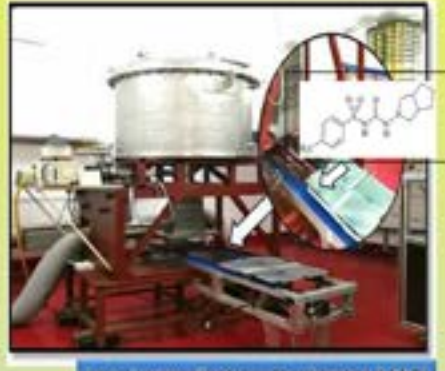
The degradation of gliclazide was performed using low energy electron accelerator (LEEA) at the energy of 200 KeV, current of 1 mA and irradiation doses ranging from 5 to 40 kGy. Spike and unspike sewage treatment plant (STP) effluent with 100 000ug/l of gliclazide was irradiated by LEEA. The result show that 100% removal of gliclazide was achieved at 40kGy but only 57% was mineralized. Removal of COD were 8.3% and 86.0% for spike STP effluent and unspike STP effluent at applied dose of 40kGy. The result also indicated electron beam irradiation (EBI) also promotes the nitrification process when there is a decrease in ammonia (NH₃-N) concentration and an increase in nitrite (NO₂-N) and nitrate (NO₃-N) concentration. The experimental results also showed that EBI did not have a significant effect on phosphorus concentration and does not inhibit the growth of green algae.

INTRODUCTION

- Gliclazide (GLZ) is an amphoteric diabetic medication having pKa values of 5.8 and 2.9 respectively due to the presence of the sulfonamide and aliphatic amine groups.
- GLZ residues presence in the environment:
 - Surface water- 6-15ng/l
 - Hospital effluent- 16-26ng/l
 - Sewage treatment plant effluent – 49-60ng/l (Al-Qaim et al., 2016).
- Gliclazide has been shown slow to degrade in the environment after treating either hospital sewage treatment plants or sewage treatment plants (Al-Qaim et al., 2016).
- Thus, this study investigate the degradation of GLZ in STP effluent samples by EBI technique. Degradation of, GLZ, and was detected by HPLC. Apart that, monitoring of COD, TOC, NH₃-N, NO₂⁻, NO₃⁻ values before and after irradiation process were carried out as well.



METHOD



Electron Beam Irradiation Setup

Irradiation process

- Energy: 200 KeV ;
- Current: 1 mA ; Dose: 5-40 kGy.

Sample Characterization

- HPLC-DAD analyses – Gliclazide quantification
- UV-Vis Spectrophotometer (DR 5000) - Organic and inorganic anions analyses.

For further information, please contact:

Khomsaton Abu Bakara
Nuclear Science Agency
Nuclear Research Division
Tel: +603-8911 1221
Fax: +603-8911 2154
Email: khomsat@nuklear.mam.gov.my

For further information, please contact:

Khomsaton Abu Bakara
Nuclear Science Agency
Nuclear Research Division
Tel: +603-8911 1221
Fax: +603-8911 2154
Email: khomsat@nuklear.mam.gov.my



REMOVAL OF GLICLAZIDE IN SEWAGE TREATMENT PLANT EFFLUENT BY ELECTRON BEAM IRRADIATION

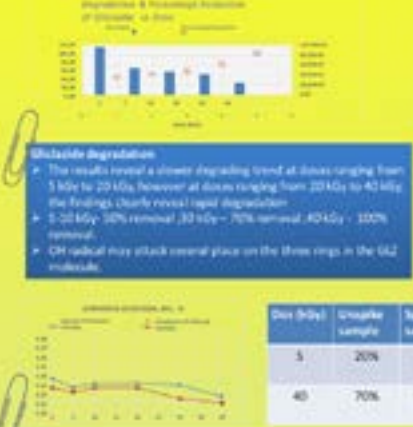
By: Khomsaton Abu Bakara, Sarala Selambakkanu, Ting Teo Ming, Aya Ayuni Manazil, Mohd Danni, Fahrudin, Mukhlis Mokhtar, Mohd Azhar Ahmad, Natasha Isnin




RESULTS & DISCUSSION

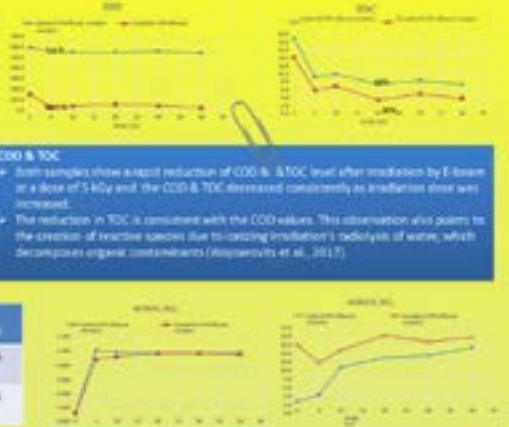
Gliclazide degradation

- The results reveal a slower degrading trend at doses ranging from 5 kGy to 20 kGy, however at doses ranging from 20 kGy to 40 kGy the findings clearly reveal rapid degradation.
- 5-20 kGy: 10% removal, 30 kGy – 70% removal, 40 kGy – 100% removal.
- OH radical may attack several place on the three rings in the GLZ molecule.



COD & TOC

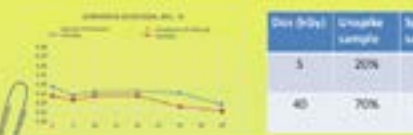
- Both samples show a rapid reduction of COD & BTOC level after irradiation by E-beam at a dose of 5 kGy and the COD & TOC decreased consistently as irradiation dose was increased.
- The reduction in TOC is consistent with the COD values. This observation also points to the creation of reactive species due to electron irradiation's radiolysis of water, which decomposes organic contaminants (Aggarwal et al., 2017).



Nitrification

- Both (spike and unspike STP effluent) trend of results showed nearly identical where ammonia-nitrate content drops while nitrite and nitrate levels increase after EBI.
- As stated in Equation (1), ammonia nitrogen interacts with OH radicals to create NH₂ radicals (Hammer et al., 2003). Subsequently, NH₂ radicals reacts with H₂O₂ and OH as shown in equations (2) and (3), respectively (Fapaga, F. 2018). Thereafter, oxidation of radical ammonia will rapidly would form NHOH and NO₂O₂.
- The unstable NO₂O₂ will split to NO₂, which can be oxidized to NO₃ by OH or H₂O₂.









5 kGy



20 kGy



40 kGy

CONCLUSION

The experiments demonstrate that GLZ can be remove effectively by low energy EB irradiation (LEEA). In the initial concentration about 100 000ng/l in spike STP sample, about 50% removal efficiency was achieved at a dose of 20kGy and 100% removal at a dose of 40kGy. However, only about 57% GLZ in spike STP samples was mineralized at dose of 40kGy while 85% mineralization was achieved for unspike STP sample. At dose of 40 kGy, removal of COD was 8.3% and 86.0% for spike and unspike STP effluent respectively. This study also revealed that EBI stimulates the nitrification process in all samples which leads to reduction in NH₃-N concentration and increase in NO₂⁻, NO₃⁻ at the irradiation dose ranging from 5 kGy to 40 kGy. Besides that, EBI have no significant effect on total phosphorus. The toxicity assessment illustrated that EB treatment could not affect the green alga growth but have significant toxic to mung bean germination.

For further information, please contact:

Khomsaton Abu Bakara
Nuclear Science Agency
Nuclear Research Division
Tel: +603-8911 1221
Fax: +603-8911 2154
Email: khomsat@nuklear.mam.gov.my

For further information, please contact:

Khomsaton Abu Bakara
Nuclear Science Agency
Nuclear Research Division
Tel: +603-8911 1221
Fax: +603-8911 2154
Email: khomsat@nuklear.mam.gov.my



RTP SECURITY ASSESSMENT USING VULNERABILITY OF INTEGRATED SECURITY ANALYSIS (VISA)

A.S. Ligam, M.R. Abdul Mutalib, M.F. Abdul Farid, N. Ramli, A.N. Ab Rahim, T. Lanyau, P. Prak Tom, M.D. Usang, M.A. Che Mat Isa



Abstract

Nuklear Malaysia is responsible and accountable for the security of the reactor facility as well as its nuclear and radioactive materials. Nuklear Malaysia must ensure that security measures are both legally compliant and genuinely appropriate and effective. For similar reasons, Jabatan Tenaga Atom (JTA) may wish to initiate security assessments to ensure that the Regulatory Standards achieve their goals. Both parties are interested in determining which elements of the security system are effective, as well as how efficient and cost effective they are.

Many tools were considered to assess the effectiveness of security at Reactor TRIGA PUSPATI (RTP). However, not all of these tools are appropriate for a facility such as a small research reactor, as well as its complexities such as road conditions, terrain, and the surrounding environment, among others. After constructive meetings, workshops, and discussions with the coordinating group member, it was determined that Vulnerability of Integrated Security Analysis (VISA) as one of the chosen tools would account for the purpose due to various factors such as ease of use, data input requirement availability, and cost.

Introduction

Vulnerability of Integrated Security Analysis (VISA) methodology is a qualitative based assessment modelling tool that can systematically evaluate system effectiveness of nuclear security through the use of SMEs. The methodology is a scenario-based approach based on SME opinion, documented values or a combination of both. However, the methodology can use either qualitative or quantitative input and can be used for existing and/or future facility analyses and for the base case and upgrade cases to document the nuclear security effectiveness for both insider and/or outsider threats against a threat assessment or design basis threat.

Materials and Methods

- Facility specific detection, assessment, and delay elements are modelled using the VISA methodology to evaluate the effectiveness of the nuclear security protection system and its components.
- Input values for detection, assessment and delay elements are based on the scenario specific details.
- Using site layouts, response procedures, assumed protection element delay values and adversary attack strategies, adversary and protective force response timelines can be estimated and compared to postulate interruption neutralization which may be evaluated/assigned.

VISA Observations

Strengths

- It is easy to show the task time and the response time as well to identify whether lack of P_s , P_a , P_i and P_n .
- It is more descriptive in terms of what elements and activities of the overall assessment.
- Counter measure can be easily identified at specific location and determine critical detection point (delay, detection, etc.)

Weakness

- It is subjective on V_L , L , H , VH subject to SME judgment
- It is a single path scenario of which does not show multiple path
- It is more of qualitative and needs SME and the results can be driven by strong personality participant

Conclusion

Through VISA analysis, vulnerable paths for the RTP was determined and evaluated.

Physical security upgrade at RTP have been identified and the recommendation to be discussed with relevant parties

Result and Discussion

The security assessments considered both sabotage and theft scenarios before and after the upgrade to prevent the successful of malicious act against the targets at the RTP by introducing more delay elements.

Timelines below are for the illustration purpose only due to confidential data and does not representing real scenarios at the RTP.

Threat 1: Sabotage at the Reactor Core					Threat 2: Sabotage at the Reactor Core										
Step	Step Time (Sec)	Lead Time (Sec)	Step Description	P_s	P_a	P_i	P_n	Step	Step Time (Sec)	Lead Time (Sec)	Step Description	P_s	P_a	P_i	P_n
1	20	20	Lead Time: 20 sec (SME)	100	100	100	100	1	20	20	Lead Time: 20 sec (SME)	100	100	100	100
2	200	220	Adversary: 200 sec (SME)	100	100	100	100	2	200	220	Adversary: 200 sec (SME)	100	100	100	100
3	200	220	Adversary: 200 sec (SME)	100	100	100	100	3	200	220	Adversary: 200 sec (SME)	100	100	100	100
4	200	220	Adversary: 200 sec (SME)	100	100	100	100	4	200	220	Adversary: 200 sec (SME)	100	100	100	100
5	200	220	Adversary: 200 sec (SME)	100	100	100	100	5	200	220	Adversary: 200 sec (SME)	100	100	100	100
6	200	220	Adversary: 200 sec (SME)	100	100	100	100	6	200	220	Adversary: 200 sec (SME)	100	100	100	100
7	200	220	Adversary: 200 sec (SME)	100	100	100	100	7	200	220	Adversary: 200 sec (SME)	100	100	100	100
8	200	220	Adversary: 200 sec (SME)	100	100	100	100	8	200	220	Adversary: 200 sec (SME)	100	100	100	100
9	200	220	Adversary: 200 sec (SME)	100	100	100	100	9	200	220	Adversary: 200 sec (SME)	100	100	100	100
10	200	220	Adversary: 200 sec (SME)	100	100	100	100	10	200	220	Adversary: 200 sec (SME)	100	100	100	100
11	200	220	Adversary: 200 sec (SME)	100	100	100	100	11	200	220	Adversary: 200 sec (SME)	100	100	100	100
12	200	220	Adversary: 200 sec (SME)	100	100	100	100	12	200	220	Adversary: 200 sec (SME)	100	100	100	100
13	200	220	Adversary: 200 sec (SME)	100	100	100	100	13	200	220	Adversary: 200 sec (SME)	100	100	100	100
14	200	220	Adversary: 200 sec (SME)	100	100	100	100	14	200	220	Adversary: 200 sec (SME)	100	100	100	100
15	200	220	Adversary: 200 sec (SME)	100	100	100	100	15	200	220	Adversary: 200 sec (SME)	100	100	100	100
16	200	220	Adversary: 200 sec (SME)	100	100	100	100	16	200	220	Adversary: 200 sec (SME)	100	100	100	100
17	200	220	Adversary: 200 sec (SME)	100	100	100	100	17	200	220	Adversary: 200 sec (SME)	100	100	100	100
18	200	220	Adversary: 200 sec (SME)	100	100	100	100	18	200	220	Adversary: 200 sec (SME)	100	100	100	100
19	200	220	Adversary: 200 sec (SME)	100	100	100	100	19	200	220	Adversary: 200 sec (SME)	100	100	100	100
20	200	220	Adversary: 200 sec (SME)	100	100	100	100	20	200	220	Adversary: 200 sec (SME)	100	100	100	100
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23	200	220	Adversary: 200 sec (SME)	100	100	100	100	23	200	220	Adversary: 200 sec (SME)	100	100	100	100
24	200	220	Adversary: 200 sec (SME)	100	100	100	100	24	200	220	Adversary: 200 sec (SME)	100	100	100	100
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32	200	220	Adversary: 200 sec (SME)	100	100	100	100	32	200	220	Adversary: 200 sec (SME)	100	100	100	100
33	200	220	Adversary: 200 sec (SME)	100	100	100	100	33	200	220	Adversary: 200 sec (SME)	100	100	100	100
34	200	220	Adversary: 200 sec (SME)	100	100	100	100	34	200	220	Adversary: 200 sec (SME)	100	100	100	100
35	200	220	Adversary: 200 sec (SME)	100	100	100	100	35	200	220	Adversary: 200 sec (SME)	100	100	100	100
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37	200	220	Adversary: 200 sec (SME)	100	100	100	100	37	200	220	Adversary: 200 sec (SME)	100	100	100	100
38	200	220	Adversary: 200 sec (SME)	100	100	100	100	38	200	220	Adversary: 200 sec (SME)	100	100	100	100
39	200	220	Adversary: 200 sec (SME)	100	100	100	100	39	200	220	Adversary: 200 sec (SME)	100	100	100	100
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64	200	220	Adversary: 200 sec (SME)	100	100	100	100	64	200	220	Adversary: 200 sec (SME)	100	100	100	100
65	200	220	Adversary: 200 sec (SME)	100	100	100	100	65	200	220	Adversary: 200 sec (SME)				



PROPOSED IN-SITU FUEL BURNUP DETERMINATION OF REAKTOR TRIGA PUSPATI CORE

M.F.Abdul Farid; R.Abdul Muttalib; A.S.Ligam; M.A.Che Mat Isa; T.Lanyau; A.N. Ab. Rahim; N.S.Hamzah; P.Prak Tom; M.D.Anak Usang; M.R.Mohamed Zin; R.Md. Dan




Abstract

Reaktor TRIGA PUSPATI (RTP) has been operated for nearly forty years and the configuration of core has changed more than a dozen times due to the irradiation requirement. The percentage of uranium-235 (U-235) content in the nuclear fuel will experiencing burnup process every time the reactor operated. In this situation, considering the reactor has been operated many hours since 1962, the evolution of core configurations as well as the different in the U-235 composition, it is crucial to determine the burnup of each type of fuel element instead of taking the average core burnup. The burnup indicates the useful lifetime of the fuel in the reactor core. Fuel burnup also plays important role for reactor operation because of its capability to determine how long RTP can be operate at desired power and for how many hours of operation. Currently, determination of RTP core simulation has been based on simulation only using ORIGEN, TRIGLAV and MCNP computer codes. However, determination of burnup by experiment is rarely conducted and it is much more complex when the percentage of U-235 composition varies between fuel elements and also if configuration always changed. In this case, measurement of fuel burnup for each fuel element is necessary not only due to safety reason such as fuel integrity but also the information obtained from the measurement are crucial for future planning of the reactor itself especially for the continuity of sufficient irradiation requirement. As a part of that, the study also will contribute to obtain information of fission products in the fuel as well as its properties.

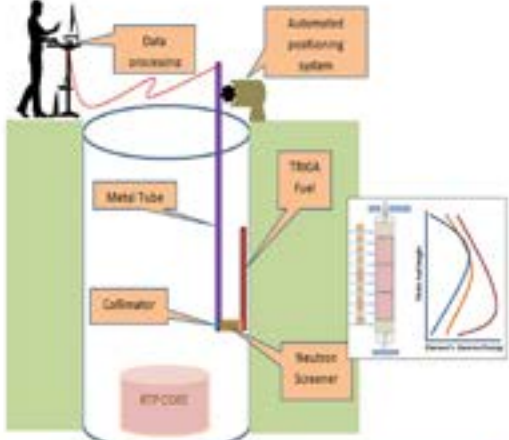
Introduction

RTP has been operated for nearly forty years and the configuration of core has changed more than a dozen times due to the irradiation requirement. The percentage of uranium-235 (U-235) content in the nuclear fuel will experiencing burnup process every time the reactor operated. Furthermore, RTP core consists of three different types of fuel elements (moderating properties for thermal neutrons) with 8 wt%, 12.5 wt% and 20 wt% of U-235 compositions.

In this situation, considering the reactor has been operated many hours since 1962, the evolution of core configurations as well as the different in the U-235 composition, it is crucial to determine the burnup of each type of fuel element instead of taking the average core burnup. The burnup indicates the useful lifetime of the fuel in the reactor core. Fuel burnup also plays important role for reactor operation because of its capability to determine how long RTP can be operate at desired power and for how many hours of operation. Currently, determination of RTP core simulation has been based on simulation only using ORIGEN, TRIGLAV and MCNP computer codes.

Objectives

- (i) To design and develop experimental tools and methodologies for the determination using gamma energy spectrum of radionuclide for each fuel elements inside the reactor pool.
- (ii) To utilize the analysis method of gamma energy characterization for each radionuclide inside fuel element.
- (iii) To determine the burnup of TRIGA fuels by using experimental approach.
- (iv) To compare and analyze the result obtained by simulation using a computer code such as ORIGEN, TRIGLAV etc.



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- T. Nakano, O. Aki, E. Ohts, "A Simple Gamma Spectrometry Method for Evaluating The Burnup of MTR type HEU Fuel Elements", Nuclear Instrumentation and Methods in Physics Research A 834, pp 175-182, 2016.
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Scope of Study

(Designing and developing an experimental method at the reactor pool tank for the measurement of gamma energy spectrum of fission products from TRIGA fuel.

Measurement of in-situ gamma energy spectrum inside reactor pool without fuel element (background) and measurement of gamma energy spectrum for fuel elements (background and fission product inside fuel element).

Analysis method will be developed in determination of fission product radionuclide contributed to the burnup calculation and identification of radioisotope generated from fuel meat.

Analysis method will be developed in characterizing of each gamma energy spectrum for each fuel element for calculation of radionuclide concentration in determination of fuel burnup.

The measurement of gamma energy spectrum, analysis of spectrum will be conducted for at least 9 fuel elements for different U-235 composition of 8 wt%, 12.5 wt% and 20 wt%.

Data from experiment will be compared with the simulation using computer code ORIGEN, TRIGLAV or MCNP etc.

For further information, please contact:

SEMINAR R&D 2022
Malaysia Nuclear Agency
Nuclear Research
NRC-4300/04/0002
NRC-04

Ats. Abdul Faliq Abdul Faliq
Project Leader
Reaktor PUSPATI/Triga
Technical Support Division
E-mail: ats@nrc.gov.my

Tel : +603-8911 1235
Fax : +603-8911 2154



Design and Construction of a Faraday Cup for Malaysian Nuclear Agency Plasma Focus Device (MNA-PF)

By: Mohd Azhar Ahmad, Halim Bajen, Leo Kwee Wah, Rokiah Sabri, Faiz Zin & Nuzulis Mokhtar




ABSTRACT

A Faraday cup has been developed for measuring pulsed ion beam of a low energy plasma focus device. The faraday cup operating in biased ion collector mode have nanosecond response and these have been used to determine the energy spectrum and flux of ion beam emerging out of the pinched plasma column. Faraday cup consists of a conductive material with a shape like a cup to 'capture' ion particles in vacuum. The hitting of ion to the metal cup would generate a current, which can be used to determine the number of ions. Therefore, this paper describes specifically design, fabrication process, our findings and all related works for faraday cup based on our Malaysian Nuclear Agency Plasma Focus Device (MNA-PF).

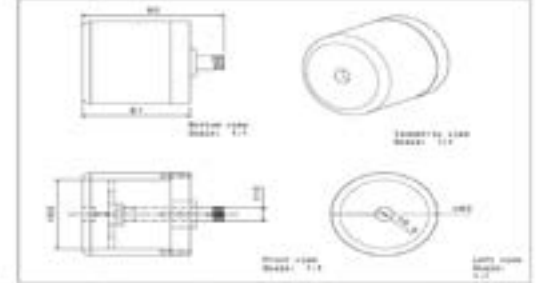
INTRODUCTION

Faraday cup consists of a conductive material with a shape like a cup to 'capture' ion particles in vacuum. The hitting of ion to the metal cup would generate a current, which can be used to determine the number of ions.

Our group, ADC are developing Faraday Cup device to measure ion beam for our plasma focus device. Ion beam is an important source produced by this device. The ion beam is produced according to the type of gas filled inside the device chamber. The present diagnostics for the MNA-PF is still lacking in term of plasma diagnostics such as ion beam diagnostic. To measure the ion beam, Faraday cup is a good choice for this specific purpose.

Design & Fabrication

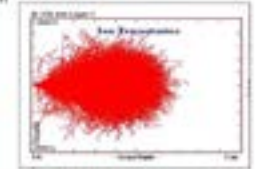
The faraday cup is designed by using 3D CAD software. The 3D CAD can ensure that all the dimensions will coincide with the desired measurement especially during fabrication process. The overview drawing and fabrication process of this faraday cup are shown below.






Result on Simulation Process

Comparison with other materials using SRIM and TRIM:



201 keV Argon Ion		
Material	Melting Temperature (°C)	Projected Range of ion inside the material (µm)
Copper	1085	0.0862
Aluminum	660	0.176
Graphite	3527	0.167
304 Stainless Steel	1400-1450	0.088

Result

The design and fabrication process has been successfully carried out including the design of the electronic circuit for 100-250V bias negative voltage supply. As a result, testing the amount of ions produced by MNA-PF can be studied and carried out in next research.



For further information, please contact:

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Malaysia Nuclear Agency
Nuclear Research
NRC-4300/04/0002
NRC-04

Ats. Abdul Faliq Abdul Faliq
Project Leader
Reaktor PUSPATI/Triga
Technical Support Division
E-mail: ats@nrc.gov.my

Tel : +603-8911 1235
Fax : +603-8911 2154

Ion Production Diagnostics in a 2.3kJ Malaysian Nuclear Agency-Plasma Focus (MNA-PF)

Abd Halim bin Baljan, Rokiah bt Mohd Sabri, Mohd Azhar Bin Ahmad, Leo Kivee Wah, Dr. Hazman Naim bin Ahsan, Mohd Noor Shafiek Bin Jaafar, Mohammad Karimi Bin Manawir,

ABSTRACT

This poster is an introduction of ion beam diagnostics suitable for Malaysian Nuclear Agency- Plasma Focus (MNA-PF) device. Currently there are two diagnostics that will be tested to the plasma focus (MNA-PF) device. The diagnostics are biased ion collector and Faraday cup.

INTRODUCTION

Malaysian Nuclear Agency-Plasma Focus (MNA-PF) configuration has enable the generation of hot and dense plasma through the pinch effect. This event will also produced radiation such as neutron, X-rays and ion beam.

Faraday Cup

Faraday cup is a metal cup (conductive) designed to collect charged particles in vacuum. It was named after Michael Faraday who founded ions around 1830s. The ion hitting the metal in the cup will generate current and then it will be measured to determine the number of ions it received. Figure 1



Figure 1

Biased Ion Collector

Biased ion collector basically is made from a piece of copper plate as the charge collector and negatively biased to certain potential. Figure 2



Figure 2

Methodology

The arrangement of the diagnostics and the plasma focus. Figure 3

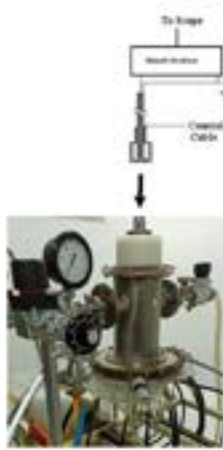
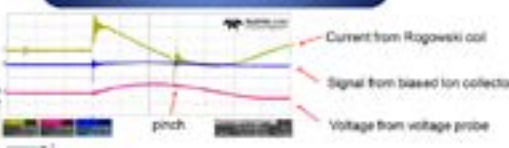


Figure 3

Result and Discussion



There are three diagnostics signals shown in the graph above, each one represent current diagnostic, voltage diagnostic and ion diagnostic. The graph shows the signal for each diagnostics the occurring of plasma pinch at 10.0 kV with am Argon gas pressure at 1.5 mbar.

ANALISA PENGGUNAAN RESEARCH LOOP DI SINAGAMA BAGI TAHUN 2019 – 2021

Syuhada Ramli, Zarina Mohd Nor, Cosmos George, Ahsanulhaliqin Abdul Wahab, Mohd Rizal Md Chulan, Nor Ishadi Ismail, Shaiful Rizaide Mohd Yakin, Wan Muhammad Ikram
MINTec-Sinagama, BST

ABSTRAK

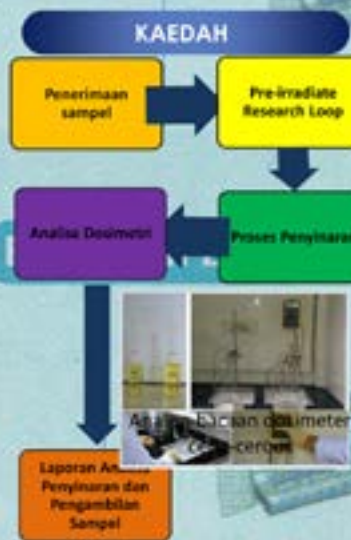
Bagi menggalakkan penggunaan penyinaran dan menyokong aktiviti penyelidikan, Sinagama turut dilengkapi dengan Research Loop sebagai sokongan R&D bagi JS 10000 IR 219 Irradiator. Pengguna Research Loop di Sinagama bagi tahun 2019 ialah 345, manakala tahun 2020 ialah 302 dan tahun 2021 adalah sebanyak 205 yang terdiri daripada penyelidikan dalaman dan luaran serta verifikasi dos pelanggan. Didapati jumlah penyinaran sampel makanan dan herba adalah 363 berbanding sampel perubatan iaitu 82 dan lain-lain iaitu 446 bagi tahun 2019 hingga 2021 dengan permohonan dos penyinaran di antara 0.1 kGy – 400 kGy. Kertas kerja ini akan membincangkan analisa data penggunaan Research Loop dan kaedah pengendalian sampel untuk penyinaran gamma menggunakan Research Loop.

Keywords/Kata kunci: Gamma irradiation, Research Loop, Year 2019-2021/ Penyinaran gamma, Research Loop, Tahun 2019 – 2021

PENGENALAN

Sinagama adalah kemudahan penyinaran gamma dari punca Cobalt-60. Pendedahan masa sampel menggunakan Research Loop terhadap penyinaran gamma adalah tidak terhad bergantung kepada kadar dos yang diperlukan. Penyinaran daripada Research Loop dijalankan tanpa mengganggu perkhidmatan penyinaran produk komersial di Sinagama.

KAEDAH



KEPUTUSAN DAN PERBINCANGAN

PENGGUNAAN RESEARCH LOOP SINAGAMA BAGI TAHUN 2019 - 2021



Peranti Perubatan
Makanan dan herba

Analisa dos penyinaran Research Loop:

- 1- Dosimeter Ceric-Cerous :
a. Low dose – julat dos 3-24 kGy
b. High dose – julat dos 10-50 kGy
- 2- Dosimeter Fricke – julat dos 0.04 – 0.4 kGy
- 3- Masa dedahan mengikut dos rate semasa (23.81 Gy/min – 28.00 Gy/min)

Aplikasi penyinaran Research Loop:

- ☐ Kaedah pensterilan
- ☐ Nyah kontaminasi produk makanan dan herba
- ☐ Sterilisasi bahan sisa pertanian
- ☐ Crosslinking atau grafting
- ☐ Ujian daya ketahanan bahan
- ☐ Lain-lain

KESIMPULAN

- Menggalakkan lebih banyak aktiviti penyelidikan berkaitan penyinaran gamma menggunakan kemudahan Research Loop.
- Membolehkan pihak industri menjalankan analisa atau verifikasi dos ke atas sampel bersaiz produk.

RUJUKAN

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Pameran SRIE 6-9 Oktober 2022

PAMERAN SRIE





VETERANS OF ROYAL MALAYSIAN NAVY INCOME GENERATION VIA UTILIZATION OF FLOATING RX-HDPE-BIOCOMPOSITE 'BAGANG' STRUCTURE IN ANCHOVY CAPTURE FISHERIES

By: Meor YR, Shaemila MS., M. Faizal AR, K.N. Kamal, M. Hazim MS,
M. Iqbal S, S. Sahwa MS and A. Zuhdi MO.

PROJECT PLANNING

This bagang structure was built as an floating anchovy capture station, also known as bagang for the benefit of the community. Engagement has been carried out between the technology provider, related authority and the recipient, which is B40 group. It can be concluded that this technology has proven to be able to generate better income for the targeted community as well as sustaining natural timber resources and creating new economic opportunities in the area.

PROCESS

Material preparation

- RX-HDPE floater
- Biocomposite decking
- Drying cabin
- Steel frame






Assembly work

- Floating module and steel frame




Mobilization

- Assembled module mobilization near seawater



Installation

- Cabin and drying chamber loading on the floating module





Net setting

- Lifting system for anchovy harvesting




For further information, please contact:

Shaharir Usman
Malaysia Science Region
Science Malaysia
Kuala Lumpur
Tel: 03-8951 2000

Dr. Ruzi Yafiq Saad
Malaysia Science Region
Kuala Lumpur
Tel: 03-8951 2000

03-8951 2000
03-8951 2144



**3RD SELANGOR
R&D AND INNOVATION
EXPO 2022**



SELANGOR

VETERANS OF ROYAL MALAYSIAN NAVY INCOME GENERATION VIA UTILIZATION OF FLOATING RX-HDPE-BIOCOMPOSITE 'BAGANG' STRUCTURE IN ANCHOVY CAPTURE FISHERIES

By: Meor YR, Sharmila MS., M. Faizal AR, K.N. Kamal, M. Hazim MS,
M. Iqbal S, S. Saliwa MS and A. Zuhdi MO.

IMPACT / BENEFIT

1

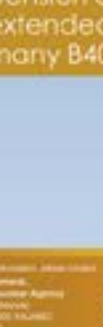
Aqua tourism station (i.e: sport fishing and edu-tourism) and generate income up to RM 4,000/week.

2

Anchovy capture fisheries with achievement up to RM 15,000/month of sales value.

3

Source of income for B40 (especially veteran with no pension and can be extended to be enjoyed by many B40 group).




For further information, please contact:

Sharmila Meor YR,
Marketing Executive Agency
Phone: 012-222 2222
Email: sharmila@meor.com.my

Meor YR,
Marketing Executive Agency
Phone: 012-222 2222
Email: meor@meor.com.my

Tel: +603-8911 2000
Fax: +603-8911 2104



**3rd SELANGOR
R&D AND INNOVATION
EXPO 2022**

**VETERANS OF ROYAL MALAYSIAN NAVY
INCOME GENERATION VIA UTILIZATION OF
FLOATING RX-HDPE-BIOCOMPOSITE 'BAGANG'
STRUCTURE IN ANCHOVY CAPTURE FISHERIES**

By: Meor YR, Shammila MS., M. Faizal AR, K.N. Kamal, M. Hazim MS,
M. Iqbal S, S. Sahwa MS and A. Zuhdi MO.



**50
MALAYSIA
BERSEKUTU
BERSAMA SAMA**

ADVANTAGES

Made from sustainable and renewable supply of fiber materials

Longer service life compared to traditional structure of anchovy capture (reduced maintenance cost)

Can be utilize as a station for sport fishing and edu-tourism

Modular type floating structure (fast execution without heavy machinery)

Mobile concept; can be relocate to place that is rich with anchovy







Tp. Selangor Innovation Center (SIC)
Bukit Jelutong
Mukim Kuala Selangor
Kuala Selangor
Jalan, 47600 Kuala
Selangor

By:
Meor Yuhayyid Saiful
Shahzad Puziwan
Nurfarhan Puziwan
E-mail: meor@icim.gov.my

Tel: +603 - 8911 8200
Fax: +603 - 8911 5154



3rd SELANGOR R&D AND INNOVATION EXPO 2022

HippoScan

Neutron Device for Moisture Under Insulation (MUI) Measurement in Oil & Gas

Md Fakarudin Bin Ab Rahman, Ismail Bin Mustapha, Dr. Nor Palza Bin Mohamad Hasan, and Dr. Susan Maria Sipan

INTRODUCTION

The battle against corrosion is an ever-present issue for the offshore oil and gas industry, with structures, pipework, and equipment widely exposed to seawater and humid, salty air. Corrosion under insulation (CUI) is a major and well-understood threat, and the industry is researching new technology to help identify the impact earlier and more reliably. Mainly, CUI affects steel components, which corrode when they are in contact with water and air. Insulation of plant and pipework can create a space where water can collect and rest against the metal surface over extended periods of time. With outdoor equipment, even very small gaps in insulating cladding can let in sufficient volumes of water to cause significant corrosion issues.

PROBLEM STATEMENT

- The presence of Moisture Under Insulation (MUI) can cause of CUI and lead to catastrophic failure of vessels, pipe work and transfer pipelines that can result in environmental discharge, explosion or harm to workers or members of the public.
- Removing insulation to check the condition of pipework is a laborious process and a costly method of assessing the condition of an asset.
- Traditional techniques employed tend to measure actual corrosion presence rather than moisture that acts as the pre-cursor to metal work degradation.

ADVANTAGES OF HippoScan

- Advanced mechanism of neutron backscattered technique is portable, non-intrusive measurement and no requirement to remove any part of the insulation prior to measurement.
- Able to identify the presence of moisture in insulation that can be used on a wide range of process vessels and transfer lines and responds specifically to moisture presence within insulation.
- Quickly identify wet insulation that may lead to corrosion and ultimate failure of plant vessels and pipe work.
- Provide an instantaneous result, allowing the field technologists to immediately identify sections of insulation containing moisture that can be quickly repaired or further measurements carried out to determine whether CUI has occurred.

PREVIOUS CLIENTS

RESULT

CONCLUSION

The American Petroleum Institute code, API 570, Inspection, Repair, Alteration and Iterating of In-service Piping Systems, the piping code first published in June 1993 quoted that Neutron Backscattered is a one of the reliable techniques to inspect CUI. This HippoScan is the best technique to solve this CUI problems.

For further information, please contact:
Director General,
Malaysian Nuclear Agency,
Bangi, 43000 Kajang, Selangor
Web: www.mna.gov.my
Email: info@mna.gov.my

Mr. Fakarudin Bin Rahman,
Plant Assessment Technology Group,
Malaysian Nuclear Agency,
Bangi, 43000 Kajang, Selangor
Web: www.mna.gov.my
Email: fakarudin@mna.gov.my

50th PERKEMBARAN

SAMARIUM-153 EDTMP FOR BONE PALLIATIVE TREATMENT

Azahari Kasbollah, Siti Selina Abdul Hamid, Wan Hamirul Bahin Wan Kamal, Saifulizan Mohamad, Rahmah Abdul Rahim, Muhammad Hanafi Mohamad Mokhtar

SAMARIUM-153 EDTMP

Samarium-153-ethylenediaminetetramethylene phosphonic acid

Samarium-153 is a radioisotope used in metabolic radiotherapy for the treatment of pain from bone metastases. Ethylenediaminetetramethylene phosphonic acid (EDTMP) in the form of freeze-dried kit (sterile and pyrogen free) is a chemical agent suitable for the convenient one-step preparation of ^{153}Sm -EDTMP. When the radioisotope Sm-153 is complexed with EDTMP and administered, the ^{153}Sm -EDTMP will localize in the bone. The beta emitting radionuclide are able to provide pain relieve and the gamma emission allows for bone imaging.



INTRODUCTION

Bone metastasis is a common complication of cancers such as prostate, breast and lung. One of the adverse effects of bone metastasis is bone pain. The pain can be extremely excruciating which significantly affects the patients quality of life.

Sm-153 acts as a palliative agent for bone pain where it emits both beta particles and gamma rays. The beta particles prevent injury signals from reaching the brain thus preventing the brain from receiving pain cues. The gamma rays in turn allows imaging to be done using a gamma camera.





Samarium-153 production process Samarium-153 labelled with EDTMP process

SAMARIUM-153 EDTMP FOR BONE PALLIATIVE TREATMENT

ADVANTAGES

Kit is suitable for the convenient one-step preparation of ^{153}Sm -EDTMP. When the radioisotope Sm-153 is complexed with EDTMP and administered, the ^{153}Sm -EDTMP will localize in the bone. The beta emitting radionuclide are able to provide pain relieve and the gamma emission allows for bone imaging.

BENEFIT & IMPACT

- ^{153}Sm -EDTMP helps relieve bone pain for patients with chronic (terminal) cancer
- Improve quality of life
- Can be produced locally with an affordable cost.

LOCALLY PRODUCED VS IMPORTED Sm-153

Impact	Locally produced Sm-153	Imported Sm-153
Cost	1/5 reduction of import cost per treatment	Expensive, RM20,000 per treatment
Availability	Available at any time, based on request, case by case basis	Need to import from abroad
Time	Within 5 working days	Minimum waiting period 30 days




POTENTIAL VALUE ADDED ON SLAUGHTER HOUSE BLOOD VIA RADIATION TECHNOLOGY FOR MULTIPLE INDUSTRIAL APPLICATION

By: Khomsaton Abu Bakar, Sarada Idris, Nurshafarina Ismail, Norliza Ishak, Sarala Selambakkannu

INTRODUCTION & INNOVATION

Blood rich with protein is the first by-product that is obtained after slaughter, but is commonly discarded or not fully utilized. It is a red fluid, which is made up of water, cells, enzymes, proteins, and other organic and inorganic substances that can be separated into 2 fractions: the cellular fraction (30-40%) and plasma (60%). The value of blood can be increased by separating the blood into plasma and cellular fraction that can be done by ionizing radiation and even ionizing radiation reduce contamination of blood during collection process. Ionizing radiation able to modify the primary structure of proteins which consist of polypeptide chain of amino acid through fragmentation, cross-linking and aggregation process. Radiation dose plays a major role in determining the application of modified protein formed from radiation.

METHOD



BENEFITS & IMPACT

- To improve separation of plasma and cellular fraction.
- To improve environmental problem in slaughter house (COD & BOD reduction in wastewater)
- To control blood-borne diseases in slaughterhouses

ADVANTAGES

Ionizing Irradiation

- Simple and easy to automation and tailored the polypeptide protein for specific application
- Faster processes to create useful bioactive peptide.
- Improve the hygenity of irradiate blood.
- Improve blood separation process.

Conventional process

- Separation blood by centrifuge at specific condition (low temp and high rpm) - 15-30 min
- Bioactive peptide from polypeptide assist by specific enzyme at critical condition - 3-7 days.

APPLICATIONS

INDUSTRIES

- Hemoglobin as Food source for aquatic feed and pet food.
- Whole animal blood cow, sheep, pig chicken as protein source in pet food.
- Porcine, chicken and bovine plasma as Protease inhibitor in surimi and cake

FOOD

- Whole animal blood as protein source in Spanish sausage.
- Porcine fibrinogen, thrombin as binder in restructured meat product.
- Porcine, chicken and bovine plasma as Protease inhibitor in surimi and cake

MEDICALS

- Bovine thrombin used to Promote blood coagulation, treatment of wound, hold skin graft in place.
- Bovine plasma used as medium for the growth of probiotic bacteria (Lactobacillus sp.)
- Bovine fibrinogen used as reagent for routine blood clotting in serology laboratories

UNIVERSITI TEKNOLOGI SARAWAK

SARAWAK
MALAYSIA

MUDSKIPPER

Scavenger

Mohd Aswadi Syarif Mohd Yusoff, Shahrin Abd. Shukur, Mohammad Samsul Mustafa, Mohd Mustari Mohd Nordin,
Engku Mohd Faim Engku Cik, Mohammad Ridwan Shar, Arwen Affiah Mahmood, Umarah Zainy Abdul Wahid

Innovative On-site Radiometric Mapping System for Natural Radioactive Sediment Transport and Efficient Coastal Erosion Monitoring

INTRODUCTION

- There are a lot of low activity natural radionuclides such as (U-238, Th-232 & K-40) in some beaches where erosion or accretion are evident and known.
- There are possibilities to make use of online mapping of natural gamma radionuclides to investigate the density distribution along the shoreline.
- Current mapping method by using sampling and counting technique is very complicated and time consuming process.
- However, if sampling and online radiometric mapping techniques performed together, the discovered data is very useful and can be used for validation to the conventional method.

ADVANTAGES

- Non-destructive and on-line measurement.
- High possible repetitive measurement.
- Produce very fast result (2-3 kilometers per day).
- Robust and reliable design.

INNOVATION

- New dedicated online radiometric mapping system has been developed creatively for sediment dynamics evaluation in coastal areas.
- This home-made heavy duty detection system consists of waterproof Thallium doped Sodium Iodide NaI(Tl) 2" x 2" size detector and battery operated electronic scaler ratemeter as data acquisition system was installed in a robust four-wheel trolley.
- The system will be supported by metric measuring wheel & Geographic Information System (GIS) mapping device that tracks both GPS and GLONASS satellites for collecting highly accurate positioning information data.

The authors gratefully acknowledge:

Universiti Teknologi Sarawak,

National Nuclear Agency,

Mohd Nur Hafiz,

BAGOL 4202/KALANG

To: Dr. Abdul Aswadi Syarif Mohd Yusoff,

Institute Technology Division,

E-mail: aswadi@uts.gov.my

Innovative On-site Radiometric Mapping System for Natural Radioactive Sediment Transport Monitoring and Efficient Coastal Erosion Monitoring

MUDSKIPPER Scan

RESEARCH OBJECTIVE

In recent years, many countries face some issues with erosion in the coastal areas. Current technology used for shoreline coastal erosion management now use airborne, satellite and un-manned aerial vehicle (UAV) drone. However, those methods have an accuracy issue because of a limited supporting data by on-land remote sensing equipment for validation. Latest nuclear technology focus on mapping the sediment movement by collecting natural gamma radioisotope sample and costing long time for spectrometry counting in the laboratory.

The first in Malaysia, MUDSkipper Scan system will be used to collect total count data along 2-3 kilometres shoreline during low tides within 2-3 hours only. The MUDSkipper Scan system will move along the beach, doing several profiles from the seawater line, till the dunes with 3-4 parallel profiles. The MUDSkipper name was chosen to replicate the movement of mudskipper fish because the system will collect data at every 10 meters position on the coastal area.

BENEFIT & IMPACT

Coastal erosion may lead to a variety of negative economic impacts. These can range from lost or damaged property or land to negative effects on tourism, shipping, trade, fishing, and other industries.

For ecosystems, erosion translates into habitat loss as coastal wetlands deteriorate. The plants and wildlife that depend on these ecosystems are negatively impacted by the effects of erosion.

Thus, early initiative to monitor the coastal erosion is crucial to prevent this environments impact.

MAPPING DATA

Project Leader: Dr. Mohd Azhar
Project Manager: Dr. Mohd Azhar
Project Coordinator: Dr. Mohd Azhar
Project Assistant: Dr. Mohd Azhar

Dr. Mohd Azhar
Dr. Mohd Azhar
Dr. Mohd Azhar
Dr. Mohd Azhar



GPR ROADSCAN:PORTABLE MOUNTING SYSTEM

Tengku Sarah Tengku Arman, Mohamad Ridzuan Ahmad, Mohamad Syarif Mohd Amin, Mohd Fari Osman, Dr Razi Mohd Zain, Amer Hameq Haron, Noryana Abd Razak, Mior Ahmad Khussairi Adnan, Khairul Nizan Mahat, Dr Hasimah AJ

INNOVATION BACKGROUND

OVERVIEW

- Ground Penetrating Radar (GPR) is an imaging technology used for pavement testing, concrete structure and subsurface exploration.
- GPR uses electromagnetic wave propagation to image and identify changes in electrical and magnetic properties in ground.
- Most commercial GPR systems are developed as conventional ground-based radar system which conducted normally using a hand pushed cart type device.

The majority of GPR scanning requires right time road works or lane closure and affecting the convenience and aesthetic beauty of road users.

PROBLEM STATEMENT

In order to help mitigate the time taken to undertake the GPR scanning process, the GPR RoadScan Portable Mounting System was designed to fully incorporate the GPR system into the vehicle including the survey wheel encoder for distance measuring and linear actuators to move the antenna up and down that give the GPR antenna air-coupled concept.

SOLUTION

The air-coupled concept the device will transmit and receive a radio wave through an antenna as it passes the overlapping of the antenna and reflected signals from the surface. Because air-coupled technology also can detect the distance between antenna and object beneath the surface they can not be detected by the other.

CONTRIBUTION TO SOCIETY

- Save time
- Safety
- Easy To Use

The result is that in larger areas such as the highway and larger, cleared pedestrian areas, the vehicle can be used to cover the area more rapidly and reduce the number of shifts required to undertake the works, thus reducing public disruption.

This mount can be easily broken down for storage and transportation. It is also eliminates the need for lane closures and provide a safer working environment. This mounting system provide an attachable and removable option for uses on sedan or four-wheel drive vehicle.

NOVELTY

The portable mounting system design

GPR RoadScan: Portable Mounting System was designed to fully incorporate the GPR system into the vehicles including the survey wheel encoder for distance measuring and linear actuators to move the antenna up and down that give the GPR antenna air-coupled concept.

The mounting system provide an attachable & removable option for uses on sedan @ 4WD vehicles.

This mount can easily broken down for storage & transportation.

PRODUCT

Product Description

- Complete, integrated with radarable electronically processing system for highway pavement inspection application.
- Installed with versatility design to cooperate with those different GSSI GPR antennas 400, 500MHz and 900 MHz.
- Rugged, design for vehicular installation (sedan @ 4WD).
- Installed with linear actuators to move the antenna up and down that give the GPR antenna air-coupled concept.

Collaborators

Construction and Civil Engineering Industries eg. PLUS, LPT, PRT, Sarawak

Commercial Potential

MOU UniMAP, MOA Prescada Sdn.Bhd.

ROAD SUBSURFACE ASSESSMENT

Mohamad Ridzuan Ahmad, Tengku Sarah Tengku Arman, Mohamad Syarif Mohd Amin, Mohd Fari Osman, Dr Razi Mohd Zain, Amer Hameq Haron, Noryana Abd Razak, Mior Ahmad Khussairi Adnan, Khairul Nizan Mahat, Dr Hasimah AJ

ROAD SUBSURFACE ASSESSMENT

Road subsurface assessment is an inspection technology to detect subsurface condition such as void, saturated water under pavement, pavement layer and other subsurface objects and structures using accuracy non-destructive remote technologies.

WHY NEED ROAD SUBSURFACE ASSESSMENT

- Early void detection
- Ensure safety to user
- Future planning for repair the road
- Quality of actual road base (pavement condition assessment)

SOLUTION

INTELLIGENT SUBSURFACE INVESTIGATION (INSI™)

REPORT

DATA COLLECTION

GPR scanning, GPR point survey, Resistivity Setup, GPR scanning, Resistivity Data Collection, Drone Data Collection.

Comparison GPR signal

GPR RoadScan Production Line 3

Layer	Depth (m)	Remarks
Asphalt	0.05	Asphalt layer
Road base	0.5	Road base layer
Subbase	1.5	Subbase layer
Subgrade	10.5	Subgrade layer

CURRENT ISSUE ON SUBSURFACE CONDITION

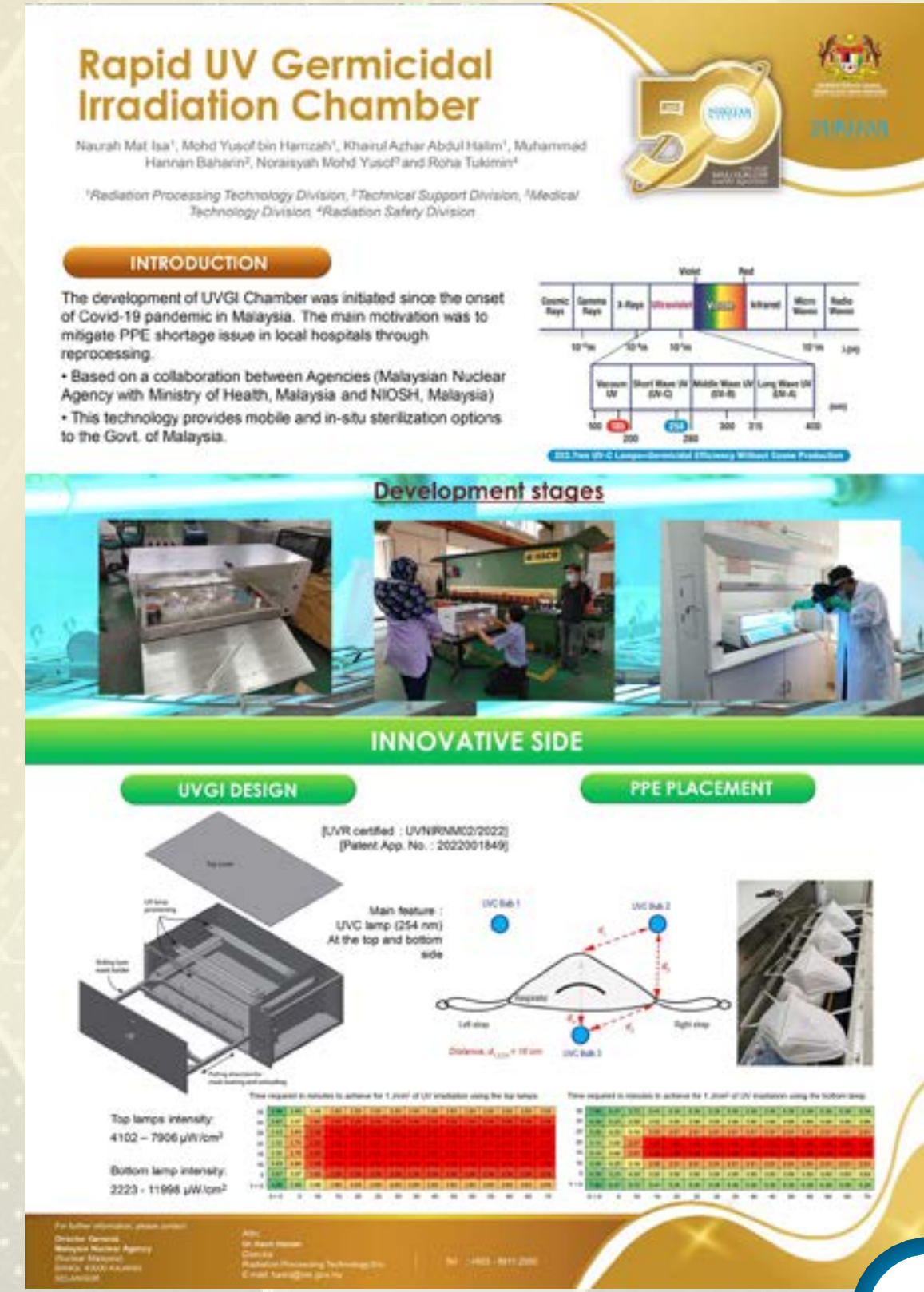
REPORT

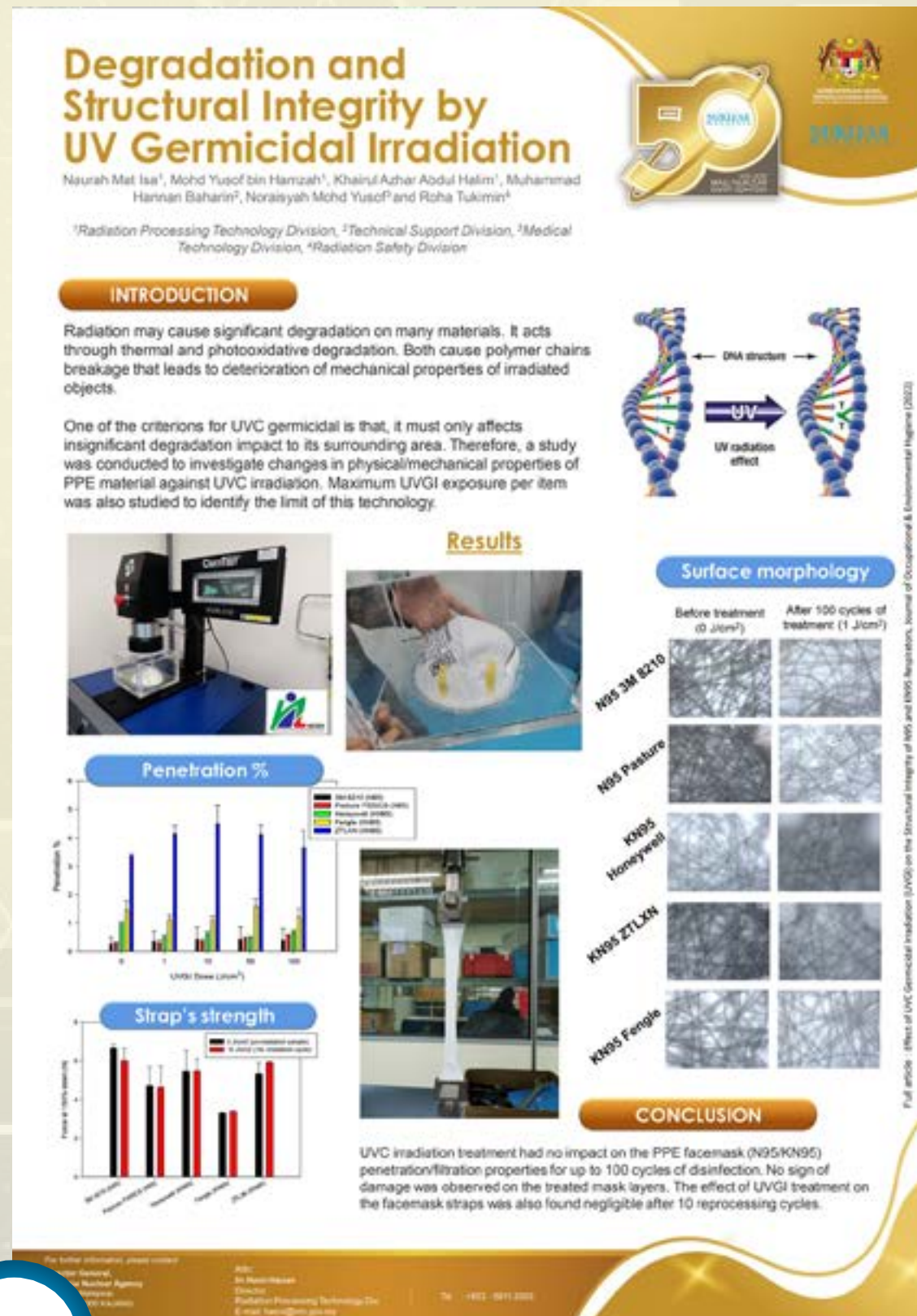
DATA COLLECTION

Comparison GPR signal

GPR RoadScan Production Line 3

Layer	Depth (m)	Remarks
Asphalt	0.05	Asphalt layer
Road base	0.5	Road base layer
Subbase	1.5	Subbase layer
Subgrade	10.5	Subgrade layer





Pameran XV11 Geosea
17-21 Oktober 2022

XVII GEOSEA 2022
ADVANCE GEOSCIENCE ADVANCE ASEAN

CTBTO
PREPARATORY COMMISSION

Regulatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organisation

MAINSTREAMING CTBT FOR MALAYSIAN SCIENTIFIC COMMUNITY

Bashirah Baharuddin, Faizal Azrie Abdul Basid, Faridah Mohamed Idris, Faisal Izzan, Zulfakar Zulkarny
Malaysian Nuclear Agency, Kajang, Selangor, Malaysia
bshirah@nuclearen.gov.my; faizal_ah@nuclearen.gov.my; faridah@nuclearen.gov.my; faisal_izzan@nuclearen.gov.my; zulfakar@nuclearen.gov.my

Radiocesium Data
(from raw data to analysed data)
- Particulate Data

Seismic Data
(from raw data to analysed data)

Infrasound Data
(from raw data to analysed data)

Hydrospheric Data
(from raw data to analysed data)

POTENTIAL STAKEHOLDERS

CTBT NATIONAL DATA CENTRE MY-NDC

VERIFICATION

Disaster Mitigation and Plan

Civil & Scientific Application (CTBT INS DATA Spin-off)

Civil Applications

Scientific Applications

CLIMATE NUCLEAR TON

Tsunami warning

Radiation released

Radiation hazards caused by volcanic eruptions

Microtremors

For further information please contact:
Bashirah Baharuddin
Research Scientist, Agency
for Nuclear Saftey
Malaysia
Email: bshirah@nuclearen.gov.my
011-2222-4444

Dr. Faridah Mohamed Idris
CTBTO Technical Team of Experts
Research and International Liaison Officer
E-mail: faridah@nuclearen.gov.my
011-2222-4444

Tel: +603-8931 4221
Fax: +603-8931 1221

XVII GEOSEA 2022
ADVANCE GEOSCIENCE ADVANCE ASIA

CTBTO
Comprehensive Nuclear Test Ban Treaty Organization

50th ANNIVERSARY
1945-2022

MALAYSIA'S IMPLEMENTATION FRAMEWORK FOR THE COMPREHENSIVE NUCLEAR-TEST-BAN TREATY (CTBT)

Sashilih Baharudin, Faisal Azrin Abdul Razali, Faridah Mohamad Idris, Faisal Izwan, Zulfakar Zukhalif
Malaysian Nuclear Agency, Kajang, Selangor, Malaysia
info@nuclear.malaysia.gov.my, fahad.azrin@nuclear.malaysia.gov.my, faridah.izwan@nuclear.malaysia.gov.my

INTRODUCTION

- CTBT is a multilateral treaty that bans all nuclear explosions in all environments
- Adopted by the United Nations General Assembly, and was opened for signature in New York on 24 September 1996
- As of September 2018, 107 states have ratified the CTBT and another 17 states have signed but not ratified it
- Malaysia signed the CTBT on 23 July 1998 and ratified the Treaty on 17 January 2008
- Following a cabinet decision, Malaysian Nuclear Agency (Nuklear Malaysia) was designated as the National Authority for the implementation of CTBT in Malaysia
- Under CTBT, Malaysia is hosting a radionuclide monitoring station (RN42) located at Tanah Rata, Pahang and operating a CTBT National Data Centre (MY-NDC) located at Malaysian Nuclear Agency, Bangi, Selangor
- The implementation of CTBT in Malaysia covers two main aspects:
 - 1) Policy and Strategic aspect
 - 2) Technological aspect

KEY ACTIVITIES

1) Policy and Strategic Aspect

- Formulation of CTBT Act
- Policy and strategic study and evaluate to ensure the implementation of Malaysia's obligations under the CTBT
- Provide authoritative and reliable information on nuclear test-ban matters (policy and technology) to government of Malaysia for country's position in regard to the nuclear non-proliferation and elimination of nuclear weapons.
- CTBT Awareness Programme among policy decision maker and other relevant stakeholders
- Capacity Building and Training Programmes
- Coordination of CTBT-related activities including R&D within four main IRS technologies namely seismic, hydroacoustic, radionuclide and infrasound
- Administrative tasks including renewal of relevant contract, license, preparation of annual Operational and Maintenance budget, management of annual financial contribution to the CTBTO, etc.

2) Technological aspect

- Operation and maintenance of RN42
- Operation and maintenance of MY-NDC
- R&D activities using CTBT data in particular on environment study

SUMMARY

- CTBT is part of international efforts aiming at banning nuclear explosion towards enhanced global peace and security
- Malaysia participation in CTBT underline strong national commitment to regional and international peace and security
- As the CTBT National Authority, Nuklear Malaysia continues collaborating with relevant stakeholders to fulfil Malaysia's obligations to CTBT

SEPTEMBER 2017 NORTH KOREA ANNOUNCED NUCLEAR TEST

SEPTEMBER 2018 NORTH KOREA ANNOUNCED NUCLEAR TEST

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For further information please contact:
Director General
Malaysian Nuclear Agency
Kajang, Selangor
03-8932 4320/43204
info@nuclear.gov.my

or
Dr. Faridah Mohamad Idris
CTBTO Principle Point of Contact
faridah.izwan@nuclear.malaysia.gov.my
E-mail: faridah@nuclear.gov.my

Tel: +603-8911 5221
Fax: +603-8911 5221



XVII GEOSEA 2022 ADVANCE GEOSCIENCE ADVANCE ASIAN
CTBTO preparatory commission for the Comprehensive Nuclear Test Ban Treaty Organisation

THE CONTRIBUTION OF CTBT DATA TO THE CLIMATE CHANGE STUDY AND EARTH SCIENCES

Basharuddin, B. H., H., M.P.T., Mohd Samad, M.S.T., M.S. Marwan, H., Mohd Fauzi, M. of Jahan, A.S.T., Hanun, N.
Baharuddin, B. H., H., M.P.T., Mohd Samad, M.S.T., M.S. Marwan, H., Mohd Fauzi, M. of Jahan, A.S.T., Hanun, N.
Baharuddin, B. H., H., M.P.T., Mohd Samad, M.S.T., M.S. Marwan, H., Mohd Fauzi, M. of Jahan, A.S.T., Hanun, N.
Baharuddin, B. H., H., M.P.T., Mohd Samad, M.S.T., M.S. Marwan, H., Mohd Fauzi, M. of Jahan, A.S.T., Hanun, N.

*Corresponding author email address : Bashiloh Boharuddin dan Mohd Fauzi Hanun
shahid@nuclear.mya.gov.my, faizal@nuclear.mya.gov.my

INTRODUCTION

CTBT stands for The Comprehensive Nuclear-Test-Ban Treaty (CTBT), which is a Treaty banning all nuclear explosions - everywhere, by everyone. Under the treaty, The International Monitoring System (IMS) facilities were developed to monitor and detect nuclear explosion that use four different technologies to look for signs of nuclear to detect acoustic signals in the oceans, [3] Infrasound [4] Radionuclide to detect radionuclide particles and a noble gas. Recently, Be-7 and Be-10 have proved to be powerful tools for studying dynamic processes that occur on the surface of the earth. One of the study is using Beryllium 7 [Be-7] for monsoon prediction.

OBJECTIVE

1. To understand and explore contribution of cosmogenic radionuclide study such Be-7 and anthropogenic radionuclide Cs-137 to the climate change study.
2. To explore radionuclide study use for geospatial conservation & preservation especially that prone to erosion and sedimentation process.

METHODOLOGY

1. Be-7 data for year 2018 was retrieved from the CTBTO radionuclide station located at Cameron Highlands [Malaysia] Bangkok [Thailand] Tanay [Philippines] and Chagos Archipelago [British Indian Ocean Territory].
2. Using RStudio the Be-7 data treated for outliers, to take out abnormal values in a random sample from the data population.
3. Later these data analyzed using to study the pattern of Be-7 concentration against meteorology data such as precipitation and wind direction. The mapping and the autocorrelation analysis were conducted with ArcGIS software 9 [version 10.2 ESRI Inc. Redlands].
4. This study focusing the Langkawi region, the data was analysed by seasonal, which later compare with meteorology data (rain and wind).

DISCUSSION

Climate change indirectly leads to erosion - challenges in preserving and conserving nature features and geo-heritage e.g. the Cliffs of Fundy UNESCO Global Geopark's lost a significant portion of its area due to coastal erosion. Factors related to climate change, such as more frequent and intense rainstorms, can exacerbate erosion. Later, this study will be extended by using anthropogenic radionuclide, Cs-137 to assess erosion rate of the area. Previous studies show that the higher Be-7 concentration, the lower the precipitation of that particular area/region.

CONCLUSION

1. The concentration of Be-7 is influenced by a wind that brings Be-7 from another place. In this study, the wind blowing from the Indian Ocean and Pacific Ocean are believed to have brought additional Be-7 to the Langkawi.
2. Further study is needed to see how temperature and equator play roles in the Be-7 movements/transportation...
3. Integration of Be-7 concentration and GIS helps to upscale the study and to give clear view of the Be-7 movements against wind directions.

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Presenter:
Bashiloh Boharuddin, PhD

Project Members:
[1] Zulfakar Zakatoffy, [2] Falaed Izwan, [3] Falaed Izwan, [4] Falaed Izwan, [5] Falaed Izwan, [6] Falaed Izwan, [7] Falaed Izwan, [8] Falaed Izwan, [9] Falaed Izwan, [10] Falaed Izwan

By further information please contact:
Executive Director,
Malaysian Nuclear Agency,
Jalan Mawar,
43000 Kajang,
Selangor,
Malaysia

Mr. Faizal Boharuddin 0919
CTBTO Malaysia Point of Contact
Planning and International Standards Division
E-mail: shahid@nuclear.mya.gov.my

Tel : +603-8911 1221
Fax : +603-8911 1221

DOSE MAPPING USING THERMOLUMINESCENCE DOSIMETER (TLD) AND GEOGRAPHICAL INFORMATION SYSTEM (GIS) TOOL FOR LONG TERM STORAGE FACILITY (LTSF), BUKIT KLEDANG, PERAK, MALAYSIA

Nur Khairunnisa Zahid¹, Faizal Azim Abdul Razzaq², Yi Mei Wei³, Nazran Harun³, Raymond Yap Tai Loong³, Noor Elzati Shuib³, Ahmad Ezzalie Abdul Kadir³, Hsuan Shien³, Mohd Taufik Dohah³, Rafiq Salehude³, Nurul Hani Farhana Mohamad Haider³, Ahmad Hasmudhi Che Kamaruddin³, Azhar Ropi³, Abdul Rahman Khalid³, Muhammad Anwar Md Noor³, Nur An-Nad Razzaq³

¹Radiation Safety and Health Division, Malaysian Nuclear Agency, Bangi, 43000 Kajang, Selangor, Malaysia

²Waste Technology and Environmental Division, Malaysian Nuclear Agency, Bangi, 43000 Kajang, Selangor, Malaysia

³Meritex Besar Incorporated, Perbadanan Meritex Besar Perak, 30020, Ipoh Perak, Malaysia



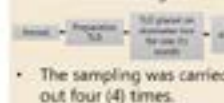
INTRODUCTION

Nuclear radiation can be found anywhere and human has always been exposed internally (inhalation, ingestion, skin absorption, open wound) and externally (irradiation from gamma, x-rays) to radiation from natural background and man-made. Environmental surveillance is an important component of the verification system for demonstrating that the controls on the releases of radioactive substances to the environment are functioning as intended under normal working conditions [1]. The repository facility is upgraded from LTSF upon completion of decontamination and decommissioning (D&D) process [2]. The surrounding community believes that the study area is hazardous and provides additional external radiation. **The main objective of this paper is to establish the dose mapping for LTSF, Bukit Kledang for better understanding of dose distribution in mentioned area.**

MATERIALS AND METHOD

The environmental surveillance can be done by numerous methodologies and one of the methodologies discussed in this paper is by creating a dose mapping using passive measurement, TLD and GIS tools at LTSF, Bukit Kledang Perak.

- 50 points were identified at on-site LTSF
- 3 points off-site LTSF and act as a control for this study
- Dosimeter box were placed at 1-metre-high at specified location
- Each TLD undergo



- The sampling was carried out four (4) times.



Figure 1.0 Sampling location at LTSF Bukit Kledang, Perak.

RESULTS AND DISCUSSION

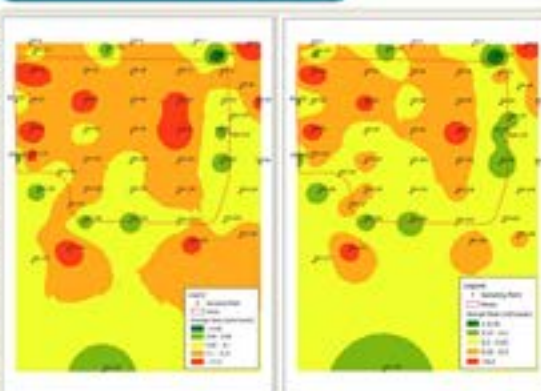


Figure 2.0 Visualise dose mapping (mSv/month and mSv/year) at LTSF Bukit Kledang, Perak using GIS tools.

The average dose per month	Max Annual Dose
Min : 0.04	0.38 mSv
Max : 0.16	Average Annual Dose
	0.24 ± 0.06 mSv

CONCLUSION

The maximum annual dose and the average annual dose is 0.38 and 0.24 ± 0.06 mSv, respectively. **The value shown is below the dose limit for public member, 1 mSv/year as stipulated by AELB [3].**

REFERENCES

- [1] IAEA 1982. Nuclear Power, The Environment and Man. Vienna International Atomic Energy Agency.
- [2] AELB 2016. Tajuk Repository Jangka Panjang di Malaysia. Bangi: Lembaga Perlindungan Tenaga Atom Malaysia.
- [3] AELB 2018. Basic Safety Radiation Protection Regulations. Atomic Energy Licensing Act 1984.

No further correspondence, please contact:
Nur Khairunnisa Zahid
Meritex Besar Incorporated
Waste Technology and Environmental Division
Meritex Besar Incorporated
Bangi, 43000 Kajang, Selangor, Malaysia
E-mail: khairunnisa@meritexb.com

Tel : +603-8911 1221
Fax : +603-8911 2754

ENVIRONMENTAL TRACER APPLICATION GROUP (e-TAG)

By: Mohamed Syahiran Mustafa, Rahman Yacup, Lskam Mejus, Roslennairi Mostapa, Jeremy Andy Dominic Daung, Hainul Nizam Idris, Nor Dalila Desa, Mohd Muzamil Mohd Hashim, Nurul Fainuz Diyana Bahrudin, Engku Mohd Fahmi Engku Chik, Rozilawati Mohd Japar



Contribution to Hydrology, Environmental and Natural Resources Studies

The main role of this group is to conduct quality research & development (R&D) in the field of water resources and environmental management using nuclear technology and other related technologies. e-TAG has been actively providing research services to external agencies and departments, whether these under the government or the private sector. Research services provided include in the field of subsurface mapping and groundwater potential study using geophysical technique, hydrological measurement and environmental tracing techniques focused on "related problem-solving". Nuclear or isotopic techniques can provide answers to questions about origin, age and distribution of groundwater, pollution source and pathway as well as the interconnections between ground and surface water and aquifer recharge systems.

OUR SERVICES

- ✓ Direct CO₂ Absorption for ¹⁴C Concentration Measurement
- ✓ New Tritium Enrichment System (NTES)
- ✓ Isotope Ratio Mass Spectrometer (IRMS)
- ✓ Liquid Scintillation Counter (LSC)
- ✓ Liquid Water Isotope Analyzer (LWIA)
- ✓ Electrical Resistivity Imaging System (ERI)
- ✓ Colloidal Borescope System (CBS)
- ✓ Wavelength Dispersive X-ray Fluorescence (WD-XRF)
- ✓ Radon Measurement in Water and Air (RAD7)

No further correspondence, please contact:
Mohamed Syahiran Mustafa
Waste Technology and Environmental Division
Meritex Besar Incorporated
Bangi, 43000 Kajang, Selangor, Malaysia
E-mail: syahiran@meritexb.com

Tel : +603-8911 1221
Fax : +603-8911 2754

PROGRAM PEMANTAUAN RADIOLOGI ALAM SEKITAR

Oleh : Kumpulan Fizik Kesihatan (KFK)
Bahagian Keselamatan dan Kesihatan Sinaran

PENGENALAN

Kumpulan Fizik Kesihatan (KFK) bertanggungjawab dalam menjalankan program pemantauan radiologi alam sekitar untuk khidmat luar di seluruh Malaysia. KFK juga menjalankan pemantauan radiologi alam sekitar meliputi sebelum dan semasa operasi Reaktor TRIGA PUSPATI Agensi Nuklear Malaysia. Program pemantauan radiologi alam sekitar dilaksanakan bertujuan untuk mengesan sebarang perubahan aras sinaran dan keradioaktifan alam sekitar yang mungkin terhasil daripada aktiviti yang dijalankan dan boleh menyebabkan dos sinaran tambahan kepada orang awam di kawasan sekitarnya. Parameter pemantauan seperti jenis sampel, jenis radionuklid yang dianalisis dan kekerapan pemantauan adalah berdasarkan kepada syarat lesen yang ditetapkan oleh Lembaga Perlesenan Tenaga Atom (AELB). Antara pemantauan yang dijalankan adalah pemantauan tahap radioaktiviti pada sampel alam sekitar (sampel tanah, flora, sedimen, air sungai, air bawah tanah, air paip, debu udara), pemantauan aras sinaran luar (secara aktif atau pasif) dan pemantauan radon toron progeni. Program pemantauan radiologi alam sekitar merangkumi kerja pensampelan, pra-rawatan sampel dan pengukuran menggunakan alat pembilang.

RINGKASAN METODOLOGI

Proses Pensampelan (Rutin)

Proses Pensampelan (Kecemasan)

Pro-Rawatan

Pengukuran

Jenis radionuklid dan tahap radioaktiviti dikenalpasti semasa pengukuran.

Antara senarai syarikat yang menerima khidmat pemantauan radiologi alam sekitar:

- Agensi Nuklear Malaysia
- MIB Inc.
- Venator Asia Sdn. Bhd.
- R-Sync Technical Resources Sdn. Bhd.
- Techno Indah Sdn. Bhd.
- Endeke Ceramics Sdn. Bhd.
- Zirrosil (M) Sdn. Bhd.
- Cockson Matthey Ceramics (M) Sdn. Bhd.
- Samsung Electronics Sdn. Bhd.
- Petronas Carigali Sdn. Bhd.
- Wijaya International Medical Centre Sdn. Bhd.
- Trimekani (Sarawak) Sdn. Bhd.

DATA TAHAP RADIOAKTIVITI

Carta Perbandingan Radioaktiviti Sampel Tanah

Carta Perbandingan Radioaktiviti Sampel Sedimen

Carta diatas merupakan salah satu carta perbandingan sampel alam sekitar di sekitar Agensi Nuklear Malaysia yang dibandingkan dengan pemantauan yang dijalankan pada 1965-1990. Program pemantauan radiologi alam sekitar telah dilaksanakan semenjak reaktor TRIGA PUSPATI mula beroperasi pada tahun 1982.

MUDSKIPPER

Innovative On-site Radiometric Mapping System for Natural Radioactive Sediment Transport and Efficient Coastal Erosion Monitoring

INTRODUCTION

- There are a lot of low activity natural radionuclides such as (U-238, Th-232 & K-40) in some beaches where erosion or accretion are evident and known.
- There are possibilities to make use of online mapping of natural gamma radionuclides to investigate the density distribution along the shoreline.
- Current mapping method by using sampling and counting technique is very complicated and time consuming process.
- However, if sampling and online radiometric mapping techniques performed together, the discovered data is very useful and can be used for validation to the conventional method.

ADVANTAGES

- Non-destructive and on-line measurement.
- High possible repetitive measurement.
- Produce very fast result (2-3 kilometers per day).
- Robust and reliable design.

INNOVATION

- New dedicated online radiometric mapping system has been developed creatively for sediment dynamics evaluation in coastal areas.
- This home-made heavy duty detection system consists of waterproof Thallium doped Sodium Iodide NaI(Tl) 2" x 2" size detector and battery operated electronic scaler ratemeter as data acquisition system was installed in a robust four-wheel trolley.
- The system will be supported by metric measuring wheel & Geographic Information System (GIS) mapping device that tracks both GPS and GLONASS satellites for collecting highly accurate positioning information data.

Best TOOL FOR IN-SHORE RADIOLOGICAL MAPPING

HIGH REABILITY

Best TOOL FOR IN-SHORE RADIOLOGICAL MAPPING

HIGH REABILITY

Innovative On-the-Roadside Mapping System for Radioactive Sediment Transport Monitoring and Efficient Coastal Defense Monitoring

MUDSKIPPER Scan

RESEARCH OBJECTIVE

In recent years, many countries face some issues with erosion in the coastal areas. Current technology used for shoreline coastal erosion management now use airborne, satellite and un-manned aerial vehicle (UAV) drone. However, these methods have an accuracy issue because of a limited supporting data by on-land remote sensing equipment for validation. Latest nuclear technology focus on mapping the sediment movement by collecting natural gamma radioisotope sample and costing long time for spectrometry counting in the laboratory. The first in Malaysia, MUDSkipper Scan system will be used to collect total count data along 2-3 kilometres shoreline during low tides within 2-3 hours only! The MUDSkipper Scan system will be move along the beach, doing several profiles from the seawater line, till the dunes with 3-4 parallel profiles. The MUDSkipper name was chosen to replicate the movement of mudskipper fish because the system will collect data at every 10 meters position on the coastal area.



BENEFIT & IMPACT

Coastal erosion may lead to a variety of negative economic impacts. These can range from lost or damaged property or land to negative effects on tourism, shipping, trade, fishing, and other industries. For ecosystems, erosion translates into habitat loss as coastal wetlands deteriorate. The plants and wildlife that depend on these ecosystems are negatively impacted by the effects of erosion. Thus, early initiative to monitor the coastal erosion is crucial to prevent this environments impact.

MAPPING DATA



For further information, please contact:
 Director General,
 Malaysian Nuclear Agency
 Nuclear Science Division
 61000 SEREMBAN
 Negeri Sembilan

Mr. Dr. Mohd. Jazlan Razali
 Technical Monitoring Division
 61000 SEREMBAN
 Negeri Sembilan

Mr. Dr. Mohd. Jazlan Razali
 Technical Monitoring Division
 61000 SEREMBAN
 Negeri Sembilan

RADIOCHEMISTRY AND ENVIRONMENT LABORATORY

By: Nooradilah Abdullah, Noor Fadriah Yusof, Mohd Zuhair Mohd Sarusi, Dainee Nor Fadriah Ahmad Tugli, Chrisius Anthonius, Mohd Tarmizi Ishak

INTRODUCTION

Radiochemistry and Environment Laboratory (RAS) provides radioanalytical services for government and commercial needs. Radiochemical analysis are performed for alpha, beta and gamma emitting radionuclides in various matrices such as soil, sediment, sludge, water, food, smear test, fauna and flora. RAS is the only national laboratory approved by Malaysian Ministry of Health (MOH) to conduct radioactivity contamination tests on the imported food following a nuclear emergency such as the Chernobyl nuclear accident in April 1986 and the Fukushima Daichi nuclear accident in March 2011. RAS also provides gross alpha/gross beta radioactivity analysis in mineral water and bottled drinking water as part of the MOH's licensing requirement before the products are sold for public consumption. RAS Laboratory has been accredited with MS ISO/IEC 17025:2005 since December 2005 by Department of Standards Malaysia for gamma emitting radionuclides.

OUR SERVICES

Gamma Spectrometry System

Gamma spectrometry system is used to measure the activity of gamma-emitted radionuclides, based on the energy and intensity of the gamma radiations emitted from that radionuclides in a sample. Services offered:

- Measurement of Cs-134 and Cs-137 in food.
- Measurement of Ra-226, Ra-228 (or Ac-228), K-40 in environmental samples. (sediment, soil, water, flora, fauna, etc.)
- Measurement of Am-241 in smoke detectors.

Gross Alpha/Gross Beta Counting System

This system comprises of gas flow proportional detector filled with a mixture of methane and argon gases and is used to measure the total activities of alpha/beta sources in samples such as drinking water, mineral water soil and smear test. Services offered:

- Measurement of gross alpha/gross beta in mineral and drinking water.
- Measurement of gross alpha/gross beta in air borne/particulate, filter and smear test.
- Measurement of gross alpha/gross beta in environmental samples.
- Analysis of efficiency for water filter system.
- Measurement of Sr-90 in environmental and food samples.

Alpha Spectrometry System

Similar to gamma spectrometry system, alpha spectrometry system is used to analyze alpha emitters radionuclides based on its energy and intensity. Services offered:

- Measurement of Po-210 in environmental samples.
- Measurement of U-234, U-235 and U-238 in environmental samples.
- Measurement of Th-228, Th-230 and Th-232 in environmental samples.
- Measurement of Pu-239+240 in environmental samples.
- Measurement of Am-241 in environmental samples.

Liquid Scintillation Counter

This instrument is used to measure the activity of low energy beta emitters such as H-3 in water ice and urine samples and C-14 in environmental samples. Services offered:

- Measurement of H-3 in urine, water, ice and environmental samples
- Measurement of C-14 environmental samples

For further information, please contact:
 Director General,
 Malaysian Nuclear Agency
 Nuclear Science Division
 61000 SEREMBAN
 Negeri Sembilan

Mr. Dr. Mohd. Jazlan Razali
 Technical Monitoring Division
 61000 SEREMBAN
 Negeri Sembilan

Mr. Dr. Mohd. Jazlan Razali
 Technical Monitoring Division
 61000 SEREMBAN
 Negeri Sembilan

RADIONUCLIDE MONITORING STATION CTBT (RN42) MALAYSIAN NUCLEAR AGENCY

Rafael Azrin Abdul Razali
Malaysian Nuclear Agency, Kajang, Selangor, Malaysia
Rafael_Azrin@mna.gov.my

RADIONUCLIDE MONITORING STATION CTBT (RN42), TANAH RATA, CAMERON HIGHLANDS, PAHANG

NUCLEAR TEST SITUATION

ATMOSPHERIC TESTS	UNDERWATER TESTS	UNDERGROUND TESTS
Seismic/ Hydroacoustic Coupling Radionuclide Release	Seismic/ Infrasonic Coupling Radionuclide Release	Seismic/ Infrasonic Coupling Radionuclide Release

MONITORING STATIONS

Four (4) monitoring stations CTBT:

1. Radionuclide and Noble Gas Monitoring Stations
2. Seismic Monitoring Stations
3. Infrasonic Monitoring Stations
4. Hydro-acoustic Monitoring Stations

One (1) laboratory station CTBT:

1. Laboratory radionuclide stations

DAILY OPERATION (RN42 STATION)

RADIONUCLIDE MONITORING STATION DAILY OPERATION

1. AIR INTAKE (24 hour)
2. AIR SAMPLER (24 hour)
3. DETECTOR (24 hour)
4. DATA TRANSFER (24 hour)

1. Take out previous filter paper frame (Snow White Air Sampler)
2. Replace with new filter paper (Snow White Air Sampler)
3. Take out filter paper from frame
4. Fold in filter paper
5. Fill folded filter paper into compressed pot
6. Compress filter paper
7. Print barcode
8. Take out compressed filter paper
9. Compress filter paper with barcode
10. Open Delay Chamber Drawer
11. Fill Compressed filter paper in delay chamber
12. Gamma Detector (gamma sample)

DATA TRANSFER PROCESS

Station → National Data Center (NDC) → International Data Center (IDC) → Comprehensive Nuclear-Test Ban Treaty Organization (CTBT)

For further information please contact:
 Director General,
 Malaysian Nuclear Agency,
 Kajang, Selangor,
 43400 KAJANG,
 MALAYSIA
 Email: rafael_azrin@mna.gov.my
 Tel: +603-8911 1221
 Fax: +603-8911 1221

Pameran ESTCON

1-2 Disember 2022

NUKLEAR MALAYSIA

Produk Penyelidikan NUKLEAR MALAYSIA

Untuk keterangan lanjut, sila hubungi:
Kerusi Pengarah
Agensi Nuklear Malaysia, Bangi,
43000 Kajang, Selangor

Uj: Pengarah
Bahagian Pengkembangan Teknologi

Tel: 03-8911 2000
Fax: 03-8925 2588

Shukri_mohd@nuclearmalaysia.gov.my
www.nuclearmalaysia.gov.my

MALAYSIAN NUCLEAR AGENCY PLASMA FOCUS (MNA-PF)

Plasma Focus Group
Accelerator Development Center
Technical Support Division
Malaysian Nuclear Agency

Abstract

A small Plasma Focus Device is developed at Malaysian Nuclear Agency with simplicity in design, reliability and cost effective to act as a source of pulsed high-density plasma. The device is based on UNU/ICTP PFF design from Mather type. The goal of this project is to make a device as a neutron generator capable of producing 10^4 neutrons of 2.4MeV energy per shot. The dynamics of the device, the specifications and some results from the device are shown.

Introduction

Plasma Focus (PF) is a new promising technology in plasma as well as in accelerator physics. Dense Plasma Focus (DPF) is a machine that produces a hot, dense and short-lived plasma and also sources of intense high-energy photons and x-ray, electron and ion.

There are two types of DPF, Mather and Filippov types. Both were developed in 1960s independently by Joseph Mather and Nikolai V. Filippov respectively. As technology advances DPF is being refined and developed for various applications, including next generation microelectronics lithography (using soft x-rays or extreme UV radiation), micro machining, materials modification, medical and security inspection applications using pulsed x-ray or neutron.

This device produces a pulsed neutron source rather than continuous supply of neutron from a nuclear reactor and it can be used for NAA and neutron radiography. Further research will be developed a repetitive shots of neutron source for better applications and it is also potential for nuclear fusion study.

Plasma Focus System

Generally, the plasma focus device consists of the following subsystems:

- 1- A high voltage charger 20kV, 50mA
- 2- A single capacitor bank 15kV, 30uF
- 3- A high current switch (Spark gap switch) and a triggering electronics (SCR circuit, manual trigger and high voltage transformer)
- 4- A vacuum system (consists of a rotary vacuum pump, vacuum gauge, valve and gas inlet control)
- 5- A focus tube with a vacuum chamber
- 6- Diagnostics (Rogowski coil, high voltage probe, magnetic probe and ion beam detector)
- 7- Data acquisition and computer analysis system (Oscilloscope and computer)

Conclusion

A simple cost effective 3.3 kJ plasma focus device can be developed. The uses of different gas filler will produced a different type of radiation, Argon gas will produced x-ray whereas a deuterium gas will produced neutron.

The Schematic of the UNU/ICTP PFF Plasma Focus Tube

The Specifications of the Plasma Focus Device

Geometry Parameters	Electrical Parameters
Inner electrode radius $r_i = 0.05$ cm	Internal inductance $L_i = 0.001$ mH
Outer electrode radius $r_o = 0.15$ cm	Capacitance $C = 30$ uF
Electrode length $L = 1.0$ cm	Voltage at collapse $V_c = 20$ kV
Outer electrode length $L_o = 0.1$ cm	Maximum current $I_m = 1.0$ MA
Outer electrode length $L_o = 0.1$ cm	

Plasma Focus as built in Malaysian Nuclear Agency

(1) Inner rod (rve) and outer rod (o) shown inside the plasma chamber
(2) Plasma focus chamber with dial gauge.

Typical Signals of Plasma Focus



PUSPATI TRIGA REACTOR

TRIGA

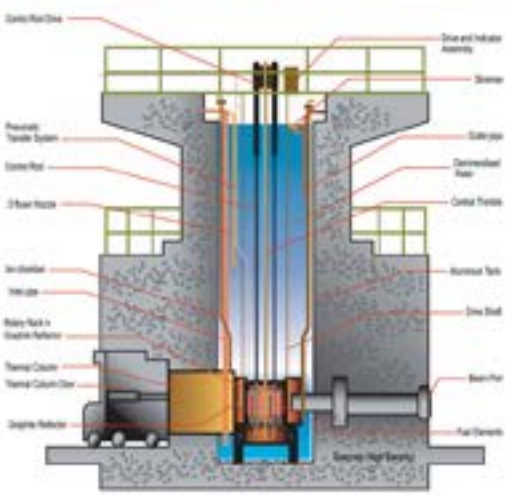
Training

Research

Isotope Production

General

Atomic

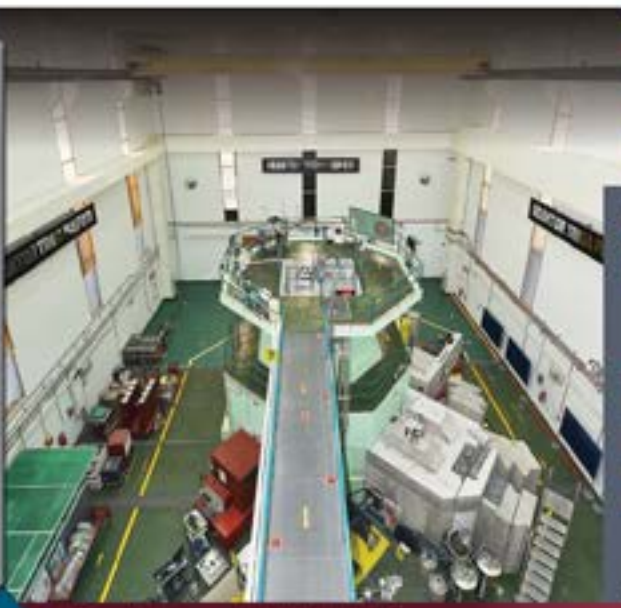


Vertical Cross Section of RTP



IRRADIATIONS FACILITIES

- Dry tube
- Central thimble
- Thermal Column
- Rotary Rack (RR)
- Neutron Radiography (NuR)
- Pneumatic Transfer System (PTS)
- Small Angle Neutron Scattering (SANS)
- Delayed Neutron Activation (DNA)



APPLICATIONS OF RTP

NUCLEAR RESEARCH AND DEVELOPMENT

- Science Studies (i.e. Environmental, Material, Geological, Archeology)
- Structural Studies (metal, ceramics, polymers and biology)
- Nuclear Materials
- Non Destructive Testing (NDT)

RADIOISOTOPE PRODUCTION

- Medical Diagnostic Studies
- Medical Therapeutic Studies
- Industrial and Agriculture Application

EDUCATION AND TRAINING

- Reactor Physics and Engineering
- Nuclear and Radiation Safety
- Nuclear Instrumentation
- Reactor Operation and Maintenance

For further information, please contact:

Director General,
Malaysian Nuclear Agency
(Nuclear Malaysia),
Bangi, 43000 Kajang
SELANGOR

Attn: Dr. Julia Abdul Karim
Reactor Technology Centre
Technical Support Division
Web: www.nuclearmalaysia.gov.my

Tel: +603 - 8911 2304
Fax: +603 - 8928 6715

Projek RISE 2022

Disember 2022

KERJASAMA PENYELIDIKAN DAN PEMBANGUNAN TEKNOLOGI PENGUJIAN DALAM TALIAN ADVANCED BORNEO ENGINEERING SDN. BHD.

NAMA SYARIKAT:
**ADVANCED BORNEO
ENGINEERING SDN. BHD.**

LATAR BELAKANG PROJEK
Syarikat Advanced Borneo Engineering Sdn. Bhd. dan Kumpulan Teknologi NDT Termaju (LENDT), Bahagian Teknologi Industri, Agensi Nuklear Malaysia telah bekerjasama untuk membangunkan satu sistem In-line Inspection - Ultrasonic Testing (ILI-UT). Sistem ini digunakan untuk melakukan pengujian ke atas jalur paip secara tanpa musnah. ILI-UT dimasukkan ke dalam sistem perpaipan saluran produk gas dan minyak dan akan mengikut aliran produk sambil mengukur dan merekodkan ketebalan dinding paip. Kelebihan ini adalah operasi jalur paip tersebut tidak terganggu. Data ketebalan jalur paip yang terkumpul dianalisa dan sebarang anomali dilaporkan untuk pembaikan. Penggunaan sistem ini dapat menjimatkan kos operasi fasiliti dengan signifikan di samping dapat memastikan integriti jalur paip adalah optimum.



PASUKAN PROJEK:
Agensi Nuklear Malaysia:
Amry Amin Abbas, Dr Rasiff Mohd Zain

**Advanced Borneo
Engineering Sdn. Bhd:**
Imran Razak, Fadilah Syahputra

OBJEKTIF PROJEK

- Membangunkan sebuah sistem pengujian in-line jenis ultrasonik (ILI-UT) untuk pengujian paip atau jalur paip.
- Mengesahkan sistem ILI-UT yang telah dibangunkan untuk aplikasi lapangan.
- Menganalisa dan menilai prestasi sistem ILI-UT yang dibangunkan.

PENCAPAIAN PROJEK

Pembangunan satu sistem ILI -UT yang digunakan untuk pengujian jalur paip logam secara in-line.



ILI-UT yang diletakkan di dalam paip ketika pengujian



Roda pengatur yang digunakan pada ILI-UT



Latihan Pemindahan Teknologi berkenaan Pengujian Ultrasonik kepada pasukan penyelidik syarikat



Aturan ILI-UT dalam kotak gred industri

Untuk maklumat lanjut, Sila hubungi:

Kelisa Pengarah,
Agensi Nuklear Malaysia
(Nuklear Malaysia)
SANGI, 43000 KAJANG, SELANGOR

Ati:
Amry Amin Abbas
Industrial Technology Division
E-mail: amry@nrm.gov.my
Tel : +603 - 8911 2000
Fax : +603 - 8911 2154

IN-LINE INSPECTION TECHNOLOGY RESEARCH AND DEVELOPMENT COLLABORATION ADVANCED BORNEO ENGINEERING SDN. BHD.

COMPANY NAME:
**ADVANCED BORNEO
ENGINEERING SDN. BHD.**

PROJECT BACKGROUND
Advanced Borneo Engineering Sdn. Bhd. and Leading Edge NDT Technology Group (LENDT), Industrial Technology Division, Malaysian Nuclear Agency has collaborated to develop an in-line Inspection - Ultrasonic Testing (ILI-UT). This system is used to perform inspection on pipe lines non-destructively. ILI-UT is inserted into an oil and gas product pipeline and it travels along with the product flow whilst measuring and recording the pipe wall thickness. The advantage is the operation of the pipeline is not disrupted. The accumulated thickness data of the pipeline is analysed and anomalies are reported for repairs. Utilisation of such system enables significant savings of facilities operation cost while enabling the optimum integrity of the pipelines.



PROJECT TEAM:
Malaysian Nuclear Agency:
Amry Amin Abbas, Dr Rasiff Mohd Zain

**Advanced Borneo
Engineering Sdn. Bhd:**
Imran Razak, Fadilah Syahputra

PROJECT OBJECTIVE

- To develop an ultrasonic in-line inspection system (ILI-UT) for pipe or pipeline inspection.
- To validate the developed ILI-UT system for field application.
- To analyse and evaluate the performance of the developed ILI-UT system.

PROJECT ACHIEVEMENT

Development of an in-line ILI-UT system used for inspection of metallic pipeline.



ILI-UT system placed in a pipe during inspection



Guide wheels used on the ILI-UT



Technology transfer training regarding Ultrasonic Testing for research team of company



Arrangement of ILI-UT in the industrial transfer case

For further information, please contact:

Director General,
Malaysian Nuclear Agency
(Nuklear Malaysia)
SANGI, 43000 KAJANG, SELANGOR

Ati:
Amry Amin Abbas
Industrial Technology Division
E-mail: amry@nrm.gov.my
Tel : +603 - 8911 2000
Fax : +603 - 8911 2154

PEMBANGUNAN KAPASITI SYARIKAT BINA INTEGRATED INDUSTRIES SDN. BHD.(BINA PAINT) DI DALAM PEMBANGUNAN PRODUK BAHAN SALUTAN

NAMA SYARIKAT:
BINA INTEGRATED INDUSTRIES SDN. BHD.

LATARBELAKANG PROJEK
Objektif utama projek adalah membangunkan kapasiti kakitangan bagi melaksanakan hala tuju syarikat di dalam menjalankan aktiviti penyelidikan dan pembangunan produk. Khidmat nasihat diberikan kepada kakitangan syarikat berhubung dengan peralatan serta teknik-teknik pencirian termaju dan bersesuaian yang boleh digunakan bagi melaksanakan aktiviti penyelidikan dan pembangunan dan pengesahan kualiti produk yang dihasilkan.

Ke arah pencapaian matlamat projek, beberapa aktiviti termasuklah siri perbincangan, penyediaan bahan mentah, formulasi pencampuran dan pencirian bahan mentah serta salutan telah dijalankan di syarikat dan di Agensi Nuklear Malaysia mengikut tempoh masa yang telah ditetapkan.



PASUKAN PROJEK:
Agensi Nuklear Malaysia:
Dr. Hishamuddin Husain,
Dr. Cik Rohaida Che Hak, Nadira Kamarudin

Bina Integrated Industries Sdn. Bhd:
Mohammad Aslamille Mohd Suhil, Mohd Fahmi Abdul Hamid,
Mohd Rodzahn Mohd Salleh

OBJEKTIF PROJEK

- Membantu di dalam perancangan hala tuju syarikat melalui pelaksanaan aktiviti penyelidikan dan pembangunan produk.
- Mengenalpasti dan memantapkan keperluan teknik-teknik pencirian dan peralatan bagi tujuan penyelidikan dan pembangunan produk syarikat.
- Memberikan khidmat nasihat dan memperkenalkan kepada kakitangan syarikat berhubung teknik-teknik pencirian termaju dan yang bersesuaian dengan industri.

PENCAPAIAN PROJEK

- Syarikat lebih jelas dan mula mengadaptasi aktiviti penyelidikan dan pembangunan terkini terhadap pembangunan serta kawalan kualiti terhadap produk yang akan dihasilkan.
- Kakitangan syarikat telah mendapat pendedahan terhadap teknik-teknik pencirian termaju bagi tujuan kawalan mutu bahan mentah serta penyelidikan dan pembangunan produk syarikat.
- Penghasilan satu formulasi dengan proses pencampuran yang boleh digunakan sebagai pembuktian konsep ke arah penghasilan produk salutan berasaskan nano.

19 September 2022 | Seminar Tuan Dr. Hishamuddin Husain, Agensi Nuklear Malaysia







Untuk makluman lanjut,
Sila hubungi:
Kelua Pengarah,
Agensi Nuklear Malaysia
(Tukioor Malaysia)
(BANGI, 43000 KAJANG)
SELANGOR
Tel : +603 - 8911 1221
Fax : +603 - 8911 2154

CAPACITY BUILDING FOR BINA INTEGRATED INDUSTRIES SDN.BHD. (BINA PAINT) IN DEVELOPMENT OF COATING PRODUCTS

COMPANY NAME:
BINA INTEGRATED INDUSTRIES SDN. BHD.

PROJECT BACKGROUND
The main objective of the project is to develop the company's capacity to implement aims in carrying out product research and development activities. Consultations were delivered to company's personnel in relation to advanced characterization techniques and equipment that can be utilized to carry out research and development activities and product quality verification.

Towards achieving the project goals, a number of activities including series of discussions, preparation of raw materials, mixing of formulation and characterization of raw materials and coatings were carried out at Bina Paint and Malaysian Nuclear Agency according to time period given.



PROJECT TEAM:
Malaysian Nuclear Agency:
Dr. Hishamuddin Husain,
Dr. Cik Rohaida Che Hak, Nadira Kamarudin

Bina Integrated Industries Sdn. Bhd:
Mohammad Aslamille Mohd Suhil, Mohd Fahmi Abdul Hamid,
Mohd Rodzahn Mohd Salleh

PROJECT OBJECTIVE

- To assist the company's aim in implementing product research and development activities.
- To identify and establish the needs of equipment and advance characterization techniques for company's products research and development.
- To give consultation and introducing advance characterization techniques to the company's personnel.

PROJECT ACHIEVEMENT

- The company is aware and began to adapt the recent advancement in product research and development activities and quality control.
- Company's personnel is familiarized with advances characterization techniques for product research and development and quality control of raw material.
- A formulation through a mixing process have been develop and can be used as a proof-of-concept for nano based coating.

19 September 2022 | Seminar Tuan Dr. Hishamuddin Husain, Agensi Nuklear Malaysia







For further information,
please contact:
Director General,
Malaysian Nuclear Agency
(Tukioor Malaysia)
(BANGI, 43000 KAJANG)
SELANGOR
Tel : +603 - 8911 1221
Fax : +603 - 8911 2154

PEMBANGUNAN BENIH CENDAWAN BAKA BARU VOLVARIELLA VOLVACEA SECARA KOMERSIAL

NAMA SYARIKAT:
CT INA ENTERPRISE

LATAR BELAKANG PROJEK
Industri cendawan di Malaysia semakin berkembang pesat berdasarkan permintaan yang semakin tinggi setiap tahun. Cendawan Volvariella volvacea atau juga dikenali sebagai cendawan jerami padi atau cendawan sawit merupakan cendawan yang amat sesuai tumbuh di dalam iklim tropika khususnya di Malaysia. Cendawan ini mendapat jolokan cendawan butang asia suatu ketika dulu merupakan pesaing utama kepada cendawan butang yang dihasilkan di kawasan temperat. Volvariella popular di kalangan pengusaha cendawan kecil kerana ianya mudah dikendalikan dan mendapat permintaan yang tinggi dikalangan penduduk tempatan. Cendawan Volvariella ini boleh dijual secara segar atau terproses melalui pengeringan, perebusan atau pembekuan. Masalah utama di dalam industri penanaman cendawan Volvariella ialah keperluan benih yang tidak konsisten, berterusan dan mempunyai kualiti yang kurang baik. Keseluruhan benih cendawan ini dibawa masuk dari Thailand tanpa kawalan kualiti. Keadaan ini bukan sahaja mengancam industri cendawan yang lain tetapi juga boleh membawa masuk kepelbagai penyakit cendawan yang mampu untuk menjejaskan produksi cendawan lain khususnya. Sehubungan dengan itu pihak syarikat mengambil inisiatif untuk membangunkan pengeluaran benih baka baru melalui aplikasi nuklear melalui kerjasama dengan Agensi Nuklear Malaysia. Benih baka baru ini merupakan hasil biakbaka mutasi cendawan Volvariella terpilih melalui penggunaan sinaran gamma secara akut. Bagi memenuhi hasrat dan keperluan industri cendawan Volvariella, pihak syarikat mensasarkan kepada penggunaan, penghasilan dan penjualan benih cendawan secara berskala besar. Melalui aplikasi nuklear ini kepelbagaian atau variabiliti cendawan Volvariella dapat dihasilkan dan melalui pemilihan serta penyaringan secara khusus dapat menghasilkan strain baka baru yang berkualiti. Ini membolehkan pengusaha cendawan mempunyai pilihan strain mengikut keperluan semasa. Melalui program RISE ini ianya dapat membantu pihak syarikat mensasarkan matlamat dan memenuhi permintaan keperluan benih cendawan Volvariella di Malaysia. Projek RISE ini telah dirancang untuk tempoh 1 tahun bermula pada Disember 2019 hingga Disember 2020.





PASUKAN PROJEK:
Agensi Nuklear Malaysia:
Ts. Dr Azhar Mohamad
Dr. Seri Chempaka Mohd Yusof
Mohd Hafiz Abd Nasir

CT INA Enterprise:
Salina Md Tahir, Siti Rohani Md Tahir

OBJEKTIF PROJEK

- Mendapat khidmat nasihat dan teknologi penghasilan benih baka baru cendawan Volvariella melalui aplikasi sinaran gama.
- Menanam, mengguna dan membangunkan benih strain baka baru cendawan Volvariella yang berkualiti.
- Membekal serta menghasilkan benih cendawan Volvariella berkualiti secara konsisten melalui pembangunan dan penghasilan secara berskala besar untuk pengkomersialan

PENCAPAIAN PROJEK

Projek RISE ini telah membantu pihak sayrikat dalam membangunkan teknik penghasilan benih cendawan Volvariella secara komersial dan mampu untuk menjual produk segar cendawan Volvariella secara sejuk beku.



Untuk maklumat lanjut,
Sila hubungi:
Katua Penganah,
Agensi Nuklear Malaysia
(Nuclear Malaysia)
BANGI, 43000 KUALANG
SELANGOR

Attn:
Katua Projek
Bahagian Agroteknologi
& Biofarm
E-mail: azhar_m@nmm.gov.my
Tel : +603 - 8911 9000
Fax : +603 - 8911 2157




DEVELOPMENT OF NEW VOLVARIELLA VOLVACEA BREED FOR COMMERCIAL MUSHROOM SEEDLINGS

COMPANY NAME:
CT INA ENTERPRISE

PROJECT BACKGROUND
The mushroom industry in Malaysia is growing rapidly based on increasing demand every year. Volvariella volvacea mushroom or also known as rice straw mushroom or palm mushroom is a mushroom that is very suitable to grow in tropical climate especially in Malaysia. This mushroom was nicknamed the Asian button mushroom once it was the main competitor to button mushrooms produced in temperate regions. Volvariella is popular among small mushroom growers because it is easy to handle and is in high demand among local residents. Volvariella mushrooms can be sold fresh or processed through drying, boiling or freezing. The main problems in the Volvariella mushroom growing industry are the inconsistent, continuous and poor quality seed requirement. All of these mushroom seedlings are imported from Thailand without quality control. This situation not only threatens other mushroom industries but can also bring in various mushroom diseases that can affect the production of other mushrooms in particular. In connection with that, the company took the initiative to develop the production of new breed seeds through nuclear application under collaboration with the Malaysian Nuclear Agency. The seedlings of this new breed are the results of the mutation breeding of selected Volvariella mushrooms through the acute use of gamma radiation. To meet the wishes and needs of the Volvariella mushroom industry, the company aims to use, produce and sell mushroom seeds on a large scale. Through this nuclear application, the diversity or variability of Volvariella mushrooms can be produced and through selection and screening specifically can produce new strains of high quality. This allows mushroom growers to have a choice of strains according to current needs. Through this RISE program, it can help the company target its goals and meet the demand for Volvariella mushroom seeds in Malaysia. This RISE project has been planned for a period of 1 year starting in December 2019 to December 2020.





PROJECT TEAM:
Malaysian Nuclear Agency:
Ts. Dr Azhar Mohamad
Dr. Seri Chempaka Mohd Yusof
Mohd Hafiz Abd Nasir

CT INA Enterprise:
Salina Md Tahir, Siti Rohani Md Tahir

PROJECT OBJECTIVE

- To get advice and technology for the production of seedling of a new breed Volvariella mushrooms through gamma ray application.
- To cultivate, utilize and develop mushroom seedlings of quality new Volvariella strains.
- To supply and consistently produce quality Volvariella mushroom seedling through development and large scale commercialization production.

PROJECT ACHIEVEMENT

This RISE project has helped the company in developing a commercial Volvariella mushroom seed production technique. And able to sell fresh Volvariella mushroom products frozen.



For further information,
please contact:
Director General,
Malaysia Nuclear Agency
(Nuclear Malaysia)
BANGI, 43000 KUALANG
SELANGOR

Attn:
Project Leader
Agrotechnology &
Bioresources Division
E-mail: azhar_m@nmm.gov.my
Tel : +603 - 8911 9000
Fax : +603 - 8911 2157




KAJIAN PENAMBAHBAIKAN SISTEM PENGELUARAN TANAMAN MELALUI PENGGUNAAN VARIETI BAHARU DARI BIAK BAKA MUTASI DAN TEKNIK BIOREAKTOR

NAMA SYARIKAT:
KULIM (M) BERHAD

LATAR BELAKANG PROJEK
Agensi Nuklear Malaysia memberikan khidmat kepakaran, latihan dan konsultasi kepada Kulim (Malaysia) Berhad untuk dua skop aktiviti; 1) penggunaan teknik bioreaktor dan kultur tisu tanaman untuk penghasilan berskala besar anak benih kelapa sawit, 2) kerjasama dalam ujian ladang ke atas anak benih nanas MD2 yang dihasilkan dari teknologi biak baka mutasi untuk saringan ketahanan terhadap penyakit dan ciri-ciri agronomi lain.



PASUKAN PROJEK:
Agensi Nuklear Malaysia:
Dr. Zaiton Ahmad, Mustapha Akil,
Dr. Sobri Hussein, Norazlina Noordin,
Afrida Abu Hassan, James Mackester Simoli,
Wan Norhanis Ahmad Yarani

Kulim (M) Berhad:
Cik Zainuriah Abdullah,
Hj Ismail Hashim, Muhammad Shukri Rahman,
Siti Razuan Ahmad, Jalliah Tow Kuman

OBJEKTIF PROJEK

- Untuk meningkatkan pengetahuan dan skill kakitangan makmal kultur tisu syarikat dalam teknik bioreaktor dan kultur tisu untuk pengeluaran anak benih kelapa sawit.
- Untuk mendapatkan data penyaringan ladang bagi anak benih nanas MD2 yang dihasilkan dari teknologi biak baka mutasi.

PENCAPAIAN PROJEK

- Kursus teori dan "hands-on" dalam teknik bioreaktor untuk pembiakan kultur sel dan organ tanaman telah selesai diberikan kepada staf syarikat.
- Perbincangan dan khidmat nasihat teknikal di makmal syarikat untuk membantu dalam penyelesaian masalah berkaitan kultur tisu.
- Penanaman ladang untuk penyaringan ciri agronomi bagi anak benih nanas MD2 yang dihasilkan dari teknologi biak baka mutasi telah selesai dilaksanakan.



Kursus pengendalian bioreaktor tumbuhan



Perbincangan dan khidmat nasihat teknikal di makmal syarikat



Penyaringan nurseri dan ladang bagi anak benih nanas MD2 yang dihasilkan dari teknologi biak baka mutasi



Nursery and field evaluation of MD2 pineapples generated from mutation breeding technology

Untuk maklumat lebih lanjut hubungi:

Katun Pengarah,
Agensi Nuklear Malaysia
(Nuklear Malaysia)
BANGI, 43000 KAJANG
SELANGOR

Atas:
Dr. Zaiton Ahmad
Tahap
Agroteknologi dan Biowasa
(e-mail: zaitonahmad@nrm.gov.my)
Tel : +603 - 8911 2000
Faks : +603 - 8911 2157

For further information, please contact:

Director General,
Malaysian Nuclear Agency
(Nuklear Malaysia)
BANGI, 43000 KAJANG
SELANGOR

Atas:
Dr. Zaiton Ahmad
Agrotechnology and Biosciences Division
(e-mail: zaitonahmad@nrm.gov.my)
Tel : +603 - 8911 2000
Fax : +603 - 8911 2157

IMPROVEMENT OF PLANT PRODUCTION SYSTEMS THROUGH THE USE OF NEW VARIETIES FROM MUTATION BREEDING AND BIOREACTOR TECHNIQUES

COMPANY NAME:
KULIM (M) BERHAD

PROJECT BACKGROUND
Malaysian Nuclear Agency provides expertise, training and consultancy to Kulim (Malaysia) Berhad for two scopes of activity; 1) use of plant bioreactor and tissue culture techniques for large-scale production of oil-palm seedlings, 2) collaborative field tests on MD2 pineapple seedlings generated through mutation breeding for disease resistant and good agronomic traits.



PROJECT TEAM:
Malaysian Nuclear Agency:
Dr. Zaiton Ahmad, Mustapha Akil,
Dr. Sobri Hussein, Norazlina Noordin,
Afrida Abu Hassan, James Mackester Simoli,
Wan Norhanis Ahmad Yarani

Kulim (M) Berhad:
Cik Zainuriah Abdullah,
Hj Ismail Hashim, Muhammad Shukri Rahman,
Siti Razuan Ahmad, Jalliah Tow Kuman

PROJECT OBJECTIVE

- To improve knowledge and skill of company's tissue culture staff in plant bioreactor and tissue culture techniques for oil-palm seedling production.
- To obtain field data on MD2 pineapples generated through mutation breeding.

PROJECT ACHIEVEMENT

- Completion of theory and hands-on training on plant bioreactor system for cell and organ culture multiplication to company's staff.
- On-site problem-solving consultation and technical discussion related to plant tissue culture.
- Completion of field planting for MD2 pineapple seedlings generated from mutation breeding for evaluation of agronomic traits.



Hands-on training on plant bioreactor system



On-site consultation and discussion



Nursery and field evaluation of MD2 pineapples generated from mutation breeding technology



Nursery and field evaluation of MD2 pineapples generated from mutation breeding technology

Untuk maklumat lebih lanjut hubungi:

Katun Pengarah,
Agensi Nuklear Malaysia
(Nuklear Malaysia)
BANGI, 43000 KAJANG
SELANGOR

Atas:
Dr. Zaiton Ahmad
Tahap
Agroteknologi dan Biowasa
(e-mail: zaitonahmad@nrm.gov.my)
Tel : +603 - 8911 2000
Faks : +603 - 8911 2157

For further information, please contact:

Director General,
Malaysian Nuclear Agency
(Nuklear Malaysia)
BANGI, 43000 KAJANG
SELANGOR

Atas:
Dr. Zaiton Ahmad
Agrotechnology and Biosciences Division
(e-mail: zaitonahmad@nrm.gov.my)
Tel : +603 - 8911 2000
Fax : +603 - 8911 2157

PENGELUARAN ANAK BENIH KULTUR TISU PISANG BERANGAN

NAMA SYARIKAT:
EGI BIOTEK SDN. BHD

LATARBELAKANG PROJEK

Pisang adalah tanaman buahan yang kerap ditanam di Malaysia. Kira-kira 50% daripada kawasan penanaman pisang diusahakan dengan pisang berangan dan jenis cavendish. Syarikat EGI BIOTEK Sdn. Bhd. menghadapi kekurangan bekalan sulur dan anak benih daripada pembekal tempatan dan pembekal komersial. Oleh itu, bagi memastikan bekalan bahan tanaman yang mampan untuk industri tanaman pisang mereka, EGI BIOTEK Sdn. Bhd. berminat untuk mengeluarkan anak benih pisang berangan melalui teknologi kultur tis. Teknologi kultur tis tumbuhan telah terbukti secara meluas dalam menawarkan penyelesaian yang menarik dan diyakini untuk pengeluaran anak benih pisang berangan yang cepat dan berterusan secara berskala besar. Dalam projek RISE ini, pasukan penyelidik dari Nuklear Malaysia menawarkan bantuan khidmat kepada EGI BIOTEK Sdn. Bhd dalam pengeluaran pisang berangan secara besar-besaran melalui kultur tis dari permulaan kultur inisiasi sehingga pemindahan anak benih di ladang. Dengan kerjasama ini, prosedur yang efisien dalam pengeluaran anak benih pisang berangan secara besar-besaran melalui kultur tis telah berjaya dibangunkan dan dioptimumkan.



PASUKAN PROJEK:
Agensi Nuklear Malaysia:
Norazlina Noordin, Afriada Abu Hassan,
Zaiton Ahmad, Norhafiz Talib, Nurhayati Iwan,
Nashimatul Adadiah Yahya

Egi Biotek Sdn. Bhd:
Abdul Halim Nawri, Ahmad Hamimi Marwan

OBJEKTIF PROJEK

- Memberikan khidmat perundingan pengeluaran anak benih kultur tis pisang berangan secara besar-besaran.
- Menjalankan latihan praktikal teknik kultur tis pisang berangan.
- Membangunkan prosedur dan memindahkan teknologi pengeluaran benih pisang berangan yang efisien dan berskala besar.

PENCAPAIAN PROJEK

Prosedur pengeluaran pisang berangan secara besar-besaran melalui kultur tis dari permulaan kultur inisiasi sehingga pemindahan anak benih di ladang telah berjaya dibangunkan dan dioptimumkan. Daripada kerjasama RISE ini, EGI BIOTEK berjaya memperoleh pengetahuan, pengalaman dan kemahiran mengenai pengeluaran anak benih kultur tis pisang berangan berskala besar menggunakan prosedur yang dibangunkan. Pasukan teknikal Agensi Nuklear Malaysia berjaya melatih pekerja EGI BIOTEK berkaitan teknologi kultur tis tumbuhan. Dengan prosedur yang dibangunkan, bekalan anak benih kultur tis pisang berangan yang berterusan dan mampan diperolehi.






Untuk maklumat lanjut,
Silalah hubungi:
**Ketua Pengarah,
Agensi Nuklear Malaysia
(Nuklear Malaysia)**
BANGI, 43000 KAJANG
SELANGOR

Attn:
Dr. Zaiton Ahmad
Tehniken
Agroteknologi dan Biosains
E-mail: zaitonahmad@nrm.gov.my
Tel : +603 - 8911 2000
Fax : +603 - 8911 2157

PRODUCTION OF PISANG BERANGAN SEEDLINGS VIA TISSUE CULTURE

COMPANY NAME:
EGI BIOTEK SDN. BHD

PROJECT BACKGROUND

Banana is the second most commonly grown fruit crop in Malaysia. About 50% of the banana growing area is cultivated with pisang berangan and the cavendish type. EGI BIOTEK Sdn. Bhd. was facing shortage of suckers and seedlings supplies from local growers and commercial suppliers. Therefore, to ensure sustainable supply of planting materials for their banana plantation industry, EGI BIOTEK Sdn. Bhd. was interested in producing berangan seedlings via tissue culture technology. Plant tissue culture technology has been widely proven to offer attractive and reliable solution for the rapid and continuous large-scale production of disease-free pisang berangan seedlings. In this RISE project, team of researchers from Nuklear Malaysia offered assistance to EGI BIOTEK Sdn. Bhd in large-scale production of Pisang Berangan via tissue culture from initiation of shoot cultures until transplanting of seedlings in the field. With this collaboration, an efficient procedure on large-scale production of pisang berangan seedlings via tissue culture was successfully developed and optimized.



PROJECT TEAM:
Malaysian Nuclear Agency:
Norazlina Noordin, Afriada Abu Hassan,
Zaiton Ahmad, Norhafiz Talib, Nurhayati Iwan,
Nashimatul Adadiah Yahya

Egi Biotek Sdn. Bhd:
Abdul Halim Nawri, Ahmad Hamimi Marwan

PROJECT OBJECTIVE

- To provide consultation on large-scale production of pisang berangan tissue culture seedlings.
- To conduct hands-on training on pisang berangan tissue culture technique.
- To develop procedure and transfer of technology on efficient and large-scale production of pisang berangan tissue culture seedlings.

PROJECT ACHIEVEMENT

A procedure on large-scale production of pisang berangan via tissue culture from initiation of shoot cultures until transplanting of seedlings in the field has been successfully developed and optimized. From this RISE collaboration, EGI BIOTEK managed to gain the know-how, experience and skills on the large-scale production of pisang berangan tissue culture seedlings using the established procedure. Agensi Nuklear Malaysia technical team managed to successfully trained the employees of EGI BIOTEK related to plant tissue culture technology. With the established procedure, continuous and sustainable supply of pisang berangan tissue culture seedlings could be obtained.






For further information,
please contact:
**Director General,
Malaysian Nuclear Agency
(Nuklear Malaysia)**
BANGI, 43000 KAJANG
SELANGOR

Attn:
Dr. Zaiton Ahmad
Agrotechnology and
Biosciences Division
E-mail: zaitonahmad@nrm.gov.my
Tel : +603 - 8911 2000
Fax : +603 - 8911 2157

PROJEK PEMBANGUNAN RINTIS KABEL PERENCAT API TAUT SILANG SINARAN

NAMA SYARIKAT:
WONDERFUL EBEAM CABLE SDN. BHD.

LATAR BELAKANG PROJEK

Dalam pasaran kabel, terdapat beberapa jenis kabel yang digunakan dalam industri memerlukan ciri rintang haba dan sifat perencat api. Kabel-kabel ini memerlukan penebat yang diperbuat daripada bahan polimer dengan formulasi aditif untuk menghasilkan kabel dengan ciri rintang dan rintang api. Keupayaan kabel ini juga perlu dipertingkatkan lagi dengan proses penyinaran taut silang.

Pembuatan kabel di Malaysia sekarang terhad kepada kabel-kabel menggunakan tautsilang menggunakan bahan kimia yang membahayakan pengguna dan persekitaran. Bagi keperluan kabel tautsilang sinaran yang memenuhi keperluan spesifikasi automotif diimport dari negara seperti Jepun dan Korea dengan nilai kos yang jauh lebih tinggi. Dengan keadaan ringgit yang tidak stabil, kadar pertukaran asing memberi implikasi besar terhadap industri automotif di Malaysia.

Untuk menyelesaikan masalah ini, beberapa kaedah boleh digunakan dengan menggunakan teknik tautsilang sinaran menggantikan teknik taut silang kimia. Hal ini dapat memberi penjimatan kos yang dianggarkan sebanyak 25%. Dengan teknik penyinaran taut silang sinaran, kabel mengalami peningkatan dalam sifat ketahanan haba, kimia dan mekanikal.

OBJEKTIF PROJEK

- Membangunkan sebatian penebat kabel perencat api yang serasi dengan sinaran untuk keperluan industri automotif.
- Membangunkan kabel dari sebatian yang dibangunkan dan melaksana proses taut-silang serta pencirian kabel
- Mengkaji proses parameter optimum bagi kabel tautsilang menerusi kaedah radiasi.



PASUKAN PROJEK:
Agensi Nuklear Malaysia:
Muhammad Hazim Muhammad Sayuti,
Ahmad Zuhdi Mohd On

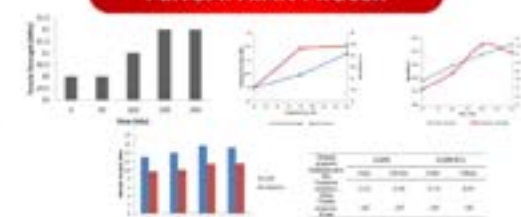
Wonderful Ebeam Cable Sdn. Bhd:
Chan Chang Choy, Chai Min Lee,
Dr. Zulkafli Ghazali

Penggunaan teknik penyinaran untuk tautsilang kabel adalah proses teknologi hijau. Di samping itu, meningkatkan kualiti kabel yang dihasilkan untuk pasaran di Malaysia, ia juga berpotensi untuk pasaran serantau. Dengan pembuatan kabel tautsilang sinaran di dalam negara, ia akan membantu negara ini dalam mengurangkan aliran tunai mata wang negara keluar negara.

Oleh itu, pihak Nuklear Malaysia mencadangkan penggunaan teknik ini untuk membantu industri tempatan dalam penghasilan wayar dan kabel. Syarikat Wonderful Ebeam Cable Sdn Bhd telah bersetuju untuk bekerjasama dalam menjayakan projek RISE ini.

Wonderful Ebeam Cable Sdn Bhd telah membangunkan beberapa formulasi yang boleh digunakan bagi menghasilkan sebatian yang diperlukan untuk digunakan sebagai bahan penebat jenis kabel ini. Agensi Nuklear Malaysia akan memberi khidmat nasihat kepada Wonderful Ebeam Cable dalam menggunakan teknologi penyinaran taut silang radiasi untuk tujuan meningkatkan kualiti wayar dan kabel.

PENCAPAIAN PROJEK



Kajian telah menunjukkan kandungan gel, sifat mekanikal, elektrik dan ujian rintang api campuran LLDPE dan LLDPE/EVA yang disinari mengalami peningkatan. Pendedahan arus elektron kepada sampel dapat mengukuhkan kekuatan mekanikal sebatian penebat dan juga menambah baik sifat elektrik. Campuran bersama EVA menunjukkan peningkatan kandungan gel yang tinggi tetapi berlaku penurunan kekuatan regangan. Dengan pertambahan aditif rintang-api pula, sebatian menunjukkan peningkatan dari segi suhu untuk mula terbakar apabila didedahkan kepada api.

Untuk maklumat lanjut, sila hubungi:
Ketua Pengarah,
Agensi Nuklear Malaysia
(Nuklear Malaysia)
BANGI, 43000 KUALANG
SELANGOR

Atau:
Muhammad Hazim Muhammad Sayuti
Bahagian Teknologi Pemrosesan Sinaran
E-mail: hazim@nma.gov.my
Tel : +603 - 8911 1221
Fax : +603 - 8911 2154

PILOT DEVELOPMENT PROJECT ON RADIATION CROSSLINKING OF FLAME RETARDANT CABLE

COMPANY NAME:
WONDERFUL EBEAM CABLE SDN. BHD.

PROJECT BACKGROUND

In the cable market, there are several types of cables used in industries requiring heat resistance and flame retardant properties. These cables require insulation made of polymeric materials with additive formulations to produce cables with resistance and fire resistance characteristics. The ability of this cable also needs to be further enhanced by the cross-link irradiation process.

Cable manufacturing in Malaysia is now limited to cross-linked cables using chemicals that are harmful to consumers and the environment. For the requirements of radiation cross-linked cables that meet the requirements of automotive specifications are imported from countries such as Japan and Korea with a much higher cost value. With the unstable state of the ringgit, the foreign exchange rate has great implications for the automotive industry in Malaysia.

To solve this problem, several methods can be used by using radiation cross-linking techniques instead of chemical cross-linking techniques. This can provide an estimated cost savings of 25%. With the radiation cross-linking technique, the cable experiences an increase in thermal, chemical and mechanical resistance properties.

PROJECT OBJECTIVE

- Developing a radiation compatible flame retardant cable insulation compound for the automotive industry.
- Develop cables from developed compounds and perform cross-linking and cable characterization processes
- Studying the process of optimal parameters for cross-linked cables through the radiation method.



PROJECT TEAM:
Malaysian Nuclear Agency:
Muhammad Hazim Muhammad Sayuti,
Ahmad Zuhdi Mohd On

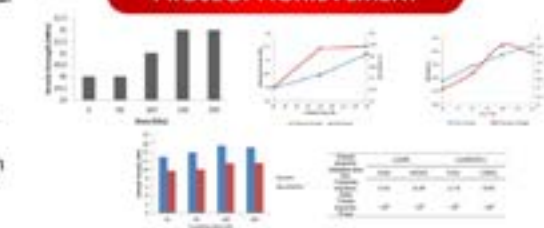
Wonderful Ebeam Cable Sdn. Bhd:
Chan Chang Choy, Chai Min Lee,
Dr. Zulkafli Ghazali

The use of irradiation techniques for cable cross-linking is a green technology process. In addition, improving the quality of cables produced for the market in Malaysia, it also has potential for the regional market. By manufacturing radiation cross-linked cables in the country, it will help the country in reducing the cash flow of the country's currency out of the country.

Therefore, Malaysian Nuclear Agency proposed the use of this technique to help the local industry in the production of wires and cables. Wonderful Ebeam Cable Sdn Bhd has agreed to cooperate in making this RISE project a success.

Wonderful Ebeam Cable Sdn Bhd has developed several formulations that can be used to produce the compounds required to be used as insulating material for this type of cable. The Malaysian Nuclear Agency will provide advisory services to Wonderful Ebeam Cable in using radiation crosslinking technology for the purpose of improving the quality of wires and cables.

PROJECT ACHIEVEMENT



Studies have shown that the gel content, mechanical properties, electrical and fire resistance tests of LLDPE and LLDPE/EVA blends that are irradiated have improved. Exposure of the sample to an electron current can strengthen the mechanical strength of the insulating compound and also improve the electrical properties. Blends with EVA showed an increase in high gel content but there was a decrease in tensile strength. With the addition of flame retardant additives, the compound shows an increase in temperature to start burning when exposed to fire.

For further information, please contact:
Director General,
Malaysian Nuclear Agency
(Nuklear Malaysia)
BANGI, 43000 KUALANG
SELANGOR

Atau:
Muhammad Hazim Muhammad Sayuti
Radiation Processing Technology Division
E-mail: hazim@nma.gov.my
Tel : +603 - 8911 1221
Fax : +603 - 8911 2154

PEMBANGUNAN KAPASITI SYARIKAT HG SOLUTION SDN. BHD. KE ARAH MEMBANGUNKAN MAKMAL PENGUKURAN RADIOLOGI BAGI ANALISIS NATURALLY OCCURRING RADIOACTIVE MATERIALS (NORM) DAN TECHNOLOGICALLY NATURALLY OCCURRING RADIOACTIVE MATERIALS (TENORM)

NAMA SYARIKAT:
HG SOLUTIONS SDN. BHD.

PASUKAN PROJEK:
Agensi Nuklear Malaysia:
Norfaizal Mohamed,
Mohd Izwan Abdul Aziz

HG Solutions Sdn. Bhd.:
Shaharuddin Satri,
Mohd Khairul Md Isa,
Mohamed Fahmi Ab Rahman





LATAR BELAKANG PROJEK

Syarikat Hg Solution Sdn. Bhd. yang terletak di Bandar Baru Bangi berhasrat untuk membangunkan sendiri kapasiti dan keupayaan dari segi personal, peralatan, infrastruktur dan lain-lain keperluan bagi melaksanakan sendiri pengukuran keradioaktifan NORM dan TENORM. Projek ini melibatkan pembangunan makmal pengukuran keradioaktifan NORM dan TENORM yang dicadangkan pelaksanaannya di kemudahan sedia ada milik syarikat di Paka, Dungun, Terengganu.

Analisis pengukuran keradioaktifan NORM dan TENORM di dalam sampel dari fasiliti minyak dan gas diperlukan bagi memantau tahap sinaran dan radioaktiviti pada fasiliti berkenaan semasa operasi biasa dan kerja penyelenggaraan. Ianya penting bagi memastikan keselamatan pekerja yang terlibat seperti yang digantikan di dalam dokumen Panduan Teknikal yang dikeluarkan oleh Lembaga Perlesenan Tenaga Atom (LPTA). Antara parameter yang perlu dianalisis adalah keaktifan gross alfa/gross beta untuk penentuan keaktifan uranium-238 dan thorium-232 di dalam sampel debu udara dan kepekatan aktiviti hendaklah serendah yang boleh dicapai secara munasabah (ALARA).

OBJEKTIF PROJEK

- Mengenalpasti keperluan peralatan, infrastruktur, latihan, sumber manusia, perajilan dan standard bagi pembangunan makmal pengukuran keradioaktifan NORM dan TENORM.
- Membenkan khidmat nasihat dan latihan kepada kakitangan syarikat untuk menjalankan pengukuran keradioaktifan NORM dan TENORM.

PENCAPAIAN PROJEK

- Perbincangan mengenai senarai keperluan yang perlu disediakan untuk membangunkan makmal bagi pengukuran keradioaktifan NORM dan TENORM.
- Perolehan sistem pembilang gross alfa/gross beta beserta dengan standard radioaktif yang digunakan semasa proses kalibrasi alat tersebut.
- Latihan pengoperasian sistem pembilang gross alfa/gross beta telah diberi kepada staf syarikat pada 28 – 30 Disember 2020 bersama-sama dengan pihak syarikat pembekal peralatan.
- Persediaan keperluan dokumentasi sistem pengurusan kualiti ISO/IEC 17025.






UTARA KUALUMPUR ANGKAP
BANGI
Naras Pengarah,
Agensi Nuklear Malaysia
(Nuclear Malaysia)
BANGI, 43000 KAJANG
SELANGOR

At: Norfaizal bin Mohamed
Bahagian Teknologi Sinar
dan Alam Sekitar
E-mail: norfaizal@nma.gov.my
Tel : +603 - 8911 1221
Fax : +603 - 8911 2154

HG SOLUTION SDN. BHD. CAPACITY DEVELOPMENT TOWARDS DEVELOPING A RADIOLOGICAL MEASUREMENT LABORATORY FOR THE ANALYSIS OF NATURALLY OCCURRING RADIOACTIVE MATERIALS (NORM) AND TECHNOLOGICALLY NATURALLY OCCURRING RADIOACTIVE MATERIALS (TENORM)

COMPANY NAME:
HG SOLUTIONS SDN. BHD.

PROJECT TEAM:
Malaysian Nuclear Agency:
Norfaizal Mohamed,
Mohd Izwan Abdul Aziz

HG Solutions Sdn. Bhd.:
Shaharuddin Satri,
Mohd Khairul Md Isa,
Mohamed Fahmi Ab Rahman





PROJECT BACKGROUND

Hg Solution Sdn. Bhd. is located in Bandar Baru Bangi, intends to develop its capacity and capability in terms of personnel, equipment, infrastructure and other requirements to carry out NORM and TENORM radioactivity measurements. This project involves the development of NORM and TENORM radioactivity measurement laboratory, which is proposed to be implemented in the company's existing facility in Paka, Dungun, Terengganu.

Analysis of NORM and TENORM radioactivity measurements involving samples originated from oil and gas facilities must be monitored regularly, especially during regular operation and maintenance work. It is crucial to ensure the workers' safety as outlined in the Technical Guide document issued by the Jabatan Tenaga Atom (formerly known as Atomic Energy Licensing Board). Parameter needs to be analyzed is gross alpha/gross beta activity to determine the activity of uranium-238 and thorium-232 in air dust sample. The activity concentration should be as low as reasonably achievable (ALARA).

PROJECT OBJECTIVE

- To identify the equipment, infrastructure, training, human resources, certification and standard requirements in developing NORM and TENORM radioactivity measurement laboratories.
- To provide consultancy advices and training to the staff to carry out NORM and TENORM radioactivity measurements.

PROJECT ACHIEVEMENT

- Discuss the requirements to be prepared to develop a laboratory for measuring NORM and TENORM radioactivity.
- Procurement of the gross alpha/gross beta counter system and the radioactive standard used during the calibration process of the tool.
- Training on the operation of the gross alpha/gross beta counter system was given to company staff on 28 – 30 December 2020, together with the equipment supplier company.
- Preparation of ISO/IEC 17025 Quality Management System documentation requirements.






For further information:
Norfaizal bin Mohamed
Director General,
Malaysia Nuclear Agency
(Nuclear Malaysia)
BANGI, 43000 KAJANG
SELANGOR

At: Norfaizal bin Mohamed
Bahagian Teknologi Sinar
dan Alam Sekitar
E-mail: norfaizal@nma.gov.my
Tel : +603 - 8911 1221
Fax : +603 - 8911 2154

PEMBANGUNAN BENIH CENDAWAN BAKA BAHARU SECARA KOMERSIAL

NAMA SYARIKAT:
AS ANUGERAH ENTERPRISE

LATAR BELAKANG PROJEK
Projek RISE ini adalah 1 tahun bermula pada Disember 2019 hingga Disember 2020. Namun projek ini dilanjutkan sehingga Jun 2021 disebabkan adanya isu pandemik Covid 19 dan PKP (Perintah Kawalan Pergerakan). Program RISE ini melibatkan pembangunan pengeluaran benih baka baharu melalui aplikasi nuklear menggunakan sinaran gamma dengan kerjasama Agensi Nuklear Malaysia. Cendawan merupakan tanaman komoditi yang bernilai tinggi semenjak tahun 2010. Permintaan cendawan meningkat hampir 20% setiap tahun. Peningkatan yang berterusan ini menunjukkan industri cendawan di Malaysia semakin berkembang dan mempunyai daya saing yang tinggi. Terdapat 18 jenis cendawan yang diusahakan di Malaysia, namun pemfokusan adalah kepada 4 jenis cendawan utama iaitu *Pleurotus sp* (Cendawan Tiram), *Volvariella volvacea* (Cendawan Jerami Padi), *Schizophyllum commune* (Cendawan Kukur) dan *Auricularia sp* (Jelly Hitam). Industri cendawan khususnya di sektor penanaman sedang menghadapi masalah kekurangan benih yang berkualiti secara berterusan dan dalam kuantiti yang besar. Benih import dari Thailand tanpa melalui kawalan kualiti memberikan kesan kepada cendawan tempatan dari aspek persaingan dan pencemaran penyakit. Keadaan ini bukan sahaja mengancam industri cendawan yang lain tetapi juga boleh membawa masuk pelbagai penyakit cendawan yang mampu untuk menjejaskan produksi cendawan lain khususnya. Baka-baka baharu yang berkualiti dari aspek pengeluaran hasil yang tinggi, kadar pertumbuhan yang cepat dan mempunyai ketahanan pada perubahan suhu yang menyebabkan berlakunya pemanasan secara global (Global Warming Phenomenon). Bagi memenuhi hasrat dan keperluan industri cendawan ini pihak syarikat mensasarkan kepada penggunaan, penghasilan dan penjualan benih cendawan secara berskala besar melalui program RISE bagi memenuhi permintaan keperluan benih di Malaysia.



PASUKAN PROJEK:
Agensi Nuklear Malaysia:
Tn. Dr Azhar Mohamad
Dr. Seri Chempaka Mohd Yusof
Mohd Hafiz Abd Nasir

AS Anugerah Enterprise:
Norrita Mohd Yusof, Mohd Saleh Sidek

OBJEKTIF PROJEK

- Mendapat khidmat nasihat dan teknologi penghasilan benih baka baharu cendawan melalui aplikasi sinaran gama
- Menanam, mengguna dan membangunkan benih strain baka baru cendawan yang berkualiti.
- Membekal serta menghasilkan benih cendawan berkualiti secara konsisten melalui pembangunan dan penghasilan secara berskala besar dan komersial.

PENCAPAIAN PROJEK

Projek RISE ini telah membantu pihak sayrikat dalam membangunkan Makmal Tisu Kultur bagi menghasilkan benih cendawan secara komersial.



Untuk maklumat lanjut
Silalah hubungi:
Kotau Pengarah,
Agensi Nuklear Malaysia
(Nuclear Malaysia)
BANGS, 43000 KAJANG
SELANGOR

Atau
Kotau Projek
Pengembangan Agroteknologi
& Biosains
E-mail: azhar_m@nm.gov.my
Tel : +603 - 8911 9000
Fax : +603 - 8911 2157

DEVELOPMENT OF NEW BREED COMMERCIAL MUSHROOM SEEDLINGS

COMPANY NAME:
AS ANUGERAH ENTERPRISE

PROJECT BACKGROUND
The RISE project is for 1 year starting from December 2019 to December 2020. However, this project has been extended until June 2021 due to the issue of the Covid 19 pandemic and the MCO (Movement Control Order). The RISE program involves the development of new breed seed production through nuclear application using gamma radiation in collaboration with the Malaysian Nuclear Agency. Mushrooms are a high-value commodity crop since 2010. The demand for mushrooms has been increased by almost 20% every year. This continuous increase shows that the mushroom industry in Malaysia is growing tremendously and has high competitiveness. There are 18 types of edible mushrooms that are cultivated in Malaysia, but the focus is on 4 main types of mushrooms, namely *Pleurotus sp* (Oyster Mushroom), *Volvariella volvacea* (Rice Straw Mushroom), *Schizophyllum commune* (Agaric Mushroom) and *Auricularia sp* (Black Jelly). The mushroom industry especially in the cultivation sector is facing the problem of lack of quality seeds continuously and in large quantities. Imported seeds from Thailand without quality control affect local mushrooms from the aspect of competition and disease contamination. This situation not only threatens other mushroom industries but can also bring in various mushroom diseases that can affect the production of other mushrooms in particular. New breeds that are of high quality in terms of high yield, fast growth rate and resistance to temperature changes that cause global warming (Global Warming Phenomenon). To meet the wishes and needs of the mushroom industry, the company aims to use, produce and sell mushroom seeds on a large scale through the RISE program to meet the demand for seeds in Malaysia.



PROJECT TEAM:
Malaysian Nuclear Agency:
Tn. Dr Azhar Mohamad
Dr. Seri Chempaka Mohd Yusof
Mohd Hafiz Abd Nasir

AS Anugerah Enterprise:
Norrita Mohd Yusof, Mohd Saleh Sidek

PROJECT OBJECTIVE

- To get advice and technology transfer for the production of new breed mushroom seeds through the application of gamma rays
- To cultivate, utilize and develop seeds of new strains of quality mushrooms.
- To supply and produce quality mushroom seeds consistently through development and production on a large scale and commercially.

PROJECT ACHIEVEMENT

This RISE project has helped the company in developing a Tissue Culture Laboratory to produce mushroom seedling commercially



Untuk maklumat lanjut
Silalah hubungi:
Kotau Pengarah,
Agensi Nuklear Malaysia
(Nuclear Malaysia)
BANGS, 43000 KAJANG
SELANGOR

Atau
Kotau Projek
Pengembangan Agroteknologi
& Biosains
E-mail: azhar_m@nm.gov.my
Tel : +603 - 8911 9000
Fax : +603 - 8911 2157

PEMBANGUNAN VARIETI PADI MENGGUNAKAN TEKNOLOGI BIAK BAKA MUTASI, INTEGRASI TEKNOLOGI BENIH TERAWAT KE ATAS BENIH PADI VARIETI BAHARU

NAMA SYARIKAT:
HAJI MD NOR BIN HAJI ABD RAHMAN (M) SDN. BHD.

LATAR BELAKANG PROJEK
Projek pembangunan varieti baharu ini telah dimulakan untuk menyokong dasar dasar negara seperti dasar Dasar Sains, Teknologi dan Inovasi Negara (2021-2030), Dasar Agromakanan Negara 2.0 (2021-2030), Dasar Sekuriti Makanan Negara (2021-2025) dan lain lain lagi. Hasil kerjasama dengan pihak industri telah berjaya menghasilkan lebih 10 varieti baharu padi mutan untuk kegunaan para pesawah di Malaysia.



PASUKAN PROJEK:
Agensi Nuklear Malaysia:
Dr. Abdul Rahim Harun, Dr. Subri Hussien, Faiz Ahmad, Shyful Azizi Abdul Rahman, James Mackester Anak Simoli, Muhammad Ruzaini Abdul Wahab, Wan Norhanis Ahmad Yarni

Haji Md Nor Bin Haji Abd Rahman (M) Sdn. Bhd.:
Dato Puad Haji Md Noor, Dato Mansor Hj Md Noor, Mohammad Zaidi Shaari, Jamaluddin Nasri, Nuradiah Aliqah Mansor

OBJEKTIF PROJEK

- Untuk menghasilkan varieti padi baharu untuk negara.
- Untuk melaksanakan program perkongsian kepakaran dalam bidang biabaka tumbuhan.
- Untuk pengkomersialan varieti padi baharu.

PENCAPAIAN PROJEK

- Pengiktirafan dari badan dunia Outstanding Achievement Award -IAEA Vienna Austria.
- Pengiktirafan dan Negara Negara Asia -Excellent Research Team Of The Year - FNCA Tokyo Japan
- Anugerah Usahawan Penyelidik - MCY 2021
- Anugerah Juara Keseluruhan - MCY 2022
- Pingat Emas Hari Inovasi Nuklear Malaysia
- Juara Keseluruhan Hari Inovasi - Piala Ketua Pengarah
- 10 Varieti padi baharu telah dihasilkan.



Lawatan Duli Yang Maha Mulia Sultan Ibrahim ibni Almarhum Sultan Iskandar ke Plot Penyelidikan Padi Mutan






Pelancaran oleh YAB Perdana Menteri Malaysia




Unit Maklumat & Data Teknologi

Ketua Pengerah, Agensi Nuklear Malaysia (Pengerah Malaysia) BANGI 43000 KAJANG SELANGOR

Ketua Projek Technology Division E-mail: nama@nma.gov.my

Tel : +603 - 8911 1221 Fax : +603 - 8911 2154

DEVELOPMENT OF NEW RICE VARIETIES USING MUTATION BREEDING TECHNOLOGY, INTEGRATION WITH TREATED SEED TECHNOLOGY

COMPANY NAME:
HAJI MD NOR BIN HAJI ABD RAHMAN (M) SDN. BHD.

PROJECT BACKGROUND
This new rice variety development project has been initiated to support national policies such as the National Science, Technology and Innovation Policy (2021-2030), National AgriFood Policy 2.0 (2021-2030), the National Food Security Policy Action Plan (2021-2025) and others. As a result of collaboration with the industry, more than 10 new mutant rice varieties have been produced for use by rice farmers in Malaysia.



PROJECT TEAM:
Malaysian Nuclear Agency:
Dr. Abdul Rahim Harun, Dr. Subri Hussien, Faiz Ahmad, Shyful Azizi Abdul Rahman, James Mackester Anak Simoli, Muhammad Ruzaini Abdul Wahab, Wan Norhanis Ahmad Yarni

Haji Md Nor Bin Haji Abd Rahman (M) Sdn. Bhd.:
Dato Puad Haji Md Noor, Dato Mansor Hj Md Noor, Mohammad Zaidi Shaari, Jamaluddin Nasri, Nuradiah Aliqah Mansor

PROJECT OBJECTIVE

- To produce new varieties of rice for the country
- To implement an expertise sharing program in the field of plant mutation breeding
- To commercialize new rice varieties

PROJECT ACHIEVEMENT

- Outstanding Achievement Award -IAEA Vienna Austria.
- Excellent Research Team Of The Year - FNCA Tokyo Japan
- Research Entrepreneur Award - MCY 2021
- Overall Champion Award -MCY 2021
- Gold medal for Malaysian Nuclear Agency Innovation day
- Overall Champion for Malaysian Nuclear Agency Innovation day



Rice project was honored to be visited by His Majesty Sultan Ibrahim ibni Almarhum Sultan Iskandar, Sultan of Johor






Officially launched by the honorable Prime Minister of Malaysia




Unit Maklumat & Data Teknologi

Ketua Pengerah, Malaysia Nuclear Agency (Pengerah Malaysia) BANGI 43000 KAJANG SELANGOR

Ketua Projek Technology Division E-mail: nama@nma.gov.my

Tel : +603 - 8911 1221 Fax : +603 - 8911 2154

PEMBANGUNAN DOKUMEN UNTUK PENGURUSAN AKREDITASI MS ISO/IEC 17020 UNTUK PENILAIAN KESELAMATAN SINARAN FREKUENSI RADIO (RF) UNTUK STRUKTUR PEMANCAR TELEKOMUNIKASI

NAMA SYARIKAT:
AVINN ENGINEERING & SERVICES SDN. BHD.

LATAR BELAKANG PROJEK
Projek ini melibatkan khidmat nasihat kepada Syarikat Avinn Engineering & Services Sdn. Bhd. dari Kuching Sarawak. Projek ini merupakan khidmat nasihat kepada syarikat bagi membangunkan dokumentasi untuk akreditasi MS ISO/IEC 17020 sebagai *Inspection Body Type A* untuk penilaian keselamatan aras radiasi frekuensi radio (RF) bagi struktur telekomunikasi.





PASUKAN PROJEK:
Agensi Nuklear Malaysia:
Roha Binti Tukimin
Wan Syazlin Wan Yunoh
Avinn Engineering & Services Sdn. Bhd:
Mohd Muazz Ideris, Lelawati Julathi,
Priscilla Sutra Anak Ango Michale

OBJEKTIF PROJEK

- Meningkatkan keupayaan syarikat bagi memantapkan aktiviti penilaian keselamatan aras radiasi frekuensi radio (RF)
- Khidmat nasihat merangkumi kursus kesedaran kepada staff dan pihak pengurusan syarikat, latihan dan penyediaan dokumen berkaitan MS ISO/IEC 17020 dan menyediakan syarikat untuk proses audit dan seterusnya akreditasi.

PENCAPAIAN PROJEK

Pihak syarikat telah pun menyediakan dokumen tersebut dengan khidmat konsultansi dari Agensi Nuklear Malaysia bagi persediaan untuk audit kecukupan dokumentasi. Program RISE ini dapat menonjolkan peranan agensi kerajaan dalam membantu syarikat swasta dalam meningkatkan keupayaan mereka sebagai *Inspection Body Type A* dalam penilaian aras keselamatan frekuensi radio bagi struktur pemancar telekomunikasi di Malaysia.



Mesyuarat dan awareness program bersama kakitangan syarikat



Struktur pemancar telekomunikasi peralatan pengukuran radiasi RF jalur lebar



Latihan pengukuran radiasi frekuensi radio di menara telekomunikasi dengan syarikat



Latihan praktikal pengukuran di lokasi tapak pemancar telekomunikasi

Untuk maklumat lanjut,
Silalah hubungi:
Kakua Pangarasan,
Agensi Nuklear Malaysia
(Nuclear Malaysia)
BANGLO 43000 KAJANG
SELANGOR.
Attn: Roha Binti Tukimin
Bahagian Keselamatan & Kesihatan Sinaran
Email: roha@nma.gov.my
Tel : +603 - 8911 2000
Fax : +603 - 8911 2114

DOCUMENT DEVELOPMENT FOR MS ISO/IEC 17020 ACCREDITATION MANAGEMENT FOR SAFETY ASSESSMENT OF RADIO FREQUENCY (RF) RADIATION FOR TELECOMMUNICATION TRANSMITTER STRUCTURES

COMPANY NAME:
AVINN ENGINEERING & SERVICES SDN. BHD.

PROJECT BACKGROUND
This project involved advisory services to Avinn Engineering & Services Sdn Bhd Company from Kuching, Sarawak. The project is an advisory service to the company to develop documentation for MS ISO/IEC 17020 accreditation as *Inspection Body Type A* for the radio frequency (RF) radiation assessment for telecommunication structures.





PROJECT TEAM:
Malaysian Nuclear Agency:
Roha Binti Tukimin
Wan Syazlin Wan Yunoh
Avinn Engineering & Services Sdn. Bhd:
Mohd Muazz Ideris, Lelawati Julathi,
Priscilla Sutra Anak Ango Michale

PROJECT OBJECTIVE

- The objective of this project is to improve the company's ability to strengthen the activities of radio frequency (RF) radiation assessment.
- The advisory services consist of awareness courses for staff and company management, training and document preparation related to MS ISO/IEC 17020 and preparing the company for the audit process and subsequent accreditation.

PROJECT ACHIEVEMENT

The company has already prepared the document with consultancy service of Malaysian Nuclear Agency for the preparation of documentation adequacy audit. This RISE program can highlight the role of government agency in assisting private company to improve their capabilities as *Inspection Body Type A* for the safety assessment of radio frequency levels for telecommunication transmitter structure in Malaysia.



Awareness program and meeting with company staff



Telecommunication transmitter structure of broadband RF radiation measurement equipment



Radio frequency radiation measurement training at the telecommunication tower with the company



Practical training measurement at telecommunication transmitter site

For further information,
please contact:
Director General,
Malaysian Nuclear Agency
(Nuclear Malaysia)
BANGLO 43000 KAJANG
SELANGOR.
Attn: Roha Binti Tukimin
Security & Radiation
Health Division
Email: roha@nma.gov.my
Tel : +603 - 8911 2000
Fax : +603 - 8911 2114



 Nuklear Malaysia

 Agensi Nuklear Malaysia

 nuklearmalaysia

 @NuklearM

 @nuklearmalaysiaofficial

 www.nuclearmalaysia.gov.my