



POPSIG

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IChemE Palm Oil Processing Special Interest Group

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Palm Oil Processing
Special Interest Group

*Correcting the
misperception on palm oil*

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POPSIG's SDG Seminar

POPSIG at MPIC's MIACES 2022

7th IPOSC and Infographic Competition

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Editor's Message

Although the production in the palm oil industry has experienced a slowdown, palm oil remains as the best option to meet the global edible oil demand. POPSIG has delivered talks on food & water, built environment & transport, and health – all about IChemE100 themes – for years.

July began with POPSIG's SDG seminar with the eminent professionals from MPOCC, SDP, AR-POS/Heriot-Watt, SOPB, UM and Segi-Enam Advisors Pte Ltd. They underlined the urgency to extend the coverage on SDGs, promote mechanisation, adopt circular economy, implement NDPE policy, and improve globally recognised sustainability certification.

POPSIG was the Institution Partner at the Ministry of Plantation Industries and Commodities, MPIC-organised Malaysia International Agricommodity Expo & Summit (MIACES) at MITEC on 26-28 July 2022. The 9th PM of Malaysia said MIACES could be an excellent platform to promote the technologies at the international level.

During the 33rd SOMChE, four professionals highlighted the sustainability issues in today's palm oil. In this forum, Professor Dominic Foo emphasised the enforcement of regulations; Dr Steven Lim underlined transformation; Dr Carmen Goh stressed on improved practices; and, Dr Calvin Chok highlighted the development of environmental technologies.

Dr Harikrishna Kulaveerasingam (SDP) made a global address to the Generation Z worldwide during a IR4.0 conference at UM. While digitalisation is an ongoing commitment at SDP, advanced intelligent seed system and PAU have been used for higher yield recovery.

The 7th IPOSC hosted by MPOC was held at InterContinental Hotel Kuala Lumpur. YBrs Pn Wan Aishah Wan Hamid (CEO of MPOC) addressed to impose ESG criteria in industry. The event observed the prize-giving ceremony of POPSIG-MPOC IPOSC 2022 Infographic Competition.

This year, POPSIG celebrated excellences in chemical engineering at Bangi Resort Hotel. Professor Chong Mei Fong (Chair of POPSIG) underlined that the laboratory-based technologies are researched and optimised for scale-up applications in industry. YBrs Dr Ruslan Abdullah (Director of SESD at MPOC) focused on talent building among young scientists and engineers, while Mr Khoo Kiak Kern (MD of Desmet) looked forward to the development in both edible and non-edible applications.

The 2022 POPSIG Best Final Year Design sponsored by Desmet Ballestra Malaysia has been awarded to Swinburne University of Technology Sarawak Campus "for promoting clean energy through the sustainable production of palm-based biodiesel". It was earned by Abdulqader Mohammed Alawi Bin Sahl, Thuppahimudalige Chandeepea Lakshith Fernando, Bong Zhang Ying, Tharindu Dayan Buddhika Siyambalapatiya, Osob Abdullahi Mohamud and Shaffaf Thajudheen. Their supervisor was Ir Dr How Bing Shen.

Ng Wai Lun (Taylor's), Lai Jia Yen (Swinburne) and Yeow Teck Ann (Xiamen) received the 2022 POPSIG Student Research Project Bursary sponsored by MPOC. Their projects are about glycerin pitch, CO₂ adsorption and BSFL, respectively. We look forward to their lectures in 2023.



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Webinar: Roles of Palm Oil Industry in Achieving UN SDGs

Overview

POPSIG-ARPOS Seminar 2022 was held on 4th July 2022 at 16:00 MYT (09:00 BST). Six professionals exchanged their views about the role of palm oil industry in achieving SDGs. The professionals discussed the efforts needed to improve the contribution of palm oil industry to SDGs.

Introduction to SDGs

Dr Helena Varkkey introduced that sustainable development refers to the development that meets the needs of the present without compromising the ability of future generations to meet their own needs. She highlighted that it is all about concerted efforts towards building an inclusive, sustainable and resilient future for people and planet. This could eradicate poverty in all its forms and dimensions.

In Malaysia, National SDG Council is chaired by the Prime Minister. It aims to establish direction for SDG implementation, set national agenda and milestones and prepare reporting to UN High Level Political Forum. The Steering Committee, which is chaired by the Director General of EPU, formulates SDG Roadmap, monitor progress of targets, identify issues and report to National SDG Council. It also manages five working committee: inclusivity, wellbeing, human capital, economic growth, and environment & natural resources.

Moving Towards SDGs With MPOCC & MSPO Certification Scheme

On behalf of Mohd Hasbollah Suparyono (MPOCC), Tan Chee Yong presented that MSPO is a government's commitment on sustainable palm oil production. MS2530:2022 emphasises on mitigating the impacts of global warming, upholding labour principles, assisting organisations in fulfilment of the Government of Malaysia's policy, communicating sustainable practices to stakeholders, continual improvement and many more.

Chee Yong shared that MSPO certification can bring attendant benefits for tropical ecosystems. He reported that the rate of deforestation has fallen year on year in the result of MSPO impact.

Moving forward, MPOCC would improve quality management, conduct standards revision, study impact framework and satisfaction score, and improve the handling of complaints. On technology, MPOCC would make improvements in auditing, level up transparency and integrity, develop AI-based decision

making and be more consumers/retail ready.

Reimagining Plantations

Dr Harikrishna Kulaveerasingam shared the industry and technology perspectives on SDG development in palm oil industry. It is important to improve the productivity without contributing to carbon and water footprint. He strengthened the significance to harness innovation, which referred to re-purposing technology for uses that were not discovered before.

Dr Harikrishna presented that mechanisation and robotics in the industry have contributed to decent work and economic growth. Automated control and sensors for management of oil palm milling and palm oil processing optimise overall equipment effectiveness at work.

Good agricultural practice, integrated pest management, bio-catalyst & genome, good manufacturing practice, MOH controls have minimised mineral oil contamination and 3-MCPD. Biogas for energy, EO water treatment, CO₂ fixation for algae production, H₂/full cell power packs for upstream robotics/autonomous solutions help tackle climate challenge.

Circular Economy Promotes Sustainability of Palm Oil Industry

Professor Ir Denny Ng presented that circular economy in palm oil processing is important to convert the waste (biomass and wastewater) into heat and electricity via combined heat and power system. The regeneration of energy can be used for processes in palm oil mill. Through thermal chemical and biological pathway, palm biomass can be converted into high value products (biofuels, biochemicals, biomaterials) and bio-energy (electricity).

Circular economy can be applied on site, in biorefinery and for recycle materials. Biogas, biochar, bio-oil, syngas, briquette and pellet from biorefinery can be fed to the boiler to generate useful outputs, such as electricity and MPS. Biogas from biorefineries can be streamed to CHP system to generate electricity for processing and to produce boiler feedwater for wastewater treatment.



Contribution of an Oil Palms Plantation Company Towards Achieving SDGs

Galau Melayong shared that all SOPB employees receive minimum wage. The firm also delivers training to local communities on the know-how and skills in oil palm cultivation. On wellbeing of employees, clinical facilities and treatments are provided for free to their workers.

SOPB also launched and implements NDPE Policy throughout supply chain for the conservation of life on land. Internal career development programme is provided to deliver decent work experiences. Palm biomass is recycled to produce renewable energy. SOPB is committed to produce and sell high-quality products with sustainability certification.

SDGs and Beyond: Malaysian Palm Oil's Competitive Challenges & Opportunities

Khor Yu Leng highlighted that palm oil industry has performed well on SDGs, ESG and sustainable development. She shared that the UN Global Compact stated that taking actions was not enough, and matrices were still quite weak after 20 years.

In general finding on SDGs on UN Global Compact, there were too few SDG goals targeted. She questioned if people are moving harder with greater urgency to report better matrices and extend the coverage on UN SDGs. It is arguable that it has been 20 years of talking and pledges.

Yu Leng believed that the world should now be in the stage of measurable, as we are in the era where “greenwash” is very much a headlined topic.

Acknowledgements

The organisers gratefully appreciate the support provided by the following organisations:

- Malaysian Palm Oil Council
- Monash-Industry Palm Oil Education and Research Platform
- Universiti Kebangsaan Malaysia-Yayasan Sime Darby Chair for Sustainability

Event: Malaysia International Agricommodity Expo & Summit (MIACES) 2022: Advancing Agricommodity in Sustainable Ecosystem *Institution Partner: POPSIG*

Overview

Malaysia International Agricommodity Expo & Summit (MIACES) was organised by the Ministry of Plantation Industries and Commodities (MPIC) Malaysia, and co-organised by Malaysian Rubber Council (MRC), Malaysian Palm Oil Council (MPOC) and Malaysian Timber Council (MTC). The theme of MIACES 2022 was Advancing Agricommodity in Sustainable Ecosystem. POPSIG was delighted to be an official Institution Partner of MIACES 2022.

The Prime Minister of Malaysia YAB Dato' Sri Ismail Sabri bin Yaakob today officiated MIACES 2022. MIACES 2022 involved 10,000 visitors, 1,288 trade delegate participations from 39 countries and over 350 international companies and 537 business to business meetings conducted. The Prime Minister was joined by the Minister of MPIC YBM Datuk Hajah Zuraida Kamaruddin, Minister of Science, Technology and Innovation (MOSTI) YBM Dato' Sri Dr Adham bin Baba, Deputy Ministers of MPIC and Secretary General of MPIC.

MIACES 2022 helped bridge the gap between industry players, accelerating digitalization to build a sustainable ecosystem. The expo and summit also enabled industry players in each agricommodity network to transact and collaborate in the same hub. A total of 20 speakers were involved in mentoring and coaching sessions for start-ups in the plantation and commodity industries, as well as recruitment, training and upskilling sessions for all. The B2B Virtual MIACES platform offered a one-on-one session with exporters, distributors, importers, investors, manufacturers, retailers, merchants, wholesalers and government bodies and agencies.

Speech by YBM Datuk Hajah Zuraida Kamaruddin, Minister of MPIC Malaysia

The Minister of MPIC underlined that the welfare of plantation workers will be safeguarded. Sustainability issues outlined in the National Agricommodity Policy (DAKN) 2021-2030 will be complied. Zuraida said MIACES aimed to promote Malaysia as an international hub of the agricommodity sector. It would be able to showcase local innovation and technology at an international level. MIACES also opened up the space and potential for industry players to penetrate the international market in a conducive business environment. The business to business meeting provided a collaboration platform to generate income for local agricommodity sector and boost the GDP. The expo also contributed to the increase of gross domestic product (GDP) and empowered the agricommodity sector.

Speech by YAB Dato' Sri Ismail Sabri Yaakob, Prime Minister of Malaysia

During the launching ceremony, the Prime Minister said the government was targeting 300 billion MYR in export value through MIACES. He was confident that MIACES acted as a progressive move to connect industry with innovation for achieving Sustainable Development Goals (SDGs).

Until February 2022, commodity export value rose by 5% compared to the previous year. By the end of 2021, the agricommodity sector achieved trading value of 270.2 billion MYR, equivalent to an increase by 39.7% compared to the previous year.

Ismail Sabri highlighted the importance of reducing the dependency on food imports and strengthening food security. The move to reuse the waste produced would promote circular economy development in Malaysia.

Malaysian Timber Certification Scheme (MTCS) is also widely recognised by the countries. Certified Malaysian timber products were employed for the construction of Japan's National Stadium for Tokyo 2020 Olympics.

China's state-owned companies will collaborate with Malaysian firms as well as the Malaysian Palm Oil Board to produce oil palm-based products involving 6 billion MYR in foreign direct investment (FDI). The products included hydrotreated vegetable oil (HVO) and sustainable aviation fuels (SAFs).

The development of HVO and SAF plant in Malaysia will drive the palm oil sector towards high-tech and high-value industries. He added that the joint venture (JV) is expected to provide 1,000 job opportunities.

Through MIACES, he told that 300 billion MYR export value for 2022 was targeted compared to 209.5 billion MYR for 2021. The participants of MIACES exhibition could have the opportunity to explore new markets for exports.

The prime minister said MIACES expo could be an excellent platform to promote products and technologies related to the oil palm, rubber, timber, cocoa, pepper and kenaf industries at the international level.



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Webinar: 33rd SOMChE: Empowering and Building Resilience in Achieving Sustainable Development Goals at Heriot-Watt University of Malaysia

Overview

This forum discussed the sustainability aspects of today's palm oil. The panel also highlighted how we are positioning or have positioned ourselves to fulfil future demand for palm oil without compromising its sustainability.

Panel

The panel discussion was moderated by Ir Prasath Ramani from POPSIG. The panel consisted of:

- Professor Ir Dr Dominic Foo Chwan Yee, Professor of Process Design and Integration at University of Nottingham Malaysia & Founding Director of Centre of Excellence for Green Technologies at University of Nottingham Malaysia
- Dr Steven Lim, Assistant Professor at Universiti Tunku Abdul Rahman & Chairperson of Centre for Photonics and Advanced Material Research
- Dr Carmen Goh Kar Mun, Manager at Eureka Synergy Sdn Bhd & Research and Development Manager at Green Plant Organic Fertilizer Sdn Bhd
- Ir Dr Calvin Chok Vui Soon, Head of Technology at KL-Kepong Oleomas Sdn Bhd

Topic 1: Sustainable palm oil

Dominic stated that the three fundamental elements of sustainability are environment, economics and social. He stressed that it is needed to put more efforts on social aspect to give good impressions to people outside ASEAN.

Steven believed that the term refers to how to produce palm oil with no irreversible negative impacts to the environment and society, as well as sustainable land use.

Carmen stressed that the emerging concept of NDPE focuses on economic, social welfare, environment and no exploitation of workers.

Calvin added that palm oil plantation growth has been very rapid in the past few years, and the industry observes exponential growth until a cap set by the Malaysian authority.

Topic 2: Mitigate deforestation

Dominic emphasised that each oil palm can last for, on aver-

age, 30 years. Oil palm crop shows better yield performance as compared to other seasonal crops. Palm oil can be used for food (edible oil) and fuel (biodiesel).

Steven stressed that palm oil industry has put a great effort on mitigating deforestation. Continuous improvement on RSPO and local authority enforcement can further strengthen the mitigation of this issue. The millers should also take actions if the oil palm was sourced from deforested areas.

Calvin said that each planter needs to get the license from MPOB to perform plantation, oil production and other related tasks. He stated that KLK OLEO is improving oil yield per hectare and productivity.

Topic 3: Malaysia's COP26 pledge

Dominic shared that enforcement is a pressing issue. The authority needs to put the plan into practice.

Carmen stated that Minister of Environment and Water (KASA) had signed to make a COP26 pledge with 8 measurement statement. One is to maintain at least 50% forest cover, and 100 million trees will be planted. Deforestation also occurs with logging, agricultural plantation and housing development activities.

Topic 4: Palm oil industry is meeting SDGs

Cooperation between the regulatory body and the smallholders are vital towards achieving SDGs. Dominic believed smallholders are also major contributors to methane and carbon emissions.

Calvin shared that encouragements, government support and regulatory enforcement are essential. There are very high expectations on the standard in every material and product in the industry.

Steven described that oil palm wastes (biomass) can be transformed into a wide variety of valuable products. Palm oil contains a lot of nutrients and vitamins, of which it can address poverty issue.

Carmen stated that most players are moving towards MSPO certifications. Palm oil industry is actively addressing deforestation issues to improve the overall sustainability.



Topic 5: MSPO certification

Carmen told that there are some similar elements in RSPO and MSPO. RSPO requires annual fees from each applicant, and the requirements are rapidly being upgraded by the committee. MSPO is mandatory certification in Malaysia, from oil mills to refineries.

Calvin believed that there should be regulations for smallholders in Malaysia to meet up the minimum international standard.

Topic 6: Biodiversity

Carmen commented that most agricultural activities would affect biodiversity at a varied severity. She suggested that oil palm plantation can be grown on an unused farmland. Improved practice can start from seedling to produce more yield and be more resistant to pathogens.

Calvin shared oil palm remains as a better choice compared to the alternative oil crops. Forest conservation is part of the CSR programme in oil palm industry. Poverty is a pressing issue in Indonesia, and hence, this programme provides job opportunities for the citizens.

Topic 7: Palm oil's standing in the future

Calvin strongly believed that the only vegetable oil that has sustainable label is palm oil in the global market.

Steven said that the industry is taking proactive steps on palm oil sector development. Financial capability is the major concern to smallholders.

Topic 8: Renewable energy

Steven shared that there were arguments on the use of palm oil as fuel. The critics worried that it would cause food short-

age and boost food price. However, he believed that this advancement would not affect the global food supply chain. He added that accessibility would be the more concerned issue for discussion. The advantages of palm oil-based biodiesel are non-toxic and environmentally friendly. He commented that biodiesel is the best fit-in fuel in replacement of fossil fuels. This would save a significant amount of capital cost. Waste-to-wealth development has also begun in Malaysia, where biomass is converted into biofuel and bioproducts.

It is arguable that life cycle analysis has been conducted on palm biodiesel and ISCC body has evaluated the complete LCA of palm oil product. Calvin believed that production of palm oil for biodiesel is mostly a subsidised business.

Topic 9: SDG1 - No poverty

Carmen shared that oil palm plantation is mostly done in the rural areas. People needs to accept the industrial responsibilities without cherry-picking.

Closing remark

Steven believed that the industry is transforming to deliver better working conditions, with the development of AI, robotics and drones. Calvin saw graduates showing interested in the manufacturing of green products to minimise carbon release into the atmosphere. Carmen commented graduates would contribute to monitor technologies and machineries to support the current work. On oil mill and refinery, Ministry of Health pressed that palm oil is a food-graded product, and hence, the industry would require food analyst and nutritionist to support the production. Complete understanding on the ground is needed before proceeding to the next stage of the career. Prasath concluded that everyone needs to get the information right and understands the golden industry.

Event: MPOC: 7th International Palm Oil Sustainability Conference (IPOSC) 2022

InterContinental Hotel Kuala Lumpur, Malaysia

Overview to IPOSC 2022

The International Palm Oil Sustainability Conference 2022 (IPOSC 2022) is MPOC's biannual conference that highlights the sustainability challenges and opportunities in the Malaysian palm oil (PO) industry to stakeholders involved in the palm oil sustainability debate. IPOSC 2022 has now approached its 7th edition since its introduction in 2008.

Opening remarks

The CEO of MPOC YBrs Pn Wan Aishah Wan Hamid addressed that new international climate change and deforestation-linked legislation emerged as the challenges to the PO industry as they can potentially create trade barriers. In addition, for decades, the PO industry has been questioned on the issues related to deforestation, endangered wildlife, global warming, the sustainability of palm-based biofuels and the recent forced labour issues raised in the USA.

Pn Wan Aishah shared that corporate investors, trust funds and financial institutions have begun to impose ESG criteria in its investing and financing requirements. She believed that these developments will bring positive impacts to the corporates.

Plenary paper

The Joint Chairman of the Malaysian Industry-Government Group for High Technology (MIGHT) Yang Berbahagia Tan Sri Dr Zakri Abdul Hamid presented "The Role of Malaysian Corporations in Shifting Sustainability Compliance to Sustainability Stewardship". In his presentation, he encouraged the Malaysian PO industry to continue to be at the forefront of leading the sustainability practices.

Session 1: Net zero and decarbonisation

Senior Undersecretary at the Strategic Planning and International Division at the Ministry of Plantation Industries and Commodities (MPIC) Malaysia, Mr Pubadi a/l Govindasamy presented five strategies for the development of the PO industry: sustainability, productivity, value creation, market development and inclusiveness.

He also shared the four policies and conservation efforts that have been implemented by the government for sustainable cultivation of PO. The commitment towards sustainable smallholders development includes: (1) MSPO incentive for smallholders, (2) replanting loan for smallholders, (3) sustainable palm oil cluster, (4) koperasi penanam sawit mampan (KPSM), and (5) assistance and subsidies for smallholders.



Chief Sustainability Officer at Sime Darby Plantation Berhad (SDP) Mr Rashid Redza Anwarudin stated that SDP pursues sustainability for people, planet and prosperity. While majority of SDP's Scope 1 & 2 emissions originated from methane emissions from effluent treatments at the mills, he shared that SDP had a target to reduce 50% of its operational Scope 1 & 2 emissions by 2030.

Mr Rashid shared that over 80% of the energy consumed comes from renewable sources. He added that methane capture technology is the key in tackling the most material emission source at SDP. On solar energy, SDP Malaysia began to install photovoltaic (PV) systems in 2021. Various evaluation methods have been used to assess the risk of deforestation and peat clearance. Also, the assessments will be done on new developments to avoid deforestation.

Global sustainability trade barriers

Teoh Cheng Hai (Seniro Advisor) and Law Chu Chien (Country Manager) from Solidaridad Network Asia shared that the priority should be given to capacity building and training in Best Management Practices before embarking on the certification process.

Risk Assurance Partner at PwC Malaysia Nik Shahrizal Sulaiman presented that it is important to determine communication channels to share ESG progress and PLCs should colate feedbacks on expectations and informational needs.

Managing Director of Meo Carbon Solutions GmbH, Andreas

Feige highlighted that ongoing demand makes palm as attractive feedstock for bioenergy and non energetic markets, while there will be a premium market for low iLUC products.

Environment Counsellor at the EU Delegation to Indonesia and EU Lead for KAMI, Henriette Faergemann shared that it is important to communicate objective information to global markets to strengthen supply chains for sustainable PO. Deforestation-free PO and its traceability are the two key due diligence requirements that need to be achieved.

Forum

The forum was moderated by YBrS Dr Ruslan Abdullah, Director of Science, Environment & Sustainability Division at MPOC. Senior Manager – Sustainable Commodity at WWF-Malaysia, Benjamin Loh shared that 20-30% of the economy is focused in sectors with high transition risk; RM50-60 billion incremental GDP per annum from a net zero pathway; and, less than 1% of the GDP is the investment cost required to achieve net zero.

The CEO of RSPO Joseph D'Cruz presented that the current GHG protocols measure full Scope 1 and aim to Scope 2 coverage and eventually extend to Scope 3 (partially) emissions. Deputy Head of Corporate Banking Malaysia at CIMB Bank, Rufimy Yii See Khin underlined several green projects involving green financing. For examples, upgrading biogas infrastructure, development of climate resilient agricultural methods and commercialisation of new plant varieties.



IPOSC 2022 infographic competition

The competition was organised by POPSIG and co-organised by MPOC. The competition received 89 submissions from 192 students across 30 universities in Malaysia. Through this competition, over 22,000 “likes” were accumulated on social media and more than 400 posts related to #IPOSC2022SDGs were published.

This event witnessed the prize giving ceremony for the MPOC-POPSIG Infographic Competition. The Top 10 winning groups were presented with their prizes and certificates by the Director General of MPOB, YBhg Datuk Dr Ahmad Parveez Haji Ghulam Kadir on stage.

The prize presentation was joined by YBr Pn Wan Aishah Binti Wan Hamid (CEO of MPOC), YBr Dr Ruslan Abdullah (Director of SESD at MPOC), Dr Loh Soh Kheang (Head of Energy and Environment Unit, Engineering and Processing Research Division at MPOB) and Ir Hong Wai Onn (Founder of POPSIG).

Top 10 winning teams

1. Lum Wai Hong (Universiti Malaya), Tan Xin Ze (Universiti Malaya)
2. Helena Tan Hui Fang (Heriot-Watt University Malaysia), Lo Ming Eirwen (Universiti Tenaga Nasional)
3. Foo Jia Wen (Universiti Teknologi PETRONAS), Ho Tze Jing (Universiti Teknologi PETRONAS), Poh Ching Hong (Universiti Teknologi PETRONAS)
4. Lim Jia Yang (Universiti Malaya), Ng Chiu Hwi (Universiti Malaya)
5. Ana Ariana Zulaiqa Binti Sahar (UiTM Kampus Jasin), Nuraimi Syamimi Binti Bismi (UiTM Kampus Jasin)
6. Tengku Regina Marsya Binti Tengku Murad (SEGi University, Kota Damansara), Eshwarr G Sivakumar (SEGi University, Kota Damansara), Tan Wai Hong (SEGi University, Kota Damansara)
7. Amirul Hairie Bin Mohammad (Universiti Sains Islam Malaysia), Anis Atirah Binti Mohamad Izatul Azhar (Universiti Sains Islam Malaysia)
8. Nur Aliah Syafiqah Binti Ahmad Fauzi (Universiti Sains Malaysia), Aina Natasha binti Mahmood (Universiti Sains Malaysia)
9. Loi Xuen Ler (Heriot-Watt University Malaysia), Chen Yu Ng (Heriot-Watt University Malaysia)
10. Aunie Afifah Abdul Mutalib (Universiti Sains Malaysia), Muhammad Hafiyuddin Abdul Mutalib (Universiti Sultan Zainal Abidin)

POPSIG proudly acknowledged the support provided by MPOC.



Event: POPSIG Research and Design Showcase 2022 Bangi Resort Hotel, Bandar Baru Bangi, Malaysia

Overview to IPOSC 2022

POPSIG organised 2022 POPSIG Research and Design Showcase, a.k.a. 2022 POPSIG Award Ceremony at Matahari I Hall, Bangi Resort Hotel, Bandar Baru Bangi, Selangor Darul Ehsan, Malaysia on Monday 26 September 2022, from 9:00 am to 4:00 pm MYT. Complimentary meals and beverages were provided to the 30 exclusively invited guests at the world-class hotel.

Opening remarks

The Chair of POPSIG Professor Ir Dr Chong Mei Fong congratulated the four recipients of 2021 POPSIG Student Research Project Bursary, six recipients of 2022 POPSIG Best Final Year Design Award and three recipients of 2022 POPSIG Student Research Project Bursary. Professor Chong underlined that the final goal of the research-based process design is to allow the novel, sustainable and cost-efficient technologies from the research laboratory to be adapted in the industry for the scale-up, mass productions.

Special remarks

POPSIG gratefully appreciated the kind sponsorship provided

by Desmet Ballestra (Malaysia) Sdn Bhd to POPSIG activities since 2015.

Malaysian Oleochemical Manufacturers Group (MOMG) has also earned the appreciations from POPSIG on their sponsorship to support the development of the palm oil sector among younger generations.

POPSIG appreciated Malaysian Palm Oil Council (MPOC) for the collaboration on student activities and delivering bursaries to top performed students on palm oil research.

Keynote speech

The Director of Science, Environment and Sustainability Division (SESD) at MPOC YBr Dr Ruslan Abdullah shared that Malaysia produces a lot of small materials in the form of commodities like rubber and oil palm. The young scientists and engineers play important roles in transforming these materials into high-value products. He said creative and innovative minds with all-side ambitions can convert this basic building blocks into numerous products that can benefit us today. Perseverance, teamwork, willingness to think outside the box are the key ingredients for success.



The palm oil industry is the source of income to more than two million people in Malaysia. In 2021, the industry contributed to more than RM 103 billion, mainly in the form of crude palm oil (CPO), while only a small portion came from finished products. If the finished products comprised the majority, then it could fetch four to 10 times more the value from the field. It was expected to be able to generate a revenue of RM 500 billion.

Dr Ruslan then underlined that young scientists and engineers are needed to carry out the national agenda in exploring palm oil. The most pressing problem is labour shortage. The nation is losing RM 4 billion every year due to the inability to collect the fruits.

Mechanisation has been introduced for over five decades. The level of mechanisation practice in the industry hardly reached 50%. Biodiesel, which was developed in Malaysia in 1990s, was discovered by a group of scientists at MPOB. 30 years on, we are still struggling at B10 or B20. Across the Strait of Malacca, Indonesia who adopted our technologies, is progressively moving towards B100.

Today, teamwork can be achieved with people from different background. This helps the individuals to compete with the world's best. The scientists and engineers need multi-faceted inputs from different experts.

Special address

Managing Director of Desmet Ballestra (Malaysia) Sdn Bhd, Mr Khoo Kiak Kern expressed his enormous gratitude for being invited to the 2022 POPSIG Research and Design Showcase. It encouraged the young engineers to take part in these competitions, which focused on palm oil and technological advancement for the industry.

Mr Khoo shared that, traditionally, the processing of palm oil can be very mechanical. The downstream processes are

mainly derived from other vegetable oil processes. With the importance of palm oil globally and as the main revenue for Malaysia, it is time to add sciences behind these technologies.

The upcoming chemical engineers can carry out these challenges to bring this to another high level. He added that POPSIG was formed to create awareness of chemical engineers, and he has seen was the accumulated efforts of POPSIG, in which they have remarkably attracted many interests of young candidate in palm oil industry.

Mr Khoo hoped these efforts of continuing to develop not only on the edible application, but also on non-edible ones. For example, renewable energy and biodiesel – an important topic of sustainability today. Moving forward, hydrotreated vegetable oil (HVO) is important to produce SAF on the sustainable aviation fuel.

Palm oil is very versatile and unique oil – both for edible and industrial usages. The efforts to explore these valuable products should continue. Being renewable and with high yield per hectare, the palm oil industry will contribute positively to the net zero commitment. Mr Khoo hoped that the young engineers will continue their resourceful imagination to bring palm oil industry to another height with innovative ideas.

Today, the research work has moved away from the main products to the waste and raw materials and by-products. This was a step forward looking into the development of palm oil.

Mr Khoo congratulated the winning team from Swinburne University of Technology Sarawak Campus for their process design about the sustainable production of palm oil-derived biodiesel. To other applicants, their works were equally good.

He also congratulated POPSIG team on the momentum in making palm oil an attractive and important subject for the young engineers to explore innovative ideas.



Paper 1: Synthesis of Carbon Nanoparticles from Oil Palm Empty Fruit Bunch as Electro-catalyst for Energy Storage

Brenda Lim Ai-Lian presented that the synthesis of low-cost electro-catalyst material with comparable efficiency from OPEFB was successful. Her research showed a decrease in waste accumulation and an increase in the usage of other oil palm components.

Paper 2: Palm Oil Mill Effluent Waste Treatment using TiO₂/Ti₃C₂T_x MXene Composite Aerogel via Photocatalytic Degradation Process

Jocelyn Lim Jean Yi provided new insights on the fabrication of TiO₂/Ti₃C₂T_x composite aerogel. Her work pioneered the application of MXene-based photocatalysts in POME waste treatment.

Paper 3: Thermogravimetric Analysis and Combined Kinetic Study on the Pyrolysis of Empty Fruit Bunches Lignin Extracted using Sucrose-malic Acid-water Low Transition Temperature Mixture

Jonathan Cheng Lin Yang has successfully extracted lignin from EFB using sucrose-malic acid-water LTTM. He also explored the thermal degradation behaviour of pyrolysis of extracted lignin. He also discovered the potential of EFB lignin in the thermochemical application.

Paper 4: The Potentials of Co-pyrolysis of Empty Fruit Bunch and Disposable Face Mask Wastes

Melvin Wee Xin Jie's research addressed bio-oil quality (SDG 7), cost-effective alternative to pre-treatment of waste (SDG 12) and microplastic pollution (SDG 13). In his co-pyrolysis study, the heating rate increased heating rate and degradation rate. Ni catalyst increased the biogas yield, while ZSM-5 increased the bio-oil yield.



Paper 5: Sustainable Production of Palm Oil-derived Biodiesel

The team showed that the award-winning design diversified its downstream products. The glycerol produced was recycled as raw materials to the esterification reactor as a catalyst, while the remaining is sold as a by-product. P-HENS identified possible HEN designs, while multiple HENs provided qualitative advantages. Pinch analysis demonstrated the minimum energy utilities required.

Paper 6: Valorisation of Blended Palm Oil Mill Effluent (POME) Sediment and Oil Palm Frond (OPF) as the Substrate for Black Soldier Fly Larvae (BSFL)

Yeow Teck Ann presented that his research would create an extra source of income for the palm oil sector. It would encourage proper waste management at the mills and reduce GHG emissions. His work would promote circular bio-economy.

Paper 7: CO₂ Adsorption Study of Concurrent Activated and Modified Palm Kernel Shell Derived Activated Carbon

Lai Jia Yen demonstrated that her research would develop alternative process in producing activated carbon (AC). On economics, the research would reuse and repurpose oil palm waste. It would also reduce environmental pollution.

Paper 8: Potential of Glycerin Pitch in Mixed Culture Polyhydroxyalkanoate Production: Component Characterizations and Organic Loading Rate Optimization

Ng Wai Lun showed that his research would promote circular economy and reduce dependency of conventional GP management method (incineration and landfilling). It would reduce the risk of soil pollution, waste management cost and the release of acrolein and CO₂ released into the environment. He was confident that his breakthrough study would be the first bioconversion of GP to PHA using mixed culture.



2021 Student Bursary

The 2021 Student Bursary (for Conference) was awarded to Husna Hamizah Binti Nor Haslan. It was presented by Professor Chong to Husna Hamizah. The prize was sponsored by Desmet Ballestra (Malaysia) Sdn Bhd.

Closing remark

The Chair of POPSIG Professor Ir Dr Chong Mei Fong congratulated to all the winners of the awards and bursaries. Tokens of appreciation were presented to the sponsors and moderator:

- Desmet Ballestra (Malaysia) Sdn Bhd - represented by Mr Khoo Kiak Kern (Managing Director)
- Malaysian Palm Oil Council - represented by YBrs Dr Ruslan Abdullah (Director of SESD)

- Malaysian Oleochemical Manufacturers Group - represented by Mr Leong Tat Loong (representative of the Chairman of MOMG & General Manager of Process and Production Control at KLK Industrial Holdings Sdn Bhd)
- Moderator - Professor Lam Hon Loong, Professor at University of Nottingham Malaysia

Before the event concluded, Professor Chong introduced the theme of 2023 – Beyond Palm Oil: Connecting Life.

Acknowledgement

POPSIG gratefully acknowledges the support provided by Desmet Ballestra (Malaysia) Sdn Bhd, MOMG and MPOC.

POPSIG also appreciates the assistance provided by Darren Lim Ming Qian, Patrick Tan Yee Siang, Loi Xuen Ler and Charlene Ho Yan Weng (Master of Engineering in Chemical Engineering students at Heriot-Watt University Malaysia).





Event: MPOC: Market Forum 2022 : Exploring Opportunities With MPOC

MPOC Market Forum 2022 was held in Johor Bahru on 3 August 2022. It shared key market updates received through MPOC regional offices and market intelligence unit.

Mr Uthaya Kumar, Regional Manager at MPOC Belgium, shared four strategic goals: elevate business and trade relationships, strengthen relationship with relevant stakeholders, maximise the consumer engagement and rebalance the debate on MPO.

Dr Aleksey Udovenko, Regional Manager at MPOC Russia, listed the potentials in Eastern Europe, such as setting up HUB in CAR, securing financial flows, providing high quality and so on.

Ms Lamyaa El-Enany, Regional Manager at MPOC Egypt, presented that the North Africa region is far from self-sufficiency. Local production only meets 34% of the local demand.

Mr Karthigayen Kumar, Regional Manager at MPOC South Africa, justified that the region produces palm oil, but it imports to fill the gap in demand.

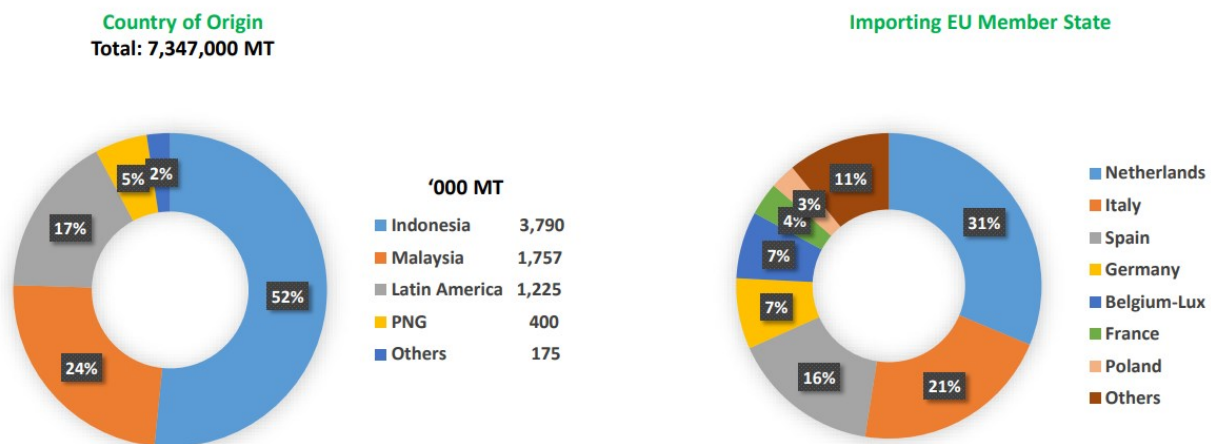
Mr Hakan Alkan, Regional Manager at MPOC Turkey, highlighted palm oil is the second largest imported oil in the region to produce palm-based industrial fats to be used in out-of-home use.

Mr Muhammad Kharibi, Regional Manager at MPOC Saudi Arabia, identified that the growing HORECA sector in Saudi Arabia, UAE and Qatar provide great opportunities for Malaysian palm oil to fulfil this growing demand.

Dr Bhavna Shah, Regional Manager at MPOC India, emphasised on awareness, collaborations, forex and VUCA to strengthen the leading role of palm oil.

Ms Rina Mariati, Regional Manager at MPOC Asia Pacific, informed that MPOC creates a platform of trade networking, works with food service sector and creates positive image of palm oil to the consumers.

EU IMPORT OF PALM OIL IN 2021



Latin America - Colombia, Guatemala, Honduras, Brazil and Ecuador
Source: Oil World Annual 2022



Figure 1: EU import of palm oil in 2021 (Kumar, MPOC, 2022)

Event: MPOC: Palm Oil Trade Fair And Seminar (POTS) Philippines 2022

MPOC POTS was held in Cebu, Philippines on 19 August 2022.

Paul Bloemendal, CEO of PRETB Pte Ltd, shared that his mission was to improve trade execution and risk control for the physical commodity markets resulting in a efficient and transparent price matching tool.

Tan Sri Datuk Dr Yusof Basiron, Consultant in the Malaysian palm oil industry, identified that the emission of CO2 from diesel can be avoided by using the equivalent amount of renewable fuel, of which palm biofuel is the only sustainable biofuel.

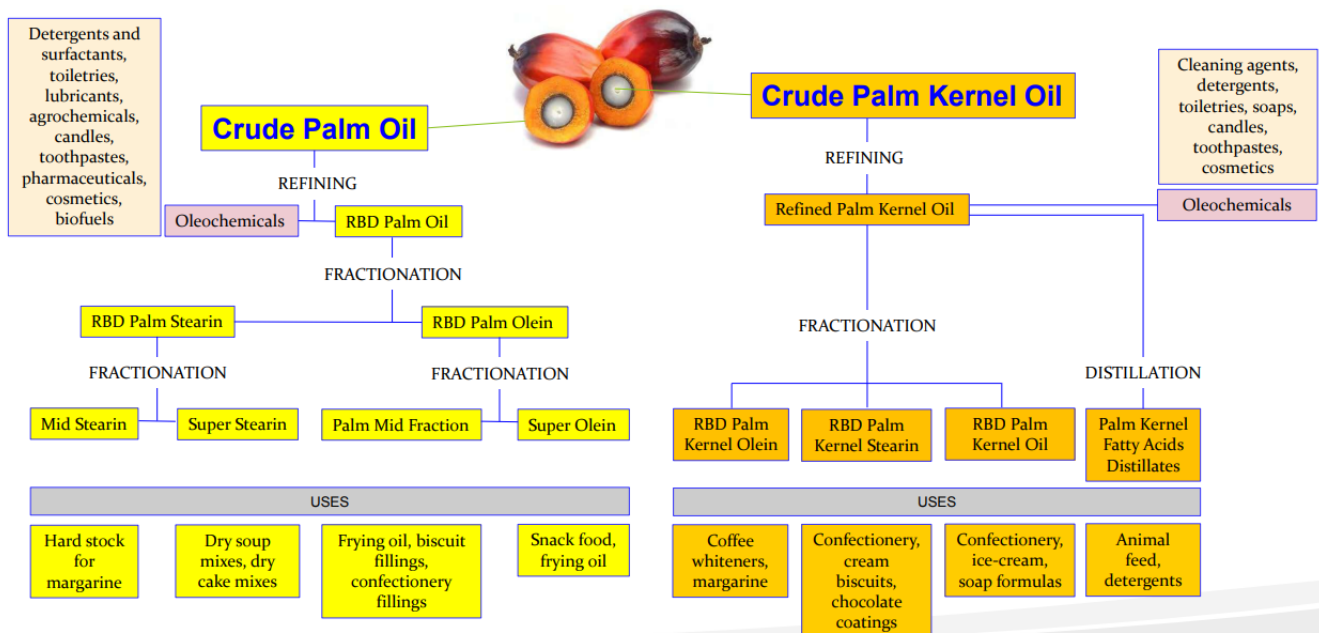
Dr Ruslan Abdullah, Director of SESD at MPOC, outlined that clinical trials proved tocotrienols improve liver health biomarkers in non-alcoholic fatty liver disease patients.

Faisal Iqbal, Director of Marketing and Market Development Division at MPOC, outlined that Philippines is the second largest importer of MPO in the Asia Pacific region with the share of 14% in 2021.

UR Unnithan, President of Malaysian Biodiesel Association (MBA), emphasised that biodiesel provides energy security, reduces GHG emission and promotes economic development.

Mohd Hasbollah Suparyono, Senior Manager of Strategic Management Department at MPOCC, highlighted that MSPO offers a credible and economical instrument, for both G2G and B2B. MSPO also addresses sustainability concerns by consumer, manufacturer, government and financial institution.

Dr Sathia Varqa, CEO of Palm Oil Analytics, presented three key factors to observe in 2022-23. They are supply (weather, production, labour and fertiliser), demand (trade policy and biodiesel), and external factors (related oils and CPO prices).



**Palm Oil is highly PRODUCTIVE,
Full of HEALTH BENEFITS, VERSATILE in its uses & SUSTAINABLE**



Figure 1: Palm oil-derived products (Ruslan, MPOC, 2022)

Roadshow: Forum: Roles of Engineers in the Smart Industry Universiti Malaya

Overview

Regional Chemical Engineering Undergraduate Conference (RCEUC) was organised by the Department of Chemical Engineering at Universiti Malaya (UM). It was held in collaboration with CEUC and IChemE-UM Student Chapter. The event is supported by IChemE's Palm Oil Processing Special Interest Group (POPSIG) and Malaysian Palm Oil Council (MPOC). The Platinum Sponsor to this event is KL-Kepong Oleomas Sdn Bhd (KLK OLEO).

Panel

The panel consisted of Anne Lim May Liang (Division Marketing Manager at Endress+Hauser Malaysia Sdn Bhd), Ir Dr Edwin Lim Chun Hsion (Assistant Professor at Heriot-Watt University Malaysia) and Ir Zulfan Adi Putra (Optimisation Engineer, ExxonMobil Business Support Centre Malaysia Sdn Bhd).

The panel discussed about the IR4.0 development in the smart industry.

Introduction to the IR4.0

Anne has been working in automation industry for 22 years, and seen the transformation of the industry. 90% of the instruments at E+H are digital ready. However, in industry, the customers only use 3% of the data - that is the primary value from the smart device. Using data at higher level allows better decision making. It brings data from OT (physical) level to IT (cloud) layer. Devices can be connected wirelessly and are battery-powered. Today, engineer can access the data wirelessly into the IT layer. On inventory, radar level device on the container is embedded with GPS and sim card. It tracks location and traces liquid level for supply chain management.

Edwin said that he used safety assessment (HAZOP) approach to evaluate IR4.0 in the palm oil industry. He optimised oil palm harvesting and evacuation path using mathematical modelling approach. It determined the shortest path to minimise operating cost. He presented sustainability comparison for various pesticide application technologies. The ROI analysis is vital with the availability of CapEx and OpEx information.

The banner features a blue and white color scheme with a circuit board pattern. At the top left, it displays the logos for IChemE (Palm Oil Processing Special Interest Group) and MPOC. The main title reads 'RCEUC 2022 Plenary Forum Roles of Engineers in the Smart Industry'. Below this, it specifies the date and time: 'Wednesday 17 August 2022 19:30-21:15 MYT (GMT+8)' and includes a 'Join us on ZOOM' button. Two circular portraits are shown: Anne Lim May Liang on the left and Ir Dr Lim Chun Hsion on the right. Below each portrait is their name and title. In the bottom right corner, there is a large '4.0' graphic with a binary code background.

IChemE
Palm Oil Processing
Special Interest Group

MPOC

SUPPORTED BY

**RCEUC 2022
Plenary Forum**
Roles of Engineers in the Smart Industry

Wednesday 17 August 2022
19:30-21:15 MYT (GMT+8)

Join us on ZOOM

Anne Lim May Liang
Division Marketing Manager
Endress+Hauser (Malaysia) Sdn Bhd

Ir Dr Lim Chun Hsion
Assistant Professor
Heriot-Watt University Malaysia

4.0



Expectation from young engineers

Anne shared that digital literacy is important in today's world. Engineers need to effectively use the data and level up to IT layer. She believed that most of the Malaysia's industries today are at IR2.0 or IR3.0. Young engineers need to make good use of data, and low-skilled and routine jobs will be replaced by digitalisation. By pass is a common problem in the industry when the operator cannot handle the advanced technology. She stressed critical thinking in solving very complex problems.

Application of mathematical formulae

Edwin emphasised that the fundamental of mass conservation is important in every application. Anne shared that the design of smart instruments at E+H already has mathematical calculation embedded into the meter. Engineers get the output from the meters and analyse certain parameters to determine some effects, such as corrosion. She highlighted that engineers need to interpret the output from the software while IR4.0 is assisting us in the decision making.

Digitalisation in water industry

Water in Malaysia is owned by the state. She told that each state has different level of digital maturity in water industry. Some states have their own cloud solution. She shared that Netilion, the E+H IoT ecosystem, can have a third party (weather forecast) embedded into cloud.

Anne emphasised that water industry is a very challenging industry. The operator cannot control the water supply because it depends on the weather. AI will be used to model the prediction and expected consumptions. This helps the operator in their operational planning.

Internet accessibility

Connectivity is the key in smart industry. Anne stressed that it is important for the IoT system to collect feedbacks from the ground. In industry, wireless technology is used for monitoring only at present in Malaysia. Wired instruments are still widely used for process plant control.

ROI index

IR4.0 technology provides a unique solution to each operator. Breakeven time is one of the primary concern to adopt a new technology. Anne believed that the majority of the management would agree that IR4.0 adoption is a solution to embrace the change. The government has a programme to provide specialists to comment on the readiness of IR4.0 in the organisation. The change not only involves the machine, but also the people and management.

Mathematical modelling

Instead of just modelling, the industrial company needs to have a green solution while adopting IR4.0 technology.

Cybersecurity

Department of Standards Malaysia is currently looking into cybersecurity in Malaysia. At present, for multinational companies, they follow the guidelines provided by the parent company and HQ. Malaysia is currently working on the legislation of IEC 62443. Anne shared that E+H is following ISO and IEC on cybersecurity.

Roadshow: Keynote Speech: Reimagining Plantations *Delivered by: Dr Harikrishna Kulaveerasingam*

Overview

This year, POPSIG had enormous privilege to have Dr Harikrishna Kulaveerasingam, FASc - Chief Research & Development Officer of Sime Darby Plantation Berhad (SDP) - to deliver a keynote speech during online RCEUC conference at Universiti Malaya. The conference was supported by POPSIG.

POPSIG was delighted to welcome the participation of the President of Malaysian Oil Scientists' and Technologists' Association (MOSTA) Yang Berbahagia Academician Tan Sri Emeritus Professor Datuk Dr Augustine S H Ong at Dr Harikrishna's talk.

Challenges in palm oil industry

It is now hardly possible to expand the land areas because of the commitment made not to clear forest and plant on peatlands. Carbon and water footprints reduction need to be considered on further expansion. The materials used need to be climate resilient.

Journey at SDP

From scientific point of view, Dr Harikrishna believed that the notable achievement at SDP was the genome programme in 2009, and the genome-select planting began in 2016. Digitalisation is still an ongoing commitment at SDP.

Sustainable oil palm growth focuses on two critical areas.

One, yield potential that involves technology embedded in seeds. Two, realised yield that addresses high quality. This can be achieved by processing the bunches as soon as possible to support customers' expectations.

SDP's GenomeSelect™

In 2009, the sequencing was completed. Dr Harikrishna shared that SDP has been breeding crops (oil palm, rubber) for about 80 years. Therefore, it allows the scientists to utilise genomic platform to provide better insights based on the large population that has been collected. It allows to develop improved materials through digital breeding platform; it also develops tools to ensure the products are at high standard. SDP also produces unique IPs and shares publications to drive developments.

The shell of the GenomeSelect™ is thinner, while its mesocarp is a bit bigger. This results in 15% additional oil produced. The commercialised technologies aims to ensure seed purity, to optimise breeding, and to accelerate integration via genomic platform.

Digitalisation

Advanced intelligent seed system is used to track and trace the seeds, so the customers understand if the seeds come from specific crosses. The seeds are randomly conducted with a subjected DNA test to ensure that they are pure.



REIMAGINING PLANTATIONS

by
Dr Harikrishna Kulaveerasingam
Chief Research and Development Officer
Sime Darby Plantation Berhad

Thursday, 18th August 2022

2 CENTURIES OF LEADERSHIP
www.simedarbyplantation.com

200 OLDER. WISER. BETTER. EST. 1821
Sime Darby Plantation

Precision agriculture

One of the challenges at operations was to realise the yield from a commercial standpoint. Although precision agriculture (PA) improves productivity and reduces costs, less than 20% of the agricultural land utilises digital technologies globally. SMART platform has been used to monitor and manage data.

PA unit (PAU) develops satellite and drone imaging for geolocation services. It enables to virtualise water management (flood) for improving drainage system. It is important to deliver the crops to the mills efficiently especially in the case of high yield productions, as the recovered yield and crops freshness are the keys.

Crop recovery

SDP is working with Universiti Putra Malaysia (UPM) on a developing machine with the performance of picking bunches at 30 sec per bunch. It is expected to deliver high productivity and be simple.

Field upkeep & nursery management

Dr Harikrishna showed the new mechanised fertiliser machine with low manuring cost, improved labour usage and faster application.

Milling & refining

SDP is progressing towards a Unified Control Centre. On industrial automation, the company wants to create smart facto-

ry to fully connect the parameters. Predictive maintenance involves software to control everything in the R&D mill, of which this system will be rolled out into the operations. IoT in agriculture will connect operations at the mills with the refineries.

Midstream value chain

Mill is equipped with command and control centres with automation and sensors to allow it to be efficient. Carbon dioxide released can be recycled back by algae farming to reduce carbon footprint. Zero discharge can be achieved where treated water can be used as boiler water.

Way forward at SDP

Dr Harikrishna shared that it is important to conduct proof of concept (POC) trials under commercial conditions to demonstrate the effectiveness and values of technologies. In the immediate term, SDP was targeting at easily implementable solutions, such as drone spraying, PA tools and reduced manual operations. On medium term, they aimed at semi-autonomous machines for improved productivity. For long-term plan, SDP targeted to deploy fully autonomous mechanisation for all operations, i.e. full plantation 4.0 deployment.

Dr Harikrishna underlined that “data is the new currency and data analytics is the new bank”. Data is being collected via digital tools and it is the key to become more efficient and effective at operations.

Get to know Dr Harikrishna Kulaveerasingam

Dr Harikrishna is the Chief Research and Development Officer at SDP. He completed his first degree (BSc) in Plant Sciences from the University of London (Wye College), and completed his PhD in Plant Developmental and Molecular Biology at the University of Leicester. He has over 30 years' post-graduate experience in biotechnology and in 2012 he was inducted into the Malaysian Academy of Science as a fellow.

In May 2009, Sime Darby announced that it has successfully sequenced, assembled, and annotated the oil palm genome exclusively using second generation sequencing technology – making it the world's first company to achieve this scientific break-through using this technology, an effort spearheaded by Dr Harikrishna.

RCEUC 2022 - KEYNOTE SPEECH

REIMAGINING PLANTATIONS

AUGUST 2022

18

THURSDAY

*Harikrishna
Kulaveerasingam*

CHIEF RESEARCH AND DEVELOPMENT OFFICER, SIME DARBY PLANTATION BERHAD

Event is supported by IChemE Palm Oil Processing Special Interest Group and Malaysian Palm Oil Council

Event: IChemE100: Food and Water, Built Environment and Transport, Health

Food and water

On 13 July 2022, ChemEng Evolution organised the IChemE100 webinar with the theme of food and water. At POPSIG, webinars about edible oil production have widely been organised to promote the sustainable production of the food-grade products. Previous POPSIG webinars also addressed the reduction of water usage in the industry to encourage water saving techniques to tackle water scarcity. To produce a high-quality product, biotechnology techniques are used to modify the genetics of the oil palm so the crop can produce higher recovered yields. More importantly, this development allows the oil palm plantation to efficiently generate high production sustainably with a limited hectare of lands.

Built environment and transport

On 10 August 2022, ChemEng Evolution organised the IChemE100 webinar with the theme of built environment and transport. At POPSIG, webinars about biodiesel production have been organised to promote the development of palm biodiesel as the sustainable alternative to the non-renewable fuel. Palm oil clinker can also be used as the sustainable construction material for the sustainable living.

Health

On 14 September 2022, ChemEng Evolution organised the IChemE100 webinar with the theme of health. At POPSIG, webinars about the health value of palm oil have been organised to promote the nutrition value, palm-based nutraceutical products and anti-inflammatory treatment.



Article: Achieving Circular Economy via Co-Pyrolysis of Palm Oil and Plastic Wastes for Biofuel Production

Written by Philip Ting Kin Tien
(Curtin University Malaysia)

The palm oil industry has made effort in raising awareness on the versatile applications of palm oil in both non-edible and edible utilization to dispel the many myths surround palm oil. Although palm oil is commonly used in electrochemical and food oleochemical industries, the increasing demand in energy and fuel resources by consumers had resulted a great interest in the synthesis of biodiesel with palm oil in recent years (Coca, 2022). Given its unique fatty acid profile, palm oil-derived biodiesel has evidently shown to have better flow properties and lower emission of nitrogen oxides during combustion compared with those derived from vegetable oils (Zahan & Kano, 2018). Besides, oil palm is also shown to yield a high amount of oil per hectare of land (tonnes/ha), with a typical production of 3.84 tonnes/ha. This shows that it is 6–9 times more efficient relative to other oil crops such as rapeseed (0.66 tonnes/ha), soybean (0.45 tonnes/ha), and sunflower (0.5 tonnes/ha) (Zulkifli et al., 2010). Also, Levin et al., 2012 mentioned that the poverty levels in countries such as Indonesia and Malaysia can be addressed due to the enormous demand and labour demanding nature of the palm oil industry, with Malaysia witnessing an increase in the area for oil palm cultivation from 3.3 million hectares (Mha) to 5.9 Mha and an increase in the production of Crude Palm Oil (CPO) from approximately 10 million tonnes (10 Mt) to 19.9 Mt ("Economics And Industry Development Division" 2022).

With all these being said, the palm oil industry has its own set

of controversies, such as the excessive generation of waste and deforestation, with Oseghale et al., (2017) reporting that both solid and liquid palm oil biomass had a combined total of 140.96 Mt of waste generated (75.61 Mt of solid biomass waste, 65.35 Mt of liquid biomass waste) in year 2015 and increased to a total of 220 Mt of waste generated in 2020. On the matter of land used for oil palm cultivation, 5.47 Mha were used by 2015, with total land use increasing to only 5.90 Mha by March 2021 (Loh, S.K. & Choo, Y.M., 2012). Besides the increasing backlash from the Europeans (who happen to be the largest crude palm oil (CPO) consumer, behind India (Levin, J. et al., 2012) has led to the establishment of certification agencies such as the Malaysian Sustainable Palm Oil (MSPO), Indonesian Sustainable Palm Oil (ISPO) and the global Roundtable on Sustainable Palm Oil (RSPO) in a bid to ensure global compliance of sustainable oil palm production practices developed by supply chain certification. On the matter of waste generation, Loh & Choo, (2012) reported that every tonne of CPO generates 9 tonnes of biomass waste, which is approximately 171 Mt of biomass generated by April 2022 (CPO production of 19 Mt as of April 2022 (Yaw, 2022), and Hamzah et al., (2019) reported that 77% of agricultural waste in Peninsular Malaysia originates from the palm oil industry. The various waste of oil palm includes mesocarp fibre (MF), pal oil fronds (OPF), palm kernel shell (PKS), palm oil mill effluent (POME), and empty fruit bunches (EFB). Figure 1 below illustrates the composition of palm oil biomass.

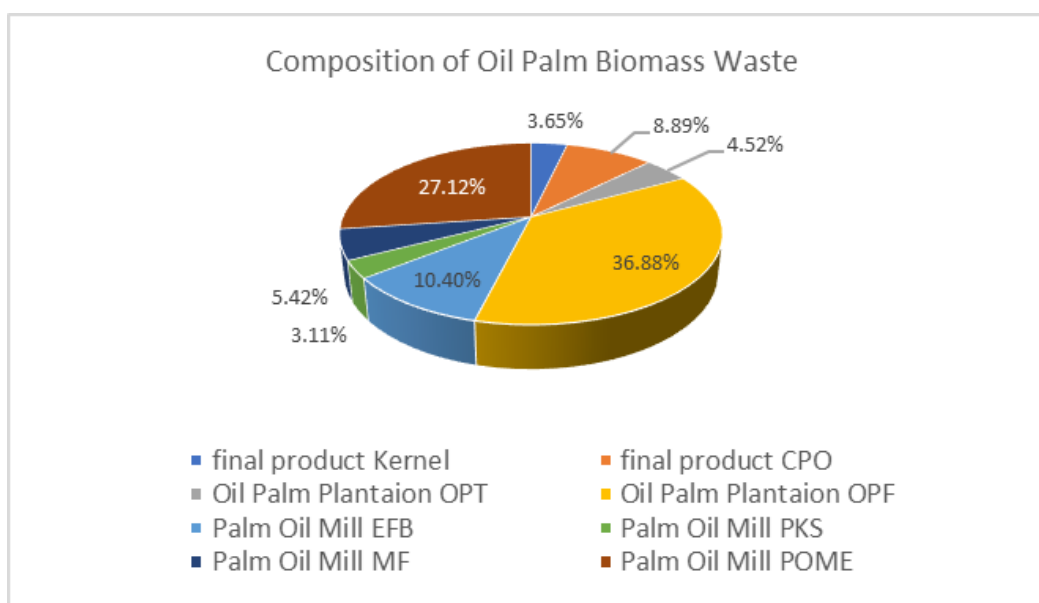


Figure 1: Typical Palm oil Biomass Composition in % (Hamzah et al., 2019; Vijaya et al., 2008) .

In addressing the current issues and meeting the circular economy aspects of the country mentioned in the earlier section, the process of pyrolysis involves the thermal decomposition of materials at elevated temperatures in an inert atmosphere ("Pyrolysis" 2014) could be introduced to address the current issues and meeting the circular economy aspects for our country. The co-pyrolysis process involves two or more materials as feedstock for the pyrolysis process, and this process have shown to improve the quality and quantity of extracted oil, reduce and control biomass waste volume, and more profitable overall compared to the pyrolysis of biomass only (Abnisa and Wan Daud 2014). It was concluded that co-pyrolysis process discharges less air pollutants, making this process a potential alternative to landfilling and incineration usually used for hazardous medical and biomass waste. There are limited to no publications available on the co-pyrolysis of palm oil wastes with medical wastes.

For this work, the authors propose the co-pyrolysis of palm kernel shell biomass waste (PKS) and surgical face mask waste (SGM) as part of the puzzle to achieving a circular economy with palm oil. The circular economy (also known as CE and circularity), is a model of consumption and production that includes leasing, sharing, repairing, reusing, recycling, and refurbishing existing products and materials for as long as it remains feasible (European Parliament, 2022). These goals essentially look at the circulation of materials and products, waste elimination, and the regeneration of nature, and the utilization of PKS and SGM in the pyrolysis proves for the generation of useful products such as bio-oil and bio-char fits the definition of achieving a circular economy.

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Philip Ting Kin Tien

Philip Ting completed Bachelor of Engineering (Honours) in Chemical Engineering at Curtin University Malaysia. He was an Executive Committee at Malaysian Red Crescent Voluntary Aid Detachment Unit No. 57 from 2015 to 2019. He was the Vice Commandant in 2017 and was the Commandant in 2018. Philip received numerous awards including Best VAD Commandant, 2019 (Issued by MRCS Sarawak Chapter), Best VAD Unit 2019 (Issued by MRCS, Sarawak Chapter), and 3rd Runner Up ICMCC 5 Minute Tech Splash 2022 (Issued by IC-MCC).

Article: Substantial Digitalization Potential of Palm Oil Industry for Sustainable Development

*Written by Tan Kah Huat
(Universiti Sains Malaysia)*

Being an edible vegetable oil, palm oil (*Elaeis guineensis*) is extracted from the fruits flesh of palm oil which consists of 50:50 ratio of unsaturated and saturated fatty acid compositions with rich amount of carotenes. It is preferred over other kinds of vegetable oils such as soybean and rapeseed because it can be used for both solids and semi-solids applications without complex process application and causing associative health problems. [1] According to Fig. 1, in year 2021, the global palm oil market was valued at USC 50.6 billion and anticipated to reach USD 70.32 billion by year 2029. Despite an unexpected outbreak of COVID-19, the overall palm oil market remained unaffected as the edible oils are used on a regular basis worldwide. [2]

Meanwhile, digitalization refers the use of leveraging digital technologies and digitized data to enable or improve process. For instances, Sequenced Logic and Proportional, Integral, Derivative (PID) control for process control system. Other than easing the costs, digitalization also enhances productivity and efficiency sustainably. [3] In the era of Industrial Revolution (IR) 4.0, the application of digitalization in palm oil industry promotes economic development by assisting on the marketing of crude palm oil. Also, it ensures the community development by tightening the regulations governing communal trading. Other than that, electronic transaction, as one of the elements of digitalization, brings three main benefits in palm oil industry, which are accuracy, speed, and efficiency. [4] In the recent past, disruptive technologies have brought advancements across many industries, with agriculture at the forefront of these transformations. [5] There are abundant advantages of digitalizing palm oil industry which encourage the people to initiate investment and implementation. Nonetheless, slow transition momentum for palm oil industry towards digitalization has emerged as one of the misperceptions recently. This should be corrected since more and more people are taking the initiatives to involve in digitalization of palm oil industry that boosts its transition.

Malaysia, as the second largest producer and exporter of palm oil, contributes for 25.8% and 34.3% of global production and export respectively. [1] Additionally, it is the first nation discovered to produce and export sustainable and certified palm oil. By taking the three-pronged strategy embedded in Malaysian Palm Oil Board (MPOB) into account, through sustainable development, they plan to instil values towards a high-income country. For midstream applications, advances in

digital technology will assist in refining and fractionation of crude palm oil to produce specialty palm oil products. For examples, fully saturate stearin function, cold stable olein fraction and sharp melting mid fraction. Moving on to downstream applications, digitalization aids in the catalyse transformation of oleochemical industries through operation improvement and growth. For operation improvement, technologies are introduced to especially increase productivity through smart manufacturing and decrease risk through supply chain planning. In the context of growth, through smart products and services, technologies are developed to provide additional revenue or new sources of income. Besides, for the concerns about the quality and safety of palm oil, the nutritional value of palm oil are claimed to be diminished by the inclusion of non-essential trace elements such 3-monochloropropane diol (3-MCPD) and glycidyl esters (GE). The high-tech instrumentation and robotics technology are trusted for their capacity to identify these trace contaminants and remove them as part of the processing supply chain, dispelling concerns about the palm oil quality. Numerous possible transformative technologies that could be applied are also shown in Fig. 2. Here, it could be observed that the palm oil versatility is being reiterated continuously by the industry through various attempts. [5]

As mentioned by the director of Malaysian Palm Oil Council (MPOC) Science, Environment and Sustainability Division, Dr Ruslan Abdullah, In order to maintain global competitiveness and relevance in palm oil industry, it is critical to decrease labour reliance and improve sustainability standards. [6] Therefore, as discussed, industries in Malaysia are working on its way to digitalize palm oil industry. By taking advantages of digitalization, the use of technologies such as Artificial Intelligence (AI), Big Data and Internet of Things (IoT) could escalate the operational efficiency and traceability. The application of satellite imaging could help in a more precise monitoring of broad areas with high level of deforestation and wildfires. Other than that, the growth of palm oil trees could be evaluated from progress and health aspects. By incorporating with AI modelling, the data gathered such as satellite indexes, plantation data, as well as weather forecast data could be utilised to generate recommendations for planting enhancements, surging the yield and sustainability. [6] Hence, it is proved that palm oil industry possesses significant potential and momentum for its transition towards digitalization.

Next, Indonesia is found as the world largest producer of palm oil as depicted in Fig. 3 followed by Malaysia, Thailand, Columbia and Nigeria. [7] By referring to Fig. 4, in year 2023, Indonesia is predicted to produce palm oil empty fruit bunches (POEFB) at around 3,696,174 tons/month. Moreover, by year 2023, it is forecasted that 30 tonnes of POEFB per hectare per year can be utilised as the organic materials and fertilisers for 1,478,470 hectares of oil palm plantation in Indonesia. [8] Since the palm oil industry brings great potential to the country, its plants are always being flourished to provide best efficiency and effectivity such as giant tank farms.

DNR process solutions, a system integrator in Indonesia, has launched a new project recently for the tank farm management system. Profibus PA segments are integrated via Ethernet pnGate PA Gateways to create the prerequisites for IR 4.0 as referred to Fig. 5. Before being transported for further processing, refined palm oil is first stored on-site in large tank farms made up of several massive tanks. The management level inside a tank farm is strived by seamless and efficient integration of the sensor and actuator technologies into the higher-level control system architecture. Thus, integrated inventory and supply chain management and field device monitoring that allows remote monitoring and real-time transparency are enabled. Furthermore, the tanks are each equipped with a radar level gauge, a multipoint thermometer, and a level limit switch. Then, using Profibus PA, temperatures and levels of the current oil amount can be transmitted. The field devices can successfully deliver current data to the tank farm inventory management system immediately and reliably. With further integration into Profinet systems, the gateway is transparent to the system operation that allows the operator to attach specific process and diagnostic data to each of the PA devices. [9] In short, from the processing of raw materials until finished goods, it could be fully integrated efficiently and sustainably with digitalization to provide real-time transparency for total inventory management, improving the overall process and management effectiveness of palm oil refining.

To conclude, there are various technologies that were implemented with some inventions and innovations being carried out at the moment to digitalize palm oil industry especially in the top two leading global countries of palm oil production, Malaysia and Indonesia. Obviously, digitalization technology will continue to bring revolutions to our lives. To further integrate palm oil industry with sustainable digitalization, innovative mindset from industry players together with industrial research and development are greatly needed. [10]

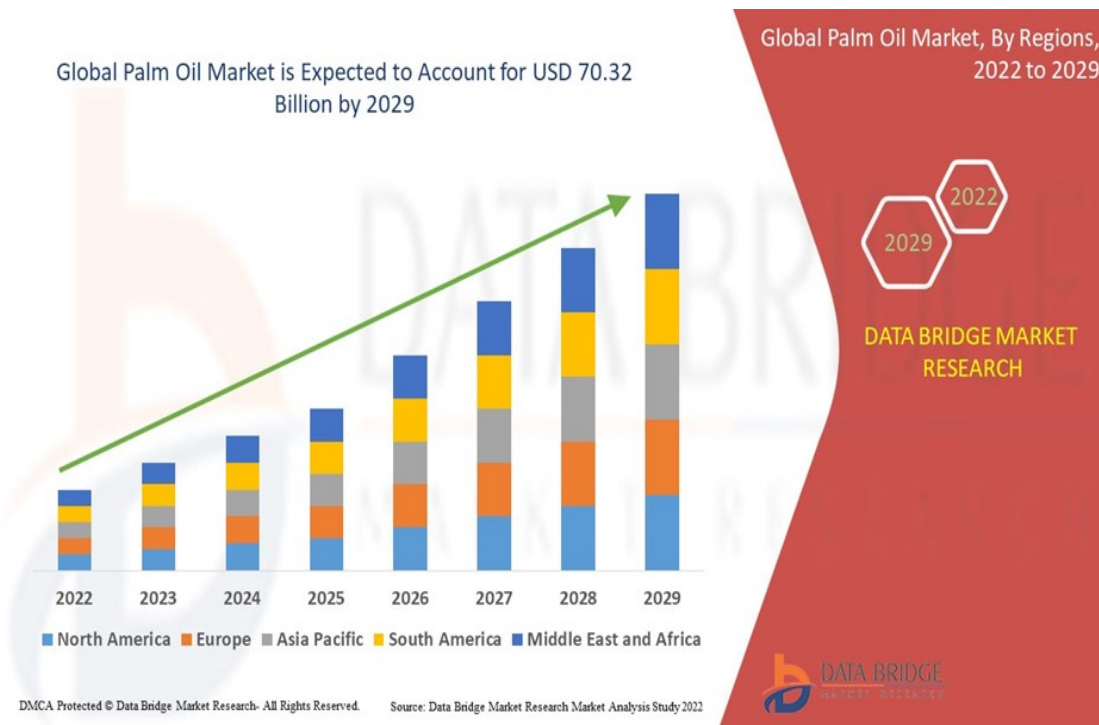


Figure 1: Global Palm Oil Market for Different Continents from Year 2022 to Year 2029 [2]

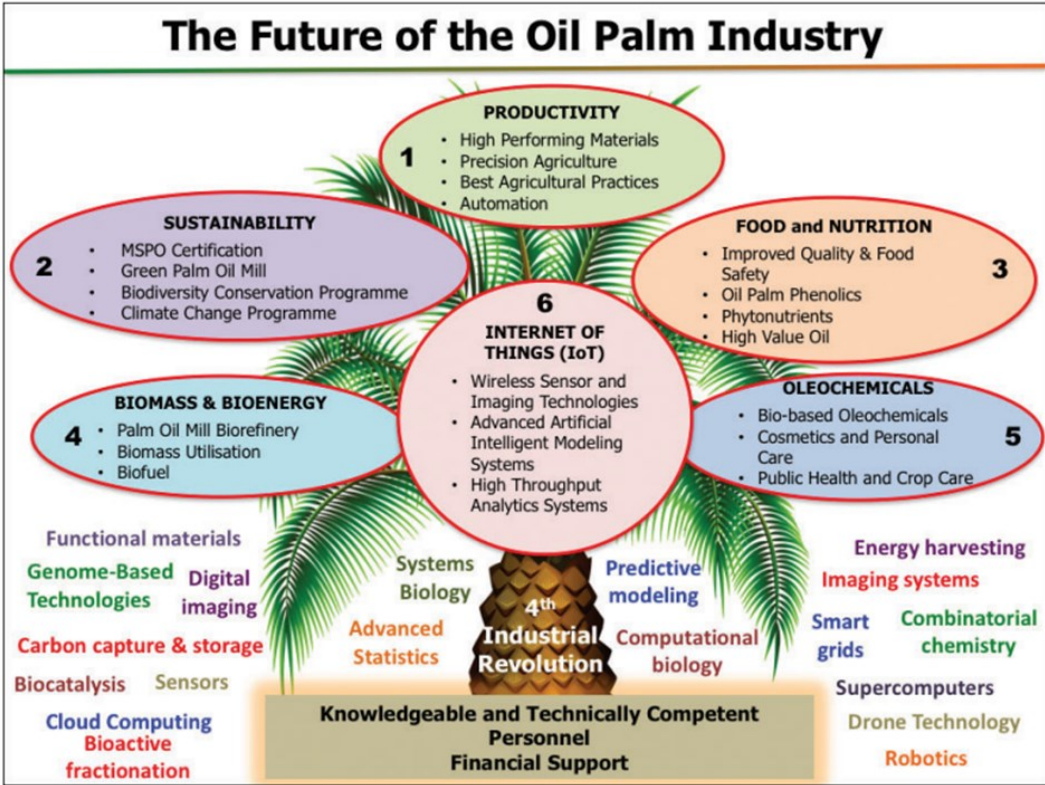


Figure 2: Future of Palm Oil Industry with Transformative Technologies in Malaysia [5]

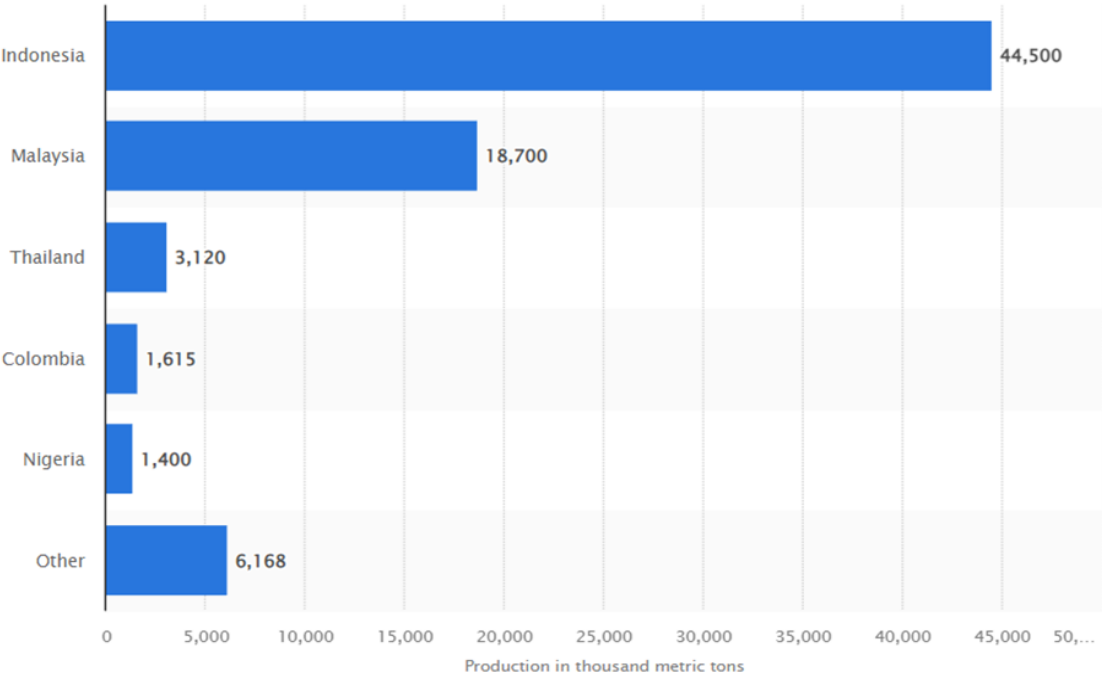


Figure 3: Leading Global Producers of Palm Oil for Years 2021/2022 [7]

Timeline	2019	2020	2021	2022	2023
January	2,958,537	3,160,345	3,362,153	3,563,961	3,765,769
February	2,637,197	2,839,005	3,040,813	3,242,621	3,444,429
March	2,791,973	2,993,781	3,195,589	3,397,397	3,599,205
April	2,739,123	2,940,931	3,142,739	3,344,547	3,546,355
May	2,786,140	2,987,948	3,189,755	3,391,563	3,593,371
June	2,725,293	2,927,101	3,128,909	3,330,717	3,532,525
July	2,826,851	3,028,659	3,230,467	3,432,275	3,634,083
August	2,956,856	3,158,663	3,360,471	3,562,279	3,764,087
September	3,270,116	3,471,924	3,673,732	3,875,540	4,077,348
October	3,044,858	3,246,666	3,448,474	3,650,282	3,852,089
November	2,961,646	3,163,454	3,365,261	3,567,069	3,768,877
December	2,968,718	3,170,526	3,372,333	3,574,141	3,775,949

Figure 4: Forecasted Production of POEFB in Indonesia from Year 2019 to Year 2023 [8].



Tan Kah Huat

Kah Huat is a third-year Bachelor of Engineering in Chemical Engineering student in 2021/2022 at Universiti Sains Malaysia. He has consecutively been awarded Dean's List from Year 1 Semester 1 to Year 3 Semester 1. He was also selected as the Top 6 Winner for Southeast Asia Global Innovation Challenge (SEA-GIC) 2021. In 2021, Kah Huat joined TF-AMD Microelectronics Penang as a Voluntary Intern. He is the Vice President of USM Chemical Engineering Student Society (ChESS) in 2021/2022. He was the President for ChESS Virtual Charity Run 2020, which was awarded Golden Activity of The Year. Kah Huat is awarded TORAY Group (Malaysia) Scholarship from 2019 to 2023. He was also presented Gold Medal & Best Malaysian Young Inventor for 29th International Invention, Innovation & Technology Exhibition (ITEX) 2018.

Article: Sustainable Production of Palm Oil-derived Biodiesel

Written by Abdulqader Mohammed Alawi Bin Sahl, Thuppahimudalige Chandeepea Lakshith Fernando, Bong Zhang Ying, Tharindu Dayan Buddhika Siyambalapitiya,

Osob Abdullahi Mohamud, Shaffaf Thajudheen

Supervised by Ir Dr How Bing Shen

(Swinburne University of Technology Sarawak Campus, Malaysia)

The price drop in crude palm oil (CPO) due to the supply being higher than the food demand suggests that palm oil needs to diversify its downstream products in order to enhance resiliency. One promising way is to utilize CPO to produce biodiesel. Utilizing CPO to produce biodiesel can push toward greener production while meeting the ever-rising energy demands. Therefore, this project presents a sustainable approach to produce palm-biodiesel. To achieve this, a novel research tool (P-HENS) is applied to synthesize sustainable alternative heat exchanger network (HEN) designs that require the least energy consumption and capital investment.

The process plant designed is illustrated in the figure below. Few aspects were implemented in the process design, which includes environmental, safety and control, economy and energy

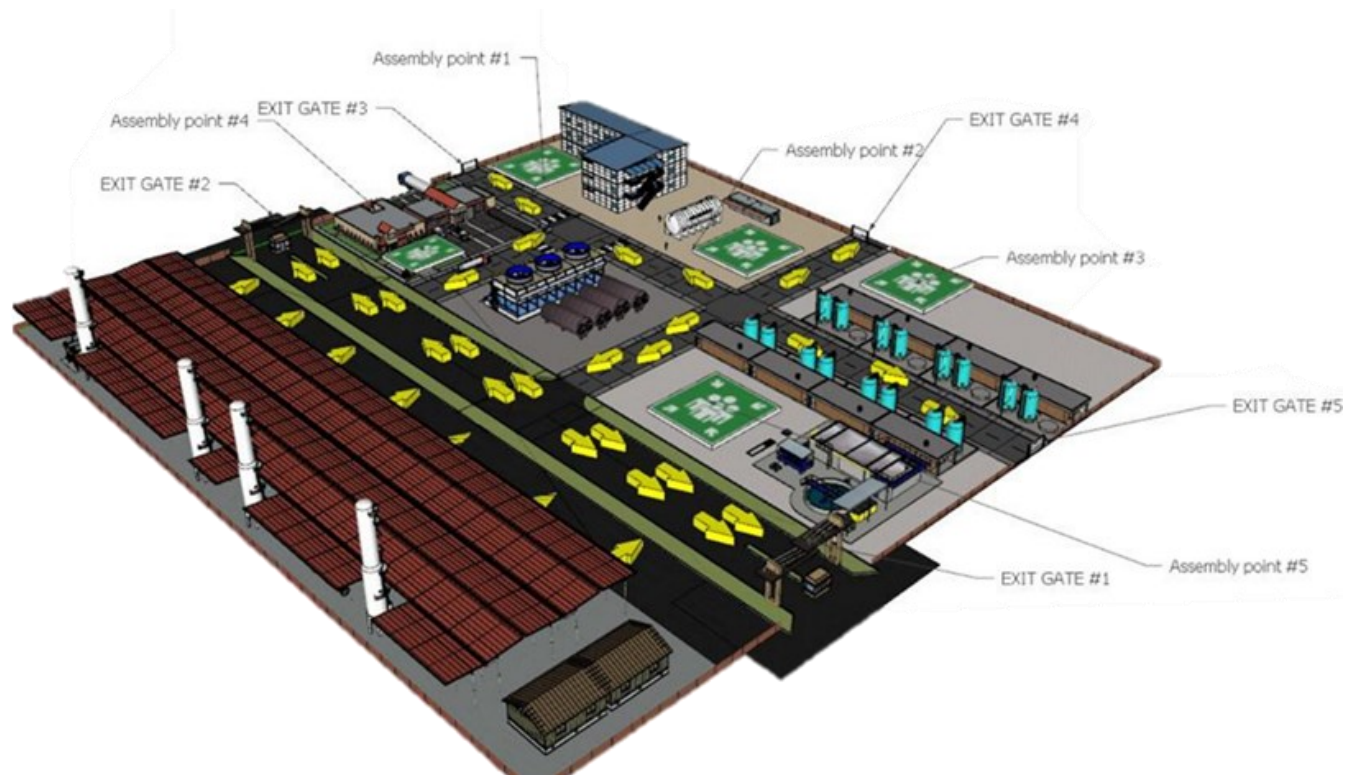


Figure 1: 3D layout of the process plant design.

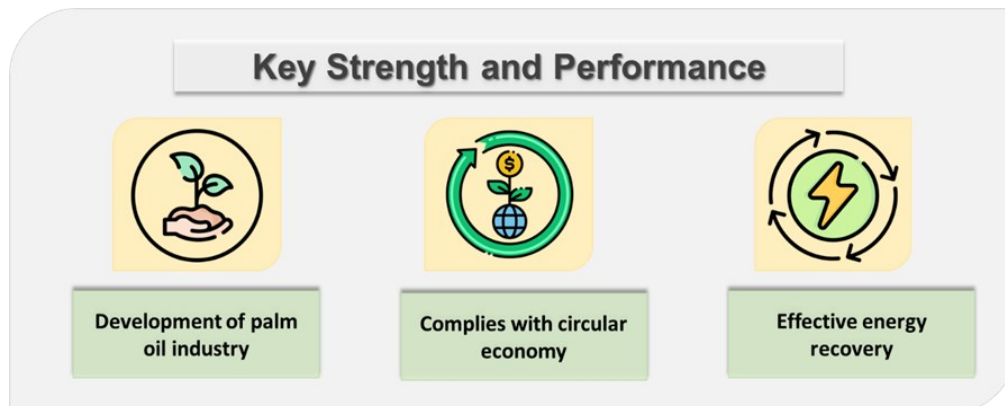


Figure 2: Key strength and performance of the process plant.

Project Aspects



Figure 3: Project aspects of the process plant .

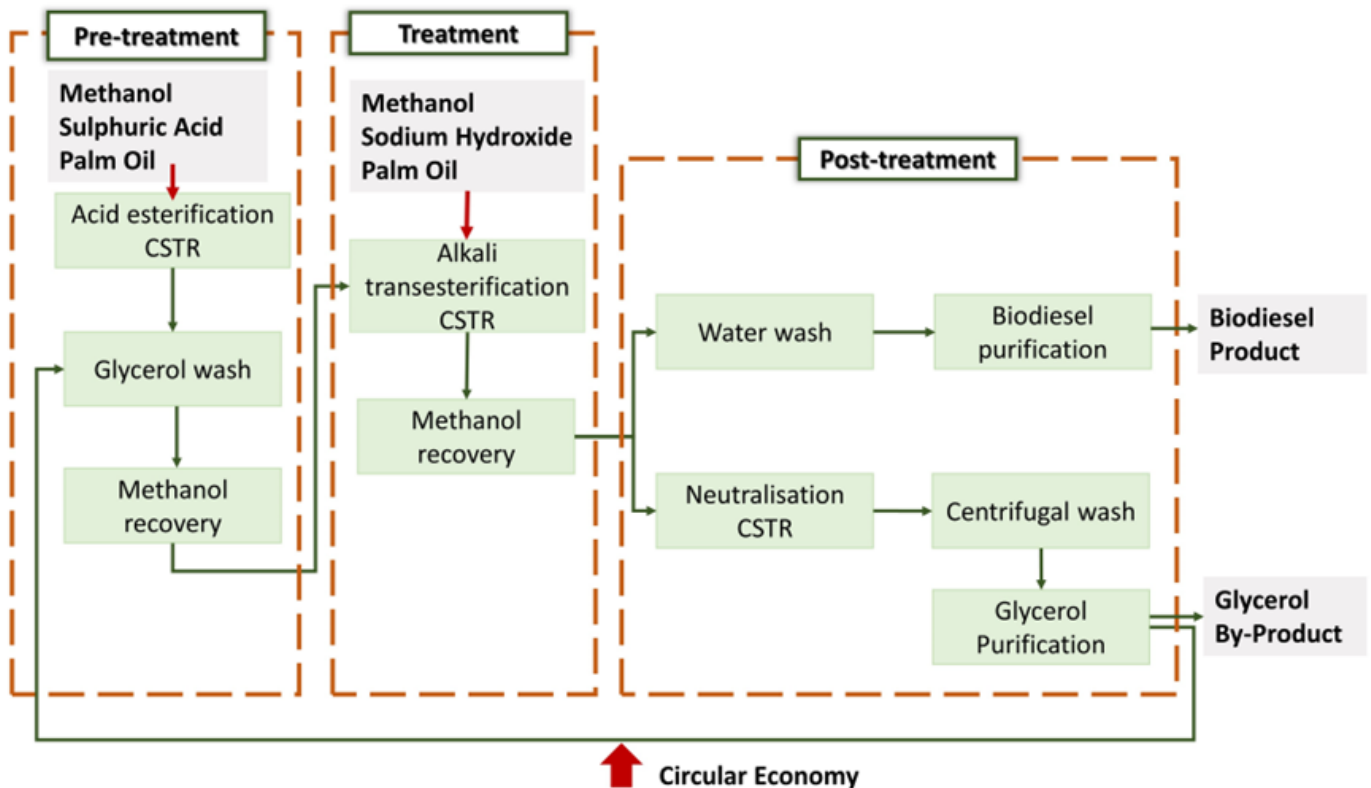


Figure 4: Block flow diagram to produce biodiesel.

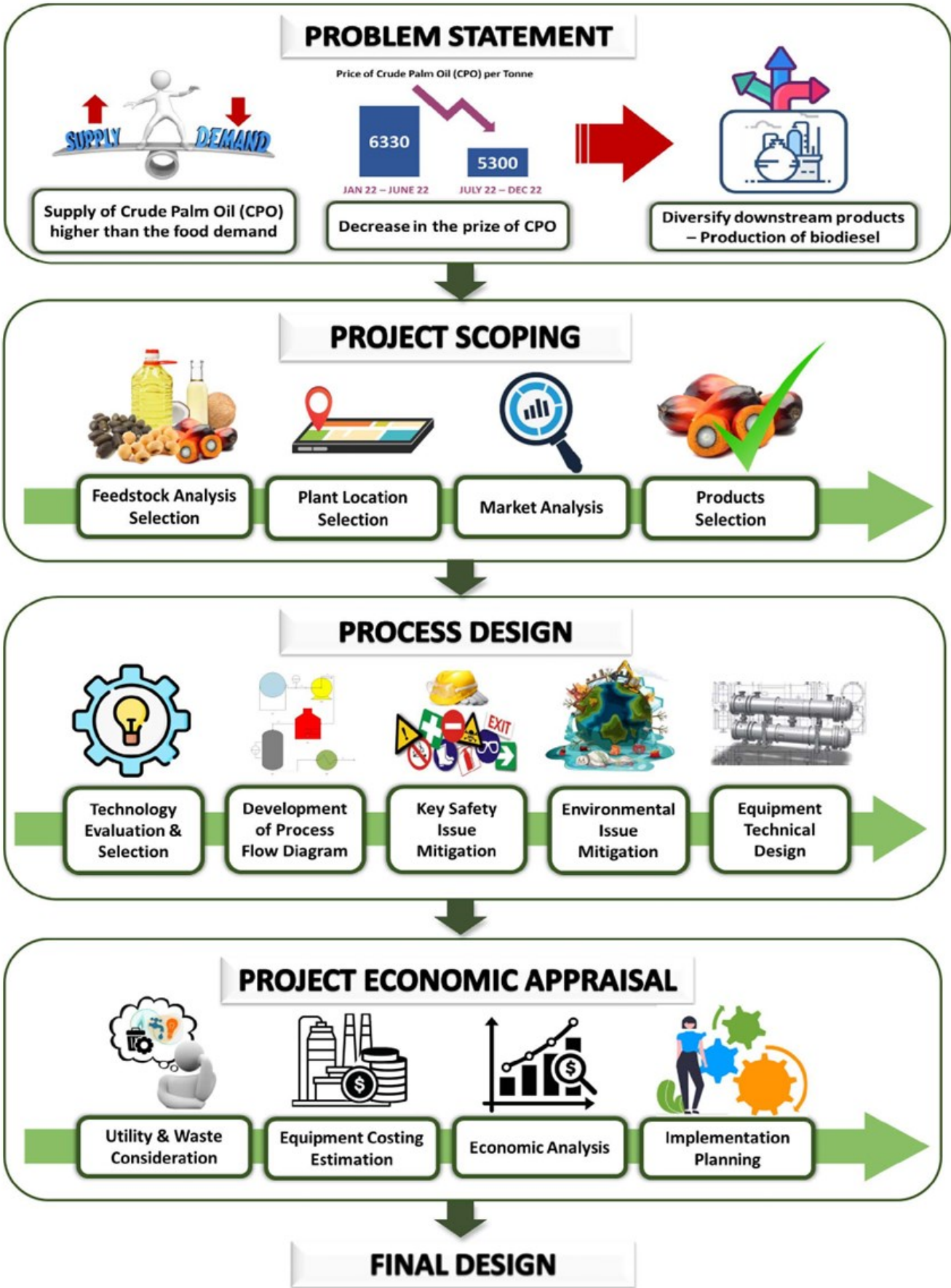


Figure 1: Global Palm Oil Market for Different Continents from Year 2022 to Year 2029 [2]

Personal reflection

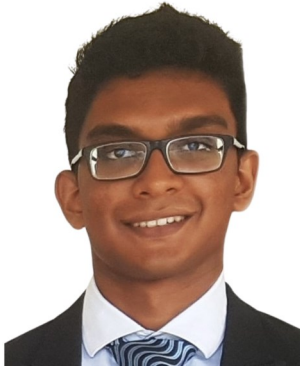
Abdulqader Bin Sahl (Team Leader)



Abdulqader obtained Bachelor of Engineering (Honours) in Chemical Engineering from Swinburne University of Technology Sarawak Campus, Malaysia. He is a Swinburne Emerging Leader chemical engineering graduate. Abdulqader obtained 7 Dean's List Award and 10 Unit Top Scorer Awards throughout his degree. He also obtained the best research paper award at the Swinburne Engineering Final Year Research Project Conference 2022 and two awards at the 32nd Symposium of Malaysian Chemical Engineers (SOMChE). Currently, he is a research assistant on a joint-industrial project with eight months of prior research experience in the process simulation of natural gas sweetening. He also presented in three conferences and published one paper with two journal papers currently under review. He is a committee member at IChemE National Early Careers Committee and was the past President and Event Coordinator at SUTS IChemE Student Chapter.

"I was elated to find out that our final year design project has been recognized as the prestigious POPSIG Best Final Year Award for 2022. This wouldn't have been possible without the team's effort and all the support and guidance from our supervisor. In our project, we have adopted the novel research tool – P-HENS to further optimize both the energy recovery and economic viability simultaneously, which shows the importance of integrating research in industrial applications. We are also trying to highlight that turning green does not necessarily have to reduce economic value; rather, it may retain or even increase profit. Finally, I would like to show my deepest gratitude to IChemE POPSIG and Desmet Ballestra for this opportunity."

Thuppahimudalige Chandeepea Lakshith Fernando

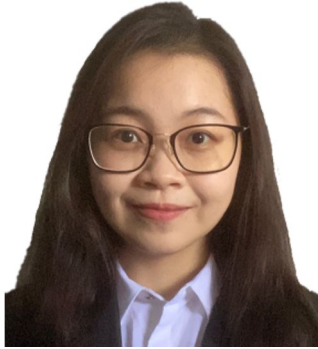


Chandeepea obtained Bachelor of Engineering (Honours) in Chemical Engineering from Swinburne University of Technology Sarawak Campus, Malaysia. He completed his 1st year studies at Australian National College. Chandeepea obtained multiple top scorer and Dean List awards from 2019 to 2022. At the beginning of 2022, he joined AI Turki Enterprises as an intern. He was included in various projects that included generating Process Flow Diagrams and its optimisation – in crude oil extraction sites in Oman. Chandeepea did his final year research project about in-vessel composting utilizing fixed temperature reactors. His research compared the differences between fixed and self-regulating reactors and found out that Monod order was the most suitable mathematical order for simulating fixed temperature reactors.

"Foremost, I want to thank IChemE POPSIG and Desmet Ballestra for giving Swinburne Sarawak this significant award. I was delighted when I first found out that the final year design project from Swinburne Sarawak had been picked out to receive the POPSIG Best Final Year Award for 2022. This award recognizes the wholehearted dedication and effort shown by everyone in the team and our supervisor, Dr How Bing Shen, throughout the entire project. This project emphasizes the use of novel software as well as the implementation of appropriate control mechanisms to enhance the performance of the design. Furthermore, we have also designed the Process Flow Diagram, which is the most fundamental part of our project, in the most energy efficient and economically feasible way which increases the sustainability of the project."

Personal reflection

Bong Zhang Ying



Zhang Ying obtained Bachelor of Engineering (Honours) in Chemical Engineering from Swinburne University of Technology Sarawak Campus, Malaysia in July 2022. She will begin her study for Master of OSH at UNIMAS in October 2022. She was the vice treasurer and vice secretary at IChemE Swinburne in 2020 and 2021, respectively. She completed her internship at TSG Green Sdn. Bhd., an RT- Paulownia lab that produces RT- Paulownia clones by cultivating tissue cultures. She was also involved in the R&D of RT- Paulownia during her internship. Her final year research project focused on the study of promoters to enhance carbon capture in the AWL process. Zhang Ying also participated in National Chemical Engineering Symposium (NACES) 2021, BoChES 2021, and RCEUC 2022.

"I am really honoured to receive this recognition from POPSIG as the Best Final Year Design Project 2022. I deeply appreciate every member of this amazing team for showing relentless effort for this project. On behalf of the team, I would also like to extend our appreciation for the utmost guidance from our supervisor, Ir. Dr. How Bing Shen throughout the journey. Last but not least, to the sponsors, IChemE POPSIG and Desmet Ballestra, thank you for providing this platform for us to apply our domain knowledge in this design project."

Tharindu Dayan Buddhika Siyambalapatiya



Tharindu obtained Bachelor of Engineering (Honours) in Chemical Engineering from Swinburne University of Technology Sarawak Campus, Malaysia. Tharindu obtained Dean's List in 2018 and 2019, along with Top Scorer achievements for several units. He was the co-author for a published a conference paper in process optimization. His final year research project was about the characterization and kinetic studies of the decomposition of oil palm empty fruit bunches derived lignin via green solvent extraction approach. His research focused on identify the vast advantages that are incorporated in using pre-treatment such as low transition temperature mixtures (LTTMs) which was a much eco-friendly approach to conventional treatment methods. Tharindu has also received the Swinburne Emerging Leader Award for skills demonstrated in multiple other areas.

"It was truly an honour to be awarded The POPSIG Best Final Year Design Award 2022. When I find out that our project was selected as the winning team, I was thrilled and very much grateful for the this prestigious award. So I would like thank POPSIG and Desmet Ballestra for this. My team and I worked extensively on this project with the guidance of our supervisor Dr. How Bing Shen. The biodiesel production plant designed in this project incorporates a novel software, P-HENS, to optimize the energy recovery while ensuring economic viability. In addition we have conducted various analysis from economic evaluation to identify ROI as well as environmental assessments to ensure the functionality of the plant is carried out in the most effective and efficient means possible. "

Personal reflection

Shaffaf Thajudheen



Shaffaf obtained Bachelor of Engineering (Honours) in Chemical Engineering from Swinburne University of Technology Sarawak Campus, Malaysia. In 2021, He joined Metito as an intern at the Department of Chemicals. He involved in the operations, assisting the lead project engineer and supervising the overall production line. Shaffaf's final year research was a case study on the energy-intensified extractive distillation process for binary separation of an azeotropic mixture.

"I still feel enormously proud of winning the award. We were up against tough competition from other exemplary leading teams from other universities. It's wonderful to be recognized for the efforts and milestones that we were brave enough to make visible to everyone. This award doesn't just get celebrated by me without mentioning the group's passionate and consistent hard work team guided by our supervisor Ir. Dr. How Bing Shen. I'm overwhelmed that we were narrowed down as the winner. It's incredible and always will be to me. All of this was achieved because of the Swinburne chemical engineering teaching staff that has guided us throughout the journey. Also, all thanks to IChemE POPSIG and Desmet Ballestra for making this award happen."

Osob Abdullahi Mohamud



Osob obtained Bachelor of Engineering (Honours) in Chemical Engineering from Swinburne University of Technology Sarawak Campus, Malaysia.

Ir. Dr. How Bing Shen (Supervisor)



Swinburne Chemical Engineering teaching staff is keen on scholarly teaching, in which efforts are committed to seamlessly introducing research elements into the program syllabus. For instance, multi-solution heat exchanger synthesis is introduced in the design project unit to enable in-depth analysis and optimization of energy recovery systems. It is such a significant recognition to receive this POPSIG award. It motivates us to continue incorporating state-of-the-art research into the fundamental lectures so that our students are well-exposed to cutting-edge knowledge and tools.



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14 JANUARY 2023

8.00 am - 5.00 pm

Dewan Canselor
Tun Abdul Razak (DECTAR)

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- 01 Interact and Engage with Malaysian Industry CEOs
- 02 Career & Internship Opportunities
- 03 TikTok Competition
- 04 Palm-based Food Product Development Competition
- 05 Sustainable Product Innovation from Palm Waste Competition
- 06 Cooking Demonstrations by Famous Chef
- 07 Attractive Prizes to be Won



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THEME: SUSTAINABLE PRODUCT INNOVATION FROM PALM WASTE

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TERMS AND CONDITIONS LINK



UPCOMING EVENTS

DATES	EVENTS
18-19 October 2022	Conference: OFIC 2022—Boosting the Potential of Oil Palm and Its Products
7 November 2022	Webinar: Conversion of Refinery By-product PFAD to Biodiesel by Catalytic and Photocatalytic Processes
16 November 2022	Roadshow: Heriot-Watt University Malaysia (Edible Oil Processing)
22 November 2022	Forum: Circular Economy - Exploring The Industry Symbiosis Within and Outside the Palm Oil Industry
22-24 November 2022	Event: National Chemical Engineering Symposium 2022
9 January 2023	Webinar (TBC)
12 January 2023	Event: MPOB Review & Outlook Seminar
14 January 2023	Event: MPOC CEO Day @ UKM
4-5 March 2023	Roadshow: Universiti Malaya (National Chemical Engineering Exposure Camp 2023)
March 2023	Roadshow: Universiti Putra Malaysia (TBC)
26 March & 1 April 2023	Roadshow: University Malaya-UCSI (IChemE Student Chapter Festival 2023)
3 May 2023 (TBC)	Roadshow: Universiti Sains Malaysia (TBC)
12 June 2023	Webinar (TBC)

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