

A quarterly palm oil newsletter brought to you by
 IChemE Palm Oil Processing Special Interest Group

POPSIG

IChemE



In the News

- | | | | |
|---|---|----|--|
| 2 | Message from Editor | 10 | POPSIG University Roadshow 1st Stop in University Tunku Abdul Rahman |
| 3 | Palm Oil Industry Awards 2019 Finalists | 12 | IChemE Malaysia Board Pays a Courtesy Call to YBM Teresa Kok |
| 4 | Systematic Tool for Sustainable Oil Palm Plantation Development — A response to European Union Resolution on Palm Oil | 13 | Chemical Engineers Support Palm Oil Sustainability |
| 6 | Oil Deodorising — New Technologies and Solutions to Improve Final Edible Oil Quality | 14 | Towards Industry 4.0 in the Palm Oil Mill |
| 8 | PORAM: A custodian of Malaysia's Palm Oil Quality since 1975 | 16 | Revolution in Palm Oil |
| 9 | POSIG & RESCU Go Live! | 18 | Monash University Malaysia Chemical Engineering Exploration Day |
| | | 19 | POPSIG University Roadshow Schedule for 2019 |
| | | 19 | Q4 Diary of Events |



Palm Oil Processing Special Interest Group

POPSIG Committee

Chair

Hong Wai Onn MIChemE

Secretary

Assoc. Prof. Dr. Wu Ta Yeong MIChemE

Treasurer

Mohan Balasingam

Event Coordinator

Liew Sin Lu AMIChemE

Chief Information, Communication and Technology Manager

Oscar Ting Teo Wei AMIChemE

Chief Editor

Dr. Tan Hui Min AMIChemE

Exco Members

Ir. Qua Kiat Seng FIChemE
 Professor Dr. Chong Mei Fong AMIChemE
 Dr. Jeff Kor Yann Kae AMIChemE
 Dr. Viknesh Andiappan MIChemE
 (University Roadshow Coordinator)

Editorial Board

Teoh Jay Kee
 Ho Jia Lynn

IT Team

Lai Ke Qin
 Victoria Gan Mee San

POPSIG gratefully acknowledges our sponsors



Excellence in Oleochemicals



MONASH
 University
 MALAYSIA

MONASH
 INDUSTRY
 PALM OIL
 PLATFORM

Editor's Message

In the Royal Address by His Royal Highness Sultan Nazrin Muizzuddin Shah at the Centenary Conference for the Incorporated Society of Planters (ISP) on 15/7/19 he said, "The relatively slow pace of change may reflect a broader trend in the agricultural sector. Apart from a few exceptions, the application of the recent wave of technological advances associated with the Fourth Industrial Revolution is significantly lagging in this sector. There are some exciting developments in agriculture, however. These include the use of sensors and the Internet of Things to achieve far greater precision in the application of chemicals. Along with the use of drones for delivery, this promises to have a revolutionary impact on the efficiency of chemical usage. This is good news for the environment and for the bottom line. But more and bolder innovation in the sector – with institutional support is necessary to overcome market failures – is clearly needed."

At POPSIG we too are focusing on Industry 4.0. On 4/9/19 Ir. Dr. Tan Chee Fai, Vice-President, Institution of Engineers Malaysia (IEM) spoke at our evening talk on 'Towards Industry 4.0 in the Palm Oil Mill' where he shared his broad experience in intelligent manufacturing in ASEAN, EU and particularly China. Dr. Tan emphasized on the urgent need for a change in mindset to put us on the path to Industry 4.0. Malaysia faces slower adoption rate of Industrial Revolution 4.0 (IR4.0) with only 15 to 20 percent of companies in the country migrating. Our Ir. Qua Kiat Seng wrote for the September/October 2019 issue of Oils & Fats International an article 'Revolution in Palm Oil' where he explores how the palm oil industry can utilize Industry 4.0 in its journey to ensure sustainability and efficiency. You will find more talks lined up in November and December that will tell us how oleochemical manufacturing is migrating and how to implement analytics.

On 20/8/19 POPSIG committee members joined the IChemE Malaysia delegation that paid a courtesy call to YBM Teresa Kok, Minister of Primary Industries. We shared with her how IChemE is helping the palm oil industry and the success of the soft launch at University Tunku Abdul Rahman of the our university roadshow of 24 universities. We are privileged that she will be attending the IChemE Malaysia Awards 2019 dinner where the winner of the Palm Oil Industry Award 2019 sponsored by KLK Oleo will be announced.

Traditionally IChemE Malaysia Royal Patron, Her Royal Highness Queen of Perak Darul Ridzuan, Tuanku Zara Salim will be guest of honour at the IChemE Malaysia Awards 2019 on 14/10/19 at Sheraton Imperial Kuala Lumpur Hotel.

POPSIG is proud to announce another first. On 9/8/19 Ir. Qua Kiat Seng and Dr. Lim Teck Wyn of RESCU were interviewed on BFM 89.9 Q and Eh?: The Palm Oil Industry. They also took calls from listeners who phoned in during the one and the half hours.

Going forward the next year and the half will be very much focused on our university roadshow and we hope that industry players will come forward to support the efforts by our volunteers to share the truth about palm oil with undergraduates.

Palm Oil Industry Award 2019 Finalists

Who will win IChemE Malaysia Palm Oil Industry Award 2019?

The IChemE Malaysia Awards 2019 will be held on 14th October at the Sheraton Imperial Kuala Lumpur Hotel.



Forty finalist entries are in with a chance of winning a trophy for excellence and innovation in chemical, biochemical and process engineering at the Institution of Chemical Engineers (IChemE) Malaysia Awards 2019.



The official finalists for the Palm Oil Industry Award 2019 are:

- IOI ACIDCHEM - *Waste Heat Recovery*
- IOI Pan-Century Edible Oils - *Natural Gas Reduction*
- IOI Pan-Century Edible Oils - *Steam Consumption Reduction*
- Sime Darby Research and Novozymes Malaysia - *Enzymatic Assisted Extraction of Palm Oil*
- Universiti Kebangsaan Malaysia - *Palm Oil Mill Effluent-based Graphenic Adsorbent*

We wish them the very best.

The previous winners of IChemE Malaysia Palm Oil Industry Award:

Year 2015 (Sponsored by KLK Oleo):

'Palm oil olein yield improvement project'

Mr. Toh Seong Hin - Asst VP, Plantation Advisory – Refinery from **Sime Darby Plantation Sdn Bhd.** receiving the 1st Palm Oil Industry Award from Mr. Siew Fook Ming, Project Director of KLK Oleo.

Year 2016 (Sponsored by POPSIG):

'Re-engineering current palm oil degumming process'

Muhammad Saiful Nidzam Ismail of **Sime Darby Research Sdn Bhd - Senior chemical engineer in Oils & Fats Refinery Technical Advisory Services Units** receiving the Palm Oil Industry Award from Hong Wai Onn, Chair of POPSIG.

Year 2017 (Sponsored by Sime Darby):

'Novel Process for Palm Phytonutrient Extraction'

Chin Hui Ling and **Lim Ching Yee** from **Excel-Vite Sdn. Bhd.** receiving the Palm Oil Industry Award from Tuan Syed Said Syed Saggaf - Head of Sime Darby Biodiesel Sdn Bhd, Head of Sime Darby Kernel Crushing Plant, Head of Health & Wellness Business.

Year 2018 (Sponsored by KLK Oleo):



'Vent Economizer'

Chong Zhe Haw and **Hassan Abas** from **IOI Edible Oils Sdn Bhd** receiving the Palm Oil Industry Award from Mr Siew Fook Ming, Project Director at KLK Oleo.

Systematic Tools for Sustainable Oil Palm Plantation Development— A Response to European Union Resolution on Palm Oil

Palm Oil has been a crucial commodity for the past few years where the emergence of palm oil leads to various aspects that are being looked into including:

- Yield
- Economic lifespan
- Years to maturity
- Production cost
- Versatile product
- Diversified market

The 3As: Availability, Accessibility, and Acceptance are significant reasons that could contribute to the growth of the palm oil industry. Global palm oil production has shown continuous increase from 1964 until today. Besides being a more efficient oil compared to other vegetable oil, palm oil is also approximately 15% lower in cost compared to the others.

However, there also setbacks that are raised following the growth of this industry. Core issues highlighted are:

- Palm oil contribution to tropical deforestation
- Carbon emission
- Wildfires
- Biodiversity loss
- Social issues

These are refuted and solutions suggested by the EU Resolution stating that

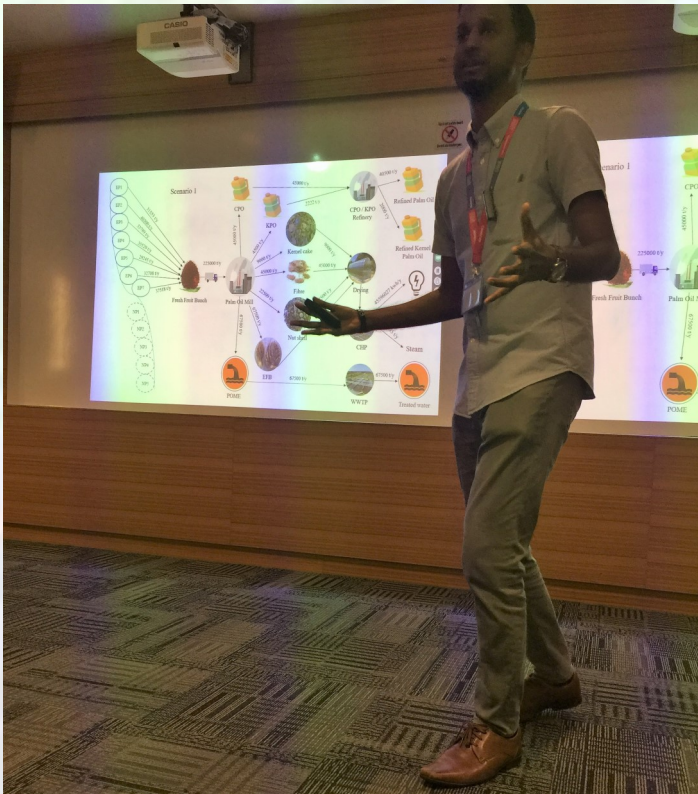
- (i) Other plant-based oils have a much higher environmental footprint & land use;
- (ii) Recognize complexity and emphasizes the importance of developing a global solution;
- (iii) Recognizes importance for conservation of rain forests and biodiversity. Stresses preservation efforts should be combined with sustainable development; and
- (iv) Oil palm - can deliver positive contributions to economic development but, must be responsible and sustainable.

Hence, leading to the need for the research by Dr. Viknesh, which aims to develop decision support tools that aid decision-makers in making systematic and scientific decisions on sustainable oil palm plantation development.

The tool developed actually allows assessment on if expansion is viable, based on:

- LUC cost (cost of all goods and services), planting cost, deforestation and land clearing cost – for palm plantations expansion
- Costs, Carbon and Water Footprints – for expansion of Palm Value Chain
- Assessment of storage options – for Oil Palm Plantation Expansion
- Assessment of required maturity – for Oil Palm Plantations for Future Demand

This can serve as a guide to industry players on the viability of a certain decision prior to actual implementation. It also gives the user an idea on how to optimize for expansion, expansion cost associated, any trade-offs and optimization of capacity to be evaluated.



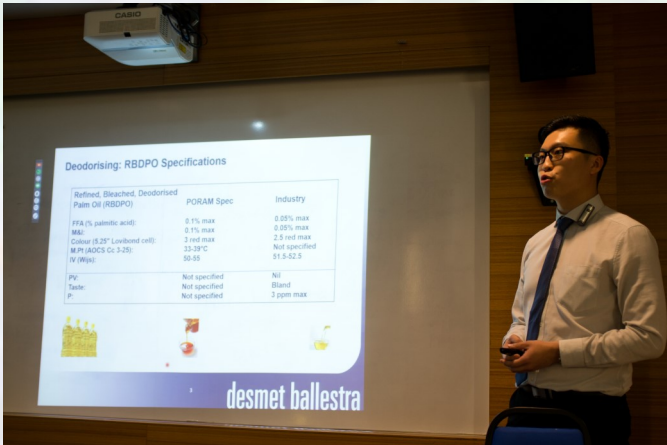
Speaker for the talk, Dr. Viknesh.



Hong Wai Onn, Chairman of POPSIG presenting certificate to Dr. Viknesh.

Oil Deodorising: New Technologies and Solutions to Improve Final Edible Oil Quality

On 29th July 2019 this was the title of the talk delivered by Mr. Chia Ing Chuk who is currently the Asst. Technical Manager in Desmet Ballestra (M) Sdn Bhd. He obtained his degree in Bachelor's of Chemical Engineering with Honours from Monash University Malaysia. He started off as a process engineer in year 2012 and has actively involved in process plant design and plant commissioning in the oil & fats industry since he joined the company.



Deodorising is a crucial part of the refining process to strip volatile components such as free fatty acids (FFA), to remove odour and taste, and finally for thermal destruction of pigments (or heat bleaching).

Desmet Ballestra latest Qualistock™+ Deodoriser is an all-in-one design with small footprint, involve low structural cost and features several benefits:

- Reduced oxidation potentials by performing oil heating and cooling under vacuum conditions.
- High heat recovery efficiency up to 80-90%.
- Low risk of heating coil leakage with free vertical expansion of heating coils.
- Reduced neutral oil loss with redesigned deodorising tray.
- Eliminated need to segregate splash oil.
- High efficiency FFA packed stripper, having subjected to lowest vacuum available in the deodoriser thus reducing stripping steam requirements.
- Low sparging steam requirements by reusing sparging steam injected in lower trays for use in FFA packed stripper.

Palm oil has gained much attention today due to its higher concentrations of 3-MCPD and GE as compared to other food oils, a new challenge to the palm oil industry. The precursor of 3-MCPD is the chlorine content in the crude oil. Current mitigating strategies includes CPO washing and use of natural bleaching earth. For GE, the precursor is the diglycerides content (DAG) in the crude oil and is formed at higher temperatures and longer residence time in the deodoriser.

With the efforts of Desmet Ballestra R&D Centre, several GE mitigation strategies are conceived:

- Dual temperature deodorising: To strip FFA at high temperature and subject to deodorising retention

time at lower temperature to limit GE formation.

- Post stripping: To strip GE from RBDPO at low vacuum pressure.
- Post refining: Post bleaching to remove GE by activated bleaching earth (choice of bleaching earth critical to avoid 3-MCPD formation) followed by mild deodorisation to remove taste.

These solutions involve additional sparging steam consumptions. Any of the strategies above, when applied to an industrial setup, will serve as a provision to the plant. The refiners should be able to adjust sparging steam consumptions according to the required RBDPO specifications. However, utilities related to conventional vacuum system (which has been designed to take the full load) will remain high. An alternative is to adopt ice condensing vacuum system whereby utility savings on vacuum system is now possible when the vapour load from the plant is reduced.

Desmet Ballestra developed its own ice condensing vacuum system, the Sublimax™ 2G, with improved performance over conventional ice condensing vacuum system:

- Falling film evaporation allowing even ice formation and longer cycle time.
- Long cycle time reduces melting frequency and heat loss.
- Smaller chilling unit with lower peak load.
- Low pressure drop reduces utilities concerning vacuum production unit (for deaeration).
- Self-draining of refrigerant and melted ice, reducing electricity consumptions.
- Efficient ice melting by hot water spraying as opposed to steam (more chilling power required to remove excess steam at the end of the melting cycle).
- Low risk of refrigerant leakage with single pipe construction and free vertical expansion of tubes.
- Low system refrigerant volume.

Although 3-MCPD and GE are formed in the refining stages, the precursors are from the CPO quality. The advancements of refining technologies in mitigating 3-MCPD and GE will only work as good as the CPO quality provided. The solution to this problem will only be successful with the joint efforts of the plantation, mill and refineries.



The Q&A session was lively centering on the new technologies including the ice condensing vacuum system.



1



2



3

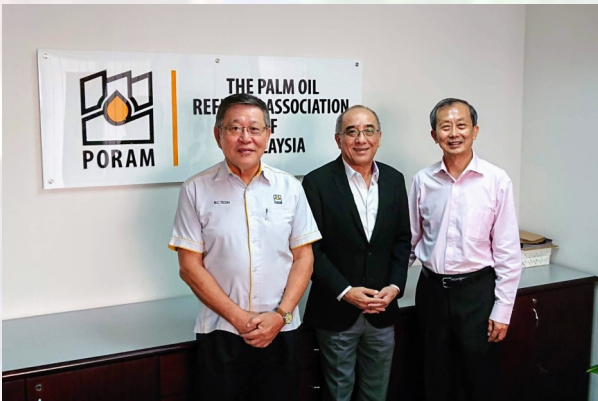


4

1. As the current hot topic, 3-MCPD and GE was also extensively discussed.
2. Ir. Qua Kiat Seng, POPSIG Exco member, presented Mr. Chia with a Certificate of Appreciation at the end of this leading edge technology talk.
3. Participants posed for a group photo at the end of a fruitful evening.
4. Mr. Chia, being a graduate of Monash University Malaysia was eagerly surrounded by lecturer Dr. Wu and undergraduates.

PORAM: A Custodian of Malaysia's Palm Oil Quality Since 1975

IChemE has been meeting up with PORAM regularly since 2008 and over the many years we have established a strong relationship. Ir. Qua Kiat Seng was at the PORAM office in Kelana Jaya on 6th August 2019 to congratulate Mr. Jamil Haron as the new chairman of PORAM for 2019-21. He was elected at PORAM's recent AGM. Mr. Jamil Haron is the CEO of Agri Asia Group.



L to R Mr. Teoh Beng Chuan CEO, Mr. Jamil Haron Chairman and Ir. Qua Kiat Seng, POPSIG Exco member.

Although Mr. Haron has himself kept a low profile now that he is the chairman of PORAM he intends to raise that of PORAM. Together we explored how PORAM could work together with IChemE as well as POPSIG and we agreed to continue the dialogue.

Not surprisingly a few days later Mr. Haron and Mr. Teoh were interviewed by The Star on 16th August 2019 and this is what they said.

"Palm Oil Refiners Association of Malaysia (PORAM) was established in 1975. Over the years, PORAM specifications have become standard for palm oil trade globally. Yet to most Malaysians, PORAM's role in safeguarding the nation's palm oil product quality remains completely unknown.

Newly appointed PORAM Chairman Jamil Haron wants to change that. "No one is highlighting what PORAM is doing. PORAM has been doing fantastic things," he exclaims.

Improving the image of Malaysia's palm oil industry

Jamil stresses that it is vital for the industry to improve its image, especially given the relentless anti-palm oil campaigning from the West. Central to that is the dissemination of information to counter the allegations that palm oil is bad for health and that its cultivation harms the environment.

"We need to improve our image. We have to prove to the world that we are doing something," he says.

As part of the concerted efforts to raise the industry's image, he believes PORAM needs to be more vocal on what it has been doing, strengthen its own public image and visibility, and increase its promotion activities.

"The whole supply chain has to work together to improve the image of palm oil," Jamil stresses.

PORAM specs a global standard

PORAM has been playing a huge role in regulating the quality of Malaysian palm oil products. Back in the 1970s when the industry was still in its infancy, PORAM "started the ball rolling". It formulated the contracts, the specifications and the arbitration rules for palm oil trade that are today widely used globally, says Jamil.

"PORAM has formulated 10 contracts; I was surprised when I found out, honestly. 10 contracts that are internationally recognised. Do you know that if there's an enquiry about processed palm oil, anywhere in the world, they would just say 'PORAM specs'?" Jamil says.

"That means when I sell to you RBD palm oil, I don't have to list out the specifications in detail -- the fatty acid, the moisture, impurities content etc. All I need to put in the contract is 'as per PORAM specifications' and it's understood by both parties," explains PORAM CEO Teoh Beng Chuan.

Due to the wide use of PORAM contracts, PORAM is also the defacto arbitrator in event of disputes between palm oil buyer and seller, even if neither party hails from Malaysia."

POPSIG & RESCU Go Live!

On BFM 89.9

Podcast > Evening Edition > Q and Eh? > Q and Eh?: The Palm Oil Industry

Q AND EH?: THE PALM OIL INDUSTRY

Qua Kiat Seng, chemical engineer | Dr Lim Teck Wyn, forestry researcher
09-Aug-19 18:00



How bad is oil palm cultivation for the environment? Should kids learn about palm oil in schools? A forestry researcher and chemical engineer joins us to answer all your questions on the burning issue of the palm oil industry.

Produced by: Loo Juosie
Presented by: Kelvin Yee, Kam Raslan

Tags: Evening Edition, palm oil, deforestation, MSPO, European Union, land rights, Consumer Goods/Services, Energy, Environment, Culture, History, Heritage

The podcast is available on this link <https://www.bfm.my/podcast/evening-edition/evening-edition/q-and-eh-the-palm-oil-industry>

Ir. Qua Kiat Seng, POPSIG Exco member and Dr. Lim Teck Wyn, Technical Director, Resource Stewardship Consultants Sdn Bhd were on the air from 6 to 7.30 pm to take questions on the palm oil industry.

Commenting on the interview Qua said, "Dr. Lim and myself formed a really good team. We were able to take a whole range of questions from planting of oil palm right down to the end of the supply chain, the consumers."

Every day we read in the media the feud between the Malaysian government and EU over palm oil.

Palm oil is the most used vegetable oil in the world with the highest yield of oil per hectare. Palm oil is widely used in food as it is nutritionally balanced, good for frying, retains the flavor of the food, resistant to spoilage etc. Yet many people in Malaysia do not know about this as well as the efforts being undertaken to make palm oil fully sustainable.

Qua added, "Therefore POPSIG supports YBM Teresa

Kok's Love MY Palm Oil campaign and on its part will over the next 2 years visit 24 universities offering chemical engineering in Malaysia to share with undergraduates the truth about palm oil."

Dr. Lim said, "The BFM interview was an opportunity to hear directly from the Malaysian public about their views on palm oil. As a forester and environmentalist, I was happy fielding questions about these topics and I was most relieved that Ir Qua, with his extensive background in the industry was able to respond to the downstream issues. One hour was hardly enough to do justice to the complex issues that underpin the challenges faced by the industry but I am confident that we gave the listeners assurance that the government takes these issues seriously."



L to R Kam Raslan, Kelvin Yee, Qua Kiat Seng and Lim Teck Wyn

Kam Raslan observed, "Insightful interview on a rarely discussed aspect of a vital, important industry" to which Kelvin Yee concurs.

"I enjoyed listening to the interview. Both of you provided well balanced answers and this is the sort messaging we should be conveying to our consumers and stakeholders. Congratulations. I have forwarded the BFM clip to many industry groups," informed Mr M R Chandran, a renowned 50 year veteran of the palm oil industry.

Ir Rafil Elyas, Principal Engineer and Founding Owner of East-One-Zero-One Sdn Bhd noted, "This is the first time the Fischer – Tropsch process is mentioned on Malaysian radio" in response to a caller who asked about using the Fischer – Tropsch process to produce biofuel from palm biomass.

POPSIG University Roadshow 1st Stop *In University Tunku Abdul Rahman*

In conjunction with the "Love My Palm Oil" Campaign recently set up by Malaysian Palm Oil Council (MPOC) with the aim to spread the awareness and educate Malaysians on the correct information regarding palm oil industry, POPSIG had played its role in supporting MPOC by soft launching the University Road Show that includes talks, forum and industry field visits targeting all 24 universities in Malaysia with Chemical Engineering Course. This initiative will be able to help educate students who are the future of the industry to have the right knowledge on palm oil industry instead of being carried away by misleading information against palm oil that is spreading around in the social media.

Several months of planning and meetings were held to set up the road show programme by POPSIG committee. Finally, the first University Roadshow was successfully launched on 16th July 2019 (Friday), 9am-12.30pm, in Universiti Tunku Abdul Rahman (UTAR) Sungai Long Campus.

First of all, POPSIG community was being introduced to the students by Ir. Qua Kiat Seng who was the founder of IChemE POPSIG. The purpose was to get the students to be aware on the existence of this special interest group where as a member of IChemE, they are eligible for membership, student bursary, best final year project award and other supports offered by POPSIG.

Next, it was an honour to have Dr. Ruslan Abdullah from MPOC to share the insight regarding the palm oil industry to the students. It was indeed an eye opening session for students to understand and know the right facts and issues happening in the palm oil industry. On top of that, Dr. Ruslan also did explained about the "Love My Palm Oil" cam-

paign to gather student ambassadors in playing a part to aid MPOC especially on events to help educate the people regarding the palm oil industry.

After that, Ir. Hong Wai Onn, Chair from POPSIG carried out an interactive session with students to expose and raise students' interest to be a part of the palm oil industry after graduation. In this session, Ir. Hong explained on how relatable palm oil industry is with students majoring in Chemical Engineering Course with the hope that more students with talents will bring the palm oil industry to another advance technology level.

Before moving on to the main event of the day, Mr. Mohan Balasingam from IChemE also briefed the students and lecturers on the importance of getting chartered and the pathway to get chartered by IChemE. Last but not least, the anticipated forum session led by moderator, Dr. Katrina Shak from UTAR with the panelists Dr. Ruslan, Ir. Qua, Ir. Hong and Dr. Steven Lim, assistant professor from UTAR. It was indeed a fruitful session whereby the panelists shared their thoughts on biodiesel, career pathway between oil and gas industry with palm oil industry, and students' role in promoting palm oil from different perspectives such as the industry and academician perspective. Before ending, it was encouraging to have an unannounced visitor to share his passion in palm oil industry to the students as well. This event was pretty much a success and the next roadshow shall be held in Monash University Malaysia on 30th Sept 2019.



Group Photo with Participants.

Souvenir Appreciation Session. From Left: Dr. Shuit Siew Hong, Dr. Mah Shih Keat, Ir. Hong Wai Onn, Ir. Qua Kiat Seng, Dr. Lim Jee Hock, Mr. Mohan Balasingam, Dr. Ruslan and Dr. Steven Lim.



Forum Session. From Left Moderator - Dr. Katrina Shak, Panels -Dr. Steven Lim, Mr. Mohan, Ir. Qua, Dr. Ruslan and Ir. Hong

IChemE Malaysia Board Pays A Courtesy Call to YBM Teresa Kok

Members of the board of IChemE Malaysia paid a courtesy call to YBM Teresa Kok, Minister of Primary Industries, at her office in Putrajaya on Tuesday 20th August 2019.

She asked Zainab about converting palm oil into jet fuel and Zainab shared that PETRONAS is considering making cosmetics from palm oil. Prof. Chan suggested to make the orangutan rehabilitation centres such as Sepilok into a major tourist attraction where the orangutan will work for us instead of against.



L to R Prof Dr. Chan Eng Seng, Zainab Kayat, YBM Teresa Kok, Ir. Dr. Christina Phang, Ir. Qua Kiat Seng, Ir. Hong Wai Onn and Tharshinye Soomaran.



Ir.

Dr. Christina Phang making a point.



When YBM commented about the deplorable state of some of the mills, Ir Hong who has spent many years upstream, told her about better mills he has managed as examples to be emulated.

The Malaysian Palm Oil Council (MPOC), a federal agency under MPI is sponsoring the Student Chapter Award at IChemE Malaysia Awards 2019. Ir Dr Phang invited YBM Teresa Kok to our Malaysia Awards 2019 dinner on 14th October 2019 at the Sheraton Imperial Hotel Kuala Lumpur.

YBM Teresa Kok warmly welcomed us at the end of what would have been a busy and long day for her. After the chair of IChemE Malaysia Ir. Dr. Christina Phang introduced IChemE Ir Qua, founder member of POPSIG, took YBM and members from MPI and MPOB present through the work POPSIG has done since its formation in 2015 to the present day Love MY Palm Oil university roadshow. The first roadshow was successfully held the previous week at University Tunku Abdul Rahman.



YBM Teresa Kok and Ir. Dr. Christina Phang.

YBM Teresa Kok said, "I didn't know you have done so much (for the palm oil industry)." Ir Dr Phang then asked what else IChemE Malaysia could do for her. From this point we could feel the passion that YBM has for palm oil as she shared with us her many ideas to take the palm oil industry forward.

It was already dark when the meeting ended. We were presented with a bottle of YBM's favourite red palm oil in a Love MY Palm Oil bag.

Chemical Engineers Support Palm Oil Sustainability

The MSPO Standards, MS2530:2013 series and the Supply Chain Certification Standard used under the MSPO Certification Scheme is a set of national standards that addresses sustainability and traceability requirements of the oil palm industry in Malaysia. It is now due for review and expected to be completed in 2020.

The MPOCC (Malaysian Palm Oil Certification Council) has on 9/8/19 appointed 2 members of POPSIG to the Working Group Part 4: General Principles for Palm Oil Mills and Supply Chain Standard.

The first Working Group (WG) meeting has started on 12 and 13/9/19 and will continue till the end of 2020.



There were about 25 participants representing the stakeholders. Representatives from Department of Standards Malaysia and MPOCC were in attendance. Seated in the middle in white shirt is the CEO of MPOCC, Mr. Chew Jit Seng.



Ir. Qua Kiat Seng is appointed a Permanent Member. He says, "I served for 5 years on the RSPO Standing Committee on Trade and Traceability and I hope to bring this experience to bear. For me the MSPO is a important differentiator of Malaysian palm oil from that of other countries."



The chartered chemical engineers. L to R Prof. Denny Ng representing ARPOS*, Ir. Hong Wai Onn representing Novozymes and Ir. Qua Kiat Seng representing POPSIG.

**Malaysian academic research on palm oil sustainability.*

Prof. Denny Ng was elected chair of the WG.

As members of IChemE we were pleased to note that in April 2019 YBM Teresa Kok had announced.

1. Limit the country's palm oil area to 6.5 million hectares expected by 2023.
2. Implement the ban on new oil palm cultivation in peatlands and impose stricter conditions on existing palm crops in this area.



Prof Ir. Dr. Chong Mei Fong is appointed the Alternate Member. She says, "MSPO will be an important element to mark our very own commitment towards the sustainable growth of palm oil. I will focus my contribution towards this."

Towards Industry 4.0 In The Palm Oil Mill

"You cannot wait until a house burns down to buy fire insurance on it. We cannot wait until there are massive dislocations in our society to prepare for the Fourth Industrial Revolution."

- By Robert J. Shiller, 2013 Nobel Laureate in Economics, Professor of Economics, Yale University.

Industry 4.0, which is the 4th industrial revolution was promoted in Germany since year 2011. The big move sparked the interest from countries around the world to keep up with the newest trend and invention of technologies in the industry. Our speaker for the talk, Ir. Dr. Tan Chee Fai, Vice-President, Institution of Engineers Malaysia (IEM) started the presentation on how industrial revolution had been developing from time to time. During the early days, plantation and crop productivity were highly dependent - the Agricultural Revolution. As time goes by, human population started to grow and resulted in higher demand. To maintain the balance of supply-demand, factories were built to solve the problem due to the ability to manufacture products in a much higher capacity.

Building factories to manufacture products in a higher capacity to cater for the demand is the starting point for the 1st Industrial Revolution in the UK, happened during 1800s. Mechanical production facilities powered by steam and water were introduced during the era of 1st Industrial Revolution. Discovery of power was then followed by discovery of electricity - the 2nd Industrial Revolution also known as the Electronic Revolution, happened during 1900s. This is the era for division of labour and mass production in the industry. IT Revolution, the 3rd Industrial Revolution was the era for the invention of internet and software, started in year 1969. Controllers were introduced into the production process for process control purposes. This is the era with wide use of electronic and IT systems that further automate the production and cut down the dependence on human labour to improve productivity. After stepping into the 20th century, the rising up of digital inventions such as Wi-Fi and 3G connected the whole world through digital - the 4th Industrial Revolution. Cyber-physical systems such as robots and artificial intelligence were invented.

Ir. Dr. Tan Chee Fai continued his speech with further explanation on Industry 4.0. Industry 4.0, known as 4th Industrial Revolution provides 3 solutions for the industry: Interoperability, Information Transparency and Decentralized Decision-Making. Interoperability is introduced into the industry through process integration for machines, devices, sensors and people that connect and communicate with one another. Information transparency is promoted by using the systems that create a virtual copy of the physical world

through sensor data in order to contextualize information. Results from daily operation are displayed solely based on what is collected and analyzed without interference of human being which greatly improves the transparency of transmitted information. As a result the operation of a company will be less dependent on human being and tends to be error free. The only challenge for implementing control technology into production process is the power supply as well as the speed due to data queuing problems and the delay in data transmission. Decentralized Decision-Making is enabled due to the ability of cyber-physical systems to make simple decisions on their own and become as autonomous as possible. Hence decision-making will be less dependent on human beings too.

Next, Ir. Dr. Tan introduced the policies which have been set by several countries for implementation of Industry 4.0. For example, Denmark implemented 'Innovation Fund' policy for innovative SME's to innovate further; Germany's 'Industries 4.0' policy is promoted to finance projects and applied research centres, tax breaks for investments in tech start-ups; whereas in South East Asia, Thailand implemented '4.0 Start-ups' to sponsor and support local start-ups and Singapore allocated IR 4.0 fund for 'Industry Transformation Programme'. As for Malaysia, implementation of the policy 'Industry 4WRD' has been carried out, but in a slow pace.

The sharing session continued with a presentation on the manufacturing value added by several Asian countries, including Malaysia. In Malaysia, 29% of the manufacturing value added were contributed from electrical and electronic industry, 20% from food and beverages industry, 12% from refined petroleum and coke, 12% from other consumer goods, 10% from chemicals industry and other industries with insignificant contribution on the manufacturing value. He shared the insight with the audiences that the electrical and electronics industry in Malaysia is well prepared for the future. He showed us that Malaysia, having placed in the leading position in the World Economic Forum country readiness framework is having a strong current base and well-positioned for the future. Ir. Dr. Tan continued his presentation by talking on the top 10 factors affecting business performance in Malaysia.

In accordance to the research conducted by the Chinese Chamber of Commerce and Industry of Malaysia, the factors are domestic competition, lower domestic demand due to low population, Ringgit's fluctuations and increase in prices of raw materials, slow implementation of government policies, manpower shortage and change in consumer preference, foreign competition, foreign worker levy and lastly domestic political situation. Domestic competition and lower domestic demand had more significant impact on local business performance among other factors. Hence, measures to overcome domestic competition is to control cost. In order to do so, Malaysia's industry has to cut down on relying human labour and switch to automated system. The significance of the role of government in embracing Industry 4.0 in Malaysia is highlighted in the talk by Ir Dr. Tan through several implementation of policies. Technology advancement is the major transformation driver in Industry 4.0 as cost is lowered down through wide usage of the advanced technology.

The goals of implementing Industry 4WRD is to increase the level of productivity in the manufacturing industry per person from RM106,647 by 30%; to ele-

vate the absolute contribution of the manufacturing sector to the economy from RM254 billion to RM392 billion; to strengthen the Malaysian innovation capacity and capability as reflected by improvement in Global Innovation Index ranking from 35th to top 30; and to increase the number of high-skilled workers in the manufacturing sector from 18% to 35%.

The talk ended with Q&A session. 1st question asked by the audience was how palm oil industry will benefit from Industry 4.0. The benefits gained from Industry 4.0 is the cut down of reliance on human, increase automation and transparency and improve efficiency through wide usage of machineries. Control technologies can be incorporated onto the machineries to improve lead time and ultimately profit can be increased. The implementation of Total Productive Maintenance system together with the technology will result in high efficiency. Followed by another enquiry on why palm oil mills have not embraced all the modern technologies. The slow adoption of Malaysia towards Industry 4.0 is due to the concern of manufacturers on the Return of Investment (ROI). Manufacturers are unlikely to be the first one to apply new technology. However, the transformation must be done before the 'pain' hits us in near future and to get Malaysia onto the path of heading towards Industry 4.0.



1. Speaker for the talk, Ir. Dr. Tan Chee Fai.
2. Audiences listening attentively to the speaker.
- 3 & 4. Ir. Dr. Tan Chee Fai doing a presentation on the development of Industrial Revolution as well as the policies implemented by other countries to embrace Industry 4.0.
5. Ir. Qua Kiat Seng presenting the Certificate of Appreciation to Ir. Dr. Tan Chee Fai as an appreciation for giving a fruitful talk.

Revolution in Palm Oil

By Ir. Qua Kiat Seng

Reprint Issue of OFI Magazine (Sept/ Oct 2019 Issue)

The palm oil industry has gone through different stages of industrial revolution. What is the next step to ensure sustainability and efficiency and how can it utilise Industry 4.0 in this journey?

Digital technology is driving exponential changes which are impacting every facet of society. Within a single generation, the world has gone from slide rules and log tables to personal computers and, more recently, cloud-based cognitive systems. Cognitive computing involves self-learning systems that use data mining, pattern recognition and natural language processing to mimic the way the human brain works. So how does this new industrial revolution impact the palm oil industry?

Industry Development

The Industrial Revolution, now also known as the First Industrial Revolution (Industry 1.0) between around 1760 to 1820-1840, saw the adoption of steam and water power and mechanisation. Industrial technologies that improved farming included the seed drill, the iron plough and the threshing machine. Machines and metal working techniques developed in the late 19th century which eventually resulted in the mass production of agricultural equipment such as reapers, binders and combine harvesters. Industry 2.0 came in the late 1800s, with the advent of assembly lines, mass production and electricity. In the cattle industry, for example, meat packing assembly plants were developed and tallow became more easily available for the oils and fats industry. In the 1980s, Industry 3.0 introduced computers and automation such as the Programmable Logic Controller (PLC), which revolutionised the automation industry. And in more recent years, Industry 4.0 has introduced manufacturing to concepts such as cyber technologies, communication through the Internet of Things (IoT), and cloud and cognitive computing.

What is Industry 4.0?

Industry 4.0 is the marriage of advanced manufacturing techniques with information technology (IT), data and analytics. IT and operations technology (OT) are combined to create value in new and different ways. Underlying this is the availability of advanced manufacturing techniques. For business operations, the benefits of Industry 4.0 are improvements in productivity and reduction of risks. These risks may be in stocks, process safety, quality and contamination. This may manifest itself in smart manufacturing and robust supply chain planning. It can also remove workers from dangerous or tedious jobs, and upskill them with the use of modern tools such as tablets, Google Glass and applying advanced analytics to make predictive and proactive actions.

Applications in Palm Oil

The palm oil industry is at various stages when it comes to Industry 4.0. To break it down, a palm oil plantation would be at the Industry 1.0 stage, the mill in Industry 2.0 and refinery and oleochemical operations in Industry 3.0, with oleochemicals closest to being at Industry 4.0. But within each sector, you can still find the entire spectrum. In 1956, oil palm plantations were encouraged under the 1st Malaysian Plan to reduce dependence on natural rubber. In the 1960s, milling and crushing were the gateway to palm oil processing, first with refining in the 1970s and then with oleochemicals in the 1980s. Oil palm trees are planted in neat rows, similar to rubber trees, conducive to manual tapping or harvesting. However, a shortage of labour is now a problem for plantations. Regular harvesting is a key factor in ensuring quality, including minimising the levels of the process contaminants, 3-MCPDs and GEs. In response, the Malaysian Palm Oil Board offered a US\$1M prize in 2015 for a mechanised harvesting solution. There was no winner and the competition has been closed since 2017. This will remain one of the bigger challenges for the oil palm industry that may need government support and sovereign funds. In plantations, drones are now increasingly utilised. One application is for applying fertilisers and pesticides. As this is a machine operating a machine, data can be collected and used as an example for the next application. It also removes a health hazard for human workers. The application of fertilisers and pesticides may increase chlorine levels in palm oil, which can then lead to increased levels of 3-MCPD. The application and use of analytical data in this way is an example of Industry 4.0 in action.

Milling

In milling, it is interesting to note that the 1953 Mongana Report remains an important reference for mill engineers. It highlights how young the sector is. Examples of changes are the different techniques for sterilisation, from hydraulic to screw pressing. There is also the new Maceration Induced Cell Rupturing Oil Nut Extraction Synthesis (MICRONES) technology, which is a more efficient palm oil extraction method, where the kernel nuts are separated from the palm fruit mesocarp before they enter the press. A large plantation company has commissioned an upscaled MICRONES plant to be built at one of its mills. This plant incorporates supervisory control and data acquisition (SCADA) technology – which is not widely used in the sector – and will bring the mill up to Industry 3.0, and potentially Industry 4.0, level. Many milling processes are generally not automated due to the difficulty in measuring multiple phase systems as well as variations in the fresh fruit bunch. Here, soft sensors could be employed. Soft sensors are inferential models that use easily measured variables to estimate process variables that are hard to measure due to technological limitations.

Refining

Refining began in the 1900s with the vacuum deodorisation of alkali-refined cottonseed oil. The palm oil refining sector has built very rapidly on this. The first physical refinery in Malaysia in 1974 had a capacity of just 100 tonnes/ day. Today, a single fully automated train can process 2,500 tonnes/day. While a heavy throughput leads to efficiency gains, it also means process control is critical. Physical refining is a compromise between colour, free fatty acid levels and optimised stability. This will lend itself to data analytics and the attempt to solve the 3-MCPD and GE issue with short time/high temperature bleaching, and longer residence/low temperature deodorisation. Much of palm oil refining is associated with fractionation and crystallisation conditions which can give rise to a wide range of products. Data analytics can fine-tune this to ensure consistency. The oleochemical industry began in 1903 with the catalytic conversion of fatty acid esters into fatty alcohol. Fat splitting in autoclaves took place in 1905. The first oleochemical plant in Malaysia in 1980 had a production capacity of 30,000 tonnes/year but this has increased to around 250,000 tonnes/year. Just as with refining, there were efficiency gains, which made process control critical. Oleochemical producers have said that some benefits of Industry 4.0 are:

- Greater control over quality
- Predictive asset management
- Soft sensors help improve energy usage and plant efficiency
- Convenience of online sales
- 3D visualisation and virtual reality training

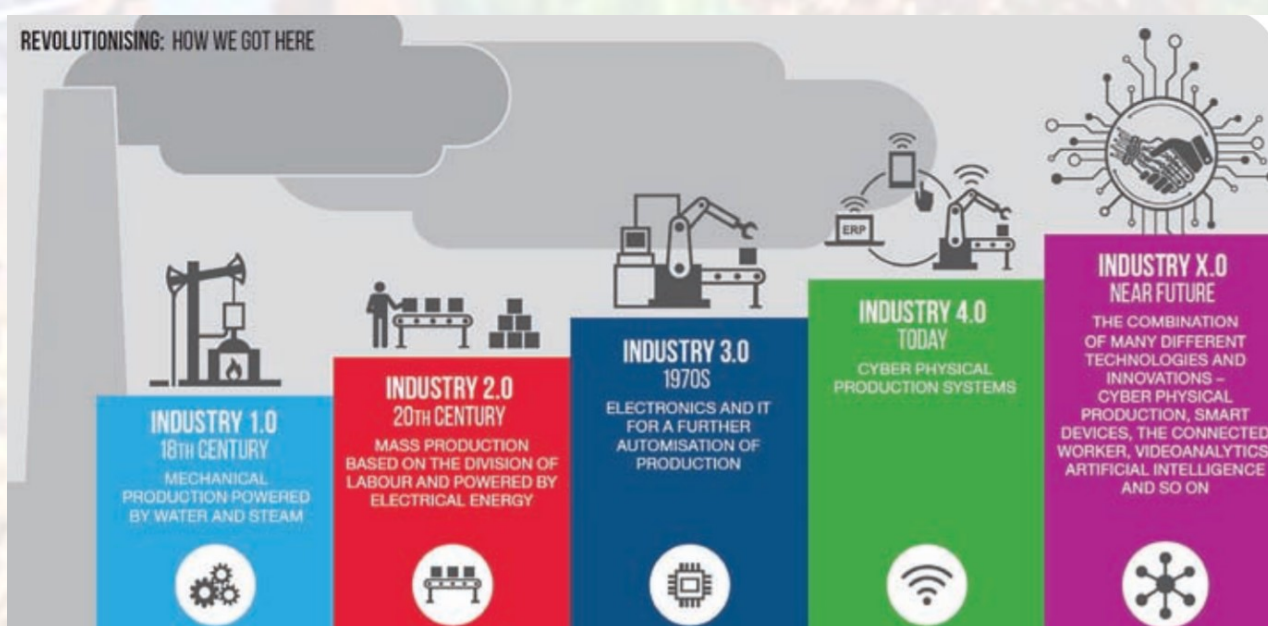
Industry 4.0 is not factory limited

Industry 4.0 also affects a company’s suppliers and customers. Modern information and communication technologies being used down the supply chain will allow distributors to detect defects and production failures. This will minimise overproduction so there is less waste. An example of where this is happening is with Roundtable on Sustainable Palm Oil (RSPO) supply chain certification, that tracks and traces the product to ensure it has been

sourced from certified plantations. This can be an enormous task and companies use enterprise resource planning (ERP) to manage this. Such tracking and tracing may soon be demanded in the supply chain for assurance on 3-MCPD and GE contaminants. Blockchain technology could be used to speed up the process, strengthen traceability and reduce costs. But it is not yet proven. It is an online cloud system designed for transparency and efficiency in purchasing a product. It has already begun to take off in parts of the agricultural sector since it appeals to consumer desire for traceability . There is a vast disparity in the upstream and downstream sectors of the palm oil industry when it comes to technology that allows automation and ultimately Industry 4.0. This is quite different from the oil and gas industry where upstream and downstream are operations are comparable in technology. In its 2019 budget, the Malaysian government has allocated RM5bn (US\$1.2bn) to propel Malaysian industries in the wake of Industry 4.0.

The uncertain future

Industry 4.0 has prompted concerns over job losses. However, Simutech wrote that in Germany, Industry 4.0 has resulted in more jobs being created than lost, with these new jobs requiring different skills. This means companies will need to retrain their workforce to implement Industry 4.0. Another issue lies with production-line downtime. Figures from Rutgers University estimates that downtime costs for the food processing industry is US\$30,000/ hour. Comparatively, the figure for the petrochemical industry is US\$87,000/hour. As more complex machines are integrated into the supply chain, manufacturing will speed up, meaning every minute of production line activity will become more valuable and downtime becomes exponentially more costly. □ Qua Kiat Seng is a chartered chemical engineer with a 32 year career in operations in the palm oil industry



Journey from Industry 1.0 to Industry X.0

Monash University Malaysia Chemical Engineering Exploration Day

Monash IChemE Student Chapter organized its very own Chemical Engineering Exploration Day to introduce and promote the program in a fun and comprehensive manner, and to highlight its importance and application in the world. It's a daylong event with talks, forum and rotation learning stations held on 27 April 2019 at Monash University Malaysia. There were approximately 70 participants presented and majority of them are pre-university and 1st year engineering students.

IChemE POPSIG chair, Hong Wai Onn, was one of the speakers. He shared with the audience on his paper titled - "Chemical Engineers in Palm Oil Processing Industry". Hong covered not only the palm oil industry outlook, but also how chemical engineers can integrate and apply technical knowledge within the industry. He ended his session by sharing the challenges lying ahead and what does the industry expect from chemical engineers nowadays.

In the live survey session after Hong's talk, it's fascinating to note that 91% of the audience were agreeable that chemical engineering is relevant in palm oil processing industry. It was a 10% hike compared to the beginning of the talk. You should see the big smile on faces of Hong as it made the day for him as Chair of POPSIG.



A very successful event with excellent speakers and very engaging participants



Lee Chin Loong, President of Monash IChemE Student Chapter presenting Hong with a token of appreciation



Forum session: (L to R) Hong Wai Onn, Gajeshwaren, July Tan, Khor Bee Chin and Alastair Tait

POPSIG University Roadshow Schedule for 2019

No.	University	Month	Date
1.	University Tunku Abdul Rahman	August	16th
2.	Monash University Malaysia	September	30th
3.	University Malaya	October	9th
4.	Xiamen University Malaysia	November	6th
5.	University Nottingham Malaysia	December	4th

For more details please visit:

<https://www.icheme.org/membership/communities/special-interest-groups/palm-oil-processing-sig/events/university-roadshow-2019-2020/>

Q4 Diary of Events (2019)

Evening Talk: **Oleochemical Manufacturing and Industry 4.0**

Speaker: Fredrik Pomrehn, JJ-Lurgi Engineering Sdn. Bhd.

Date: 4 November 2019

Time: 18:00—20:30 (GMT+8)

Location: Seminar Room 6-2-14, Monash University Malaysia, Subang Jaya, Selangor, Malaysia

Evening Talk: **Journey to Implement Analytics**

Speaker: Ir. Mohd. Sabri Zakaria, AZ Sepakat Sdn Bhd

Date: 2 December 2019

Time: 18:00—20:30 (GMT+8)

Location: Seminar Room 6-2-14, Monash University Malaysia, Subang Jaya, Selangor, Malaysia

IChemE offices

Global Headquarters

UK

Tel: + 44(0) 1788 578214

Email: membersupport@icheme.org

Australia

Tel: +61(0) 3 9642 4494

Email: austmembers@icheme.org

Malaysia

Tel: +603 2283 1381

Email: malaysianmembers@icheme.org

New Zealand

Tel: +64 (4) 473 4398

Email: nzmembers@icheme.org

Singapore

Tel: +65 6250 0385

Email: singaporemembers@icheme.org

IChemE is a registered charity in England and Wales, and a charity registered in Scotland 9SC 039661)

www.icheme.org