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ECONOMIC EMPOWERMENT FOR NATIONAL PROSPERITY

The *empowerment* of the *Bumiputera economy* is a vital step for *Malaysia's advancement*. Imperative to this is the ability to provide the *right opportunities, resources* and *support* to promote an inclusive ecosystem that is able to harness the nation's full potential and fuel economic growth.



At SIRIM, we are at the helm of these initiatives, diligently pursuing groundbreaking innovations that hold immense promise to revolutionise the country's economic landscape. From pioneering organ-on-chip technology and establishing an ethylene oxide (EtO) sterilisation facility to leveraging marine organisms to enrich chicken feed for the production of fortified eggs, we look forward to serving the needs of local industry players while also ensuring that global demands are tapped into and met. Concurrently, efforts to establish smart factories, enhance technical and vocational education and training (TVET), and improve calibration capabilities are laying the foundation for a comprehensive ecosystem geared towards national prosperity.

As the world evolves at a tremendous speed, we have to adapt to stay relevant. We look forward to not only modernising existing industries but also creating new possibilities for entrepreneurship to pave the way for our sustainable economic development. Discover how we can help you, today!



ADVISOR

Dato' Indera Ir. Dr.
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CHAIRPERSON

Nor Azlan Mohd Ramli

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Hasmafatiha Harun
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For further information on the articles featured in this magazine, please contact:

Group Marketing
SIRIM Berhad

Tel: 03-5544 6000

E-mail: publications@sirim.my



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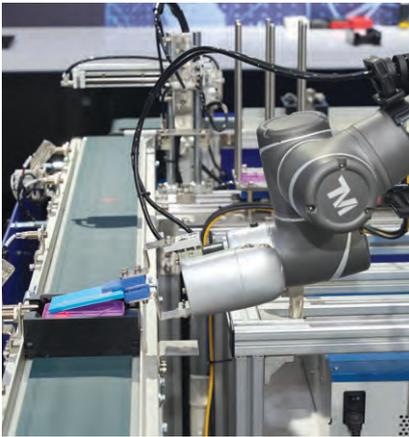
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SIRIM

leads the way in Malaysia with the introduction of cutting-edge technologies to give the local economy a boost

In a world defined by volatility, uncertainty, complexity and ambiguity (VUCA), innovation is a cornerstone for businesses to thrive. SIRIM leads the way in Malaysia with the introduction of cutting-edge technologies to give the local economy a boost.

paving the path forward



We want to promote an innovative culture across industrial research by encouraging cross-disciplinary collaboration among engineers, scientists, policymakers, and subject matter and industry experts. This would allow us to approach complex problems from multiple perspectives.

PAVING THE PATH FORWARD

by
Ir. Ts. Dr. Muhammad Izzal Ismail
Chief Technology Officer, SIRIM Industrial Research

Fostering a culture of innovation is necessary for driving economic growth and empowering local communities in Malaysia. At the heart of this lies a strategic imperative to promote a robust business mindset and entrepreneurial ecosystem.

In a bid to unleash the full potential of the nation's economy and unlock new opportunities among local industry players, SIRIM Industrial Research (SIRIM IR) is, among others, encouraging the spirit of innovation across its strategic centres.

"We want to promote an innovative culture across industrial research by encouraging cross-disciplinary collaboration among engineers, scientists, policymakers, and subject matter and industry experts. This would allow us to approach complex problems from multiple perspectives," stated Ir. Ts. Dr. Muhammad Izzal Ismail, Chief Technology Officer, SIRIM IR.

In facilitating this, employees are empowered to contribute ideas and solutions for process improvement. They are encouraged to identify opportunities for waste reduction and productivity enhancement by providing suggestions and participating in various programmes, initiatives and innovation challenges.

In its commitment to providing vital business support for small and medium enterprises (SMEs), its mission is clear.

"Our aim is to deliver high-quality and sustainable innovation to government, industry and society to foster economic growth, enhance industry competitiveness and enrich quality of life," said Dr. Muhammad Izzal.

Three key strategies have been outlined to achieve this:

- to grow the company's revenue;
- to protect the research and development (R&D) core by enhancing its capability and activities to align with the national roadmap; and
- to strengthen the workforce and enhance cultural beliefs.



These strategies will drive the development of its four key pillars, namely:



Energy and Environment Centre (EEC)

Leveraging over 25 years of expertise to consistently deliver state-of-the-art facilities and accredited laboratory services, strategically prioritising end-to-end, reliable and tailored solutions, and ensuring competitive pricing



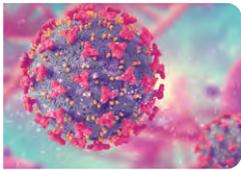
Life Sciences Centre (LSC)

Drives Life Sciences 4.0 forward with accredited GLP OECD & ISO 17025 testing, GMP pilot-scale manufacturing and pioneering biotech research and development, tailored for both local and international industries



Smart Manufacturing Centre (SMC)

Provides end-to-end engineering services and develops customised components, machines and systems while strategically enhancing its engineering services, including foundry, machining, fabrication, reverse engineering and additive manufacturing, developing comprehensive technical training programmes and implementing robust technology assessment and verification processes



Advanced Material Research Centre (AMREC)

Leverages its strengths in GreenTech-Biodegradable Products, the National Rechargeable Battery Testing Centre for EV battery ecosystem development in Malaysia, the Ethylene Oxide Sterilisation Centre, the Medical Device Innovation Centre and the Advanced Composite Centre to drive innovation and industry leadership

EMBRACING NEW TECHNOLOGICAL TRENDS

Among the myriad of emerging technological trends, Dr. Muhammad Izzal highlighted several advancements across the four pillars.

SIRIM is actively engaged in the R&D of:

- energy and grid storage
- circular economy
- precision medicine
- gene editing technologies
- biopharmaceutical technology
- stem cell research
- neuroscience
- digitised manufacturing processes
- 3D printing for manufacturing complex products

And more...

The Energy and Environment Centre focuses on promoting waste reduction and resource efficiency

through a circular economy framework.

“We uphold the values of environmental justice. Our technological solutions, products and services are not only directed at clients’ financial efficiency, but also provide solutions to the environmental impact,” he said.

The technologies are essential for transitioning to sustainable energy sources and reducing reliance on fossil fuels, thus mitigating climate change and enhancing energy security. It is also crucial to promote waste reduction, resource efficiency and sustainable practices across industries to contribute to green environmental conservation, pollution mitigation and the transition towards a circular economy model.

3 key strategies

- GROW** the company’s revenue
- PROTECT** the research and development (R&D) core by enhancing its capability and activities to align with the national roadmap
- STRENGTHEN** the workforce and enhance cultural beliefs

Our aim is to deliver high-quality and sustainable innovation to government, industry and society to foster economic growth, enhance industry competitiveness and enrich quality of life.

We uphold the values of environmental justice. Our technological solutions, products and services are not only directed at clients’ financial efficiency, but also provide solutions to the environmental impact.

4 key pillars

- Energy and Environment
- Life Sciences
- Smart Manufacturing
- Advanced Material Research

In today's dynamic business environment, organisations are constantly seeking ways to enhance their operations. By harnessing the strengths of SIRIM and tapping into global platforms like the World Economic Forum, international conferences and market intelligence, we look forward to adapting global knowledge and insights to our local context.

Currently, there is no other centre for testing batteries in the country. The NRBTC is mandated and funded by the government, not just for testing batteries, but also for providing certification. For example, a crucial standard is UN38.3, ensuring safety and quality. Batteries tested at the NRBTC that adhere to the standard will then receive the relevant certification, enabling exportation overseas.

A Gold Standard

for Battery Testing

The United Nations established the UN38.3 testing to ensure the safety of lithium-ion batteries during transportation. The test protocols are designed to replicate a wide range of extreme conditions that the batteries may encounter during international transportation via air, water, rail or road transportation, and ensure that they remain stable and safe.

The Life Sciences Centre aims to develop technology for healthcare applications through support in technology research, assessment and pilot plant scaling up. Its goal is to enhance quality of life by providing Malaysians with the best technologies and products that promote wellbeing in health and beauty at affordable prices.

These include precision medicine, which tailors treatments based on genomics; gene editing that offers precise genetic modifications; biopharmaceutical technology, which is advancing biomanufacturing for drug development; stem cell research that focuses on regenerative therapies and disease modelling; and microbiome for cosmetic products that maintain or restore the skin's natural microbial balance.

The Smart Manufacturing Centre's primary focus is on Industry 4.0, where it assists the manufacturing industry, particularly SMEs, in digitalisation and automation.

"Meanwhile, in terms of additive manufacturing, we employ 3D printing technology to produce complex and customised products," elaborated Dr. Muhammad Izzal.

Another point of focus is the optimisation of supply chains via data analytics to enable organisations to drive efficiency and agility throughout their processes.

"In today's dynamic business environment, organisations are constantly seeking ways to enhance their operations. By harnessing the strengths of SIRIM and tapping into global platforms like the World Economic Forum, international conferences and market intelligence, we look forward to adapting global knowledge and insights to our local context," explained Dr. Muhammad Izzal.

AMREC is actively involved in the advancement of technologies in fields such as biomedical research, advanced materials and smart

energy storage systems which offer significant benefits and importance across various sectors.

"Our work in advancing battery storage technologies signifies our commitment to shaping a sustainable energy landscape for the future," he added.

Collaborative efforts with the right partners within the economic ecosystem are necessary – be they government agencies, industry, academia, suppliers or other stakeholders. As a wholly owned government entity that employs research and technology to nurture the growth of SMEs, SIRIM is ideally positioned to catalyse this.

GROUNDBREAKING INITIATIVES

Among SIRIM's latest achievements are the establishment of the first National Rechargeable Battery Testing Centre (NRBTC) in SIRIM Kulim, an ethylene oxide (EtO) sterilisation facility in Permatang Pauh and the development of organ-on-chip (OOC) technology.

The NRBTC will focus on testing a wide range of rechargeable lithium-ion batteries and electric vehicle (EV) lithium-ion batteries, addressing a crucial need in the burgeoning EV industry.

"Currently, there is no other centre for testing batteries in the country. The NRBTC is mandated and funded by the government, not just for testing batteries, but also for providing certification. For example, a crucial standard is UN38.3, ensuring safety and quality. Batteries tested at the NRBTC that adhere to the standard will then receive the relevant certification, enabling exportation overseas," explained Dr. Muhammad Izzal.

The EtO sterilisation facility, on the other hand, is a scaled-down version to cater to SMEs in the medical device sectors.

"The existing EtO sterilisation

facilities in the country cater to larger volumes. Our aim is to provide an option for smaller-scale medical device manufacturers at a more affordable cost," explained Dr. Muhammad Izzal.

The OOC technology is an exciting new development for Malaysia's medical research scene, offering micro-scale models of human organs on small chips or plates. "This technology has a huge potential to revolutionise drug development as well as disease modelling and personalised medicine," he remarked.

While previously, drugs and other products had to be tested on animals to affirm their safety and efficacy, OOC technology eliminates this. Furthermore, testing via OOC can yield more accurate results.

At present, OOC technology is predominantly being developed overseas. By embarking on this journey, SIRIM hopes to pursue this avenue locally, heralding a significant stride towards self-reliance in medical innovation that promises to foster indigenous expertise and drive progress in biomedical research.

NURTURING A CAPABLE TALENT POOL

SIRIM also conducts a Vendor Development Programme, which exemplifies its commitment to supporting Bumiputera entrepreneurs across various stages of industry growth, providing assistance in product improvement, quality assurance, process optimisation and improvement, and technology adoption.

Hurdles such as challenges in adopting new technology due to high investment costs, concerns about workforce skills and return on investment (ROI) often arise. With an objective to increase the productivity of SMEs through technology penetration, upgrading and intervention, SIRIM offers the SIRIM-Fraunhofer Programme, which includes matching grants to support SMEs in their Industry

4.0 transformation, training, and consultancy services to upskill the workforce and improve products and processes to align with market needs.

"Today, we are living in a volatile, uncertain, complex and ambiguous (VUCA) world. Therefore, we must be agile, flexible and adaptive to new technologies," declared Dr. Muhammad Izzal.

Driven by the imperative to address underemployment, particularly among graduates, SIRIM seeks to provide high-skilled employment opportunities, such as design engineers and analysts, thereby fostering a skilled workforce aligned with market demands.

"Based on the job placement data for 2022 from My Future Jobs released by our Social Security Organisation (SOCSO), about 40% of graduates in the country are underemployed, finding themselves in semi-skilled or even low-skilled positions. This underscores the importance for government agencies like SIRIM to offer platforms for high-skilled employment to our young engineers," stated Dr. Muhammad Izzal.

BENCHMARKING GLOBALLY

As Malaysia's premier industrial research and technology arm, SIRIM looks forward to positioning itself among the top 50 research technology organisations in the world. To do so, it is instrumental to embrace open innovation and benchmark with successful institutions globally.

"Apart from marking ourselves against the national roadmap, we also need to benchmark with other countries' roadmaps to make sure that we align ourselves with the global ecosystem," Dr. Muhammad Izzal said.

By understanding and actively engaging in technological innovation, SIRIM aspires to contribute significantly to Malaysia's progress and stability in a rapidly evolving global landscape.

Today, we are living in a volatile, uncertain, complex and ambiguous (VUCA) world. Therefore, we must be agile, flexible and adaptive to new technologies.

Vendor Development Programme

exemplifies SIRIM's commitment to supporting Bumiputera entrepreneurs across various stages of industry growth, providing assistance in product improvement, quality assurance, process optimisation and improvement, and technology adoption

Apart from marking ourselves against the national roadmap, we also need to benchmark with other countries' roadmaps to make sure that we align ourselves with the global ecosystem.

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Top 50

research technology organisations in the world by embracing open innovation and benchmarking with successful institutions globally



Scan to watch the exclusive interview

Yearly, over

115  mil

animals worldwide are subjected to testing procedures for various drugs and other products

Every year, over 115 million animals worldwide are subjected to testing procedures for various drugs and other products in a bid to evaluate their efficacy and safety for human use. However, there has been a steady transition to in vitro test systems in the form of organ-on-chip (OOC) technology, and Malaysia is jumping on the bandwagon.

organ-on-chip technology



In essence, it's a miniature chip that replicates the intricate microenvironment of an organ. This enables researchers to assess the efficacy of new drugs directly on these chips, eliminating the need for animal or human testing in coming years.

EXPANDING HORIZONS WITH ORGAN-ON-CHIP TECHNOLOGY

by

ChM. Dr. Nurul Izza Nordin

Director, Smart Life Sciences & Wellness Section, Life Sciences Centre



By crafting miniature replicas of human organs on tiny chips, organ-on-chip (OOC) technology presents a viable solution to traditional animal testing practices. Beyond simply replacing animal models, it offers a paradigm shift in biomedical research, furnishing precise models that yield profound insights into human biology and disease.

"In essence, it's a miniature chip that replicates the intricate microenvironment of an organ. This enables researchers to assess the efficacy of new drugs directly on these chips, eliminating the need for animal or human testing in coming years," explained ChM. Dr. Nurul Izza Nordin, Director, Smart Life Sciences & Wellness Section, Life Sciences Centre.

OOC systems, akin to COVID-19 detection kits, employ microfluidic systems to examine samples and share a comparable size. However, unlike the COVID-19 or other detection kits, OOC systems boast heightened intricacy and offer

expanded versatility in function, application and design, coupled with impressive throughput capabilities. They are able to mimic different human organ structures and functions, facilitating a broad spectrum of research applications.

"Moreover, OOC platforms can be tailored to simulate various physiological conditions and disease states, providing researchers with versatile tools for studying drug responses, toxicity and disease mechanisms, thus further underscoring the OOC's versatility and potential in biomedical research," added Dr. Nurul Izza.

OOC technology facilitates high-throughput screening of drug candidates more efficiently and cost-effectively than traditional methods. Its complexity is balanced by adaptability and scalability, rendering it a potent tool for applications such as advancing biomedical research, drug development, toxicity testing, disease modelling and precision medicine.

STARTING STRONG

Although OOC technology is still in its early stages in Malaysia, we possess moderate expertise in its essential components, such as in vitro organoid culture, microfluidic technology and bioinformatic artificial intelligence (AI). However, this expertise is often scattered across academic institutions and not consistently utilised for the benefit of industries in the country.

While progress has been made in laying the groundwork for OOC technology, there still is a need to consolidate expertise, encourage innovation and stimulate demand to fully exploit the potential of these technologies, particularly in the healthcare and pharmaceutical sectors. As animal testing for cosmetics has been banned, OOCs can also be instrumental in this area. This is where the establishment of an OOC facility will encourage the utilisation and enhancement of existing expertise to support industrial growth.

SIRIM initially came across the OOC technology at a conference focusing on alternative methods to animal testing in 2021 before pursuing technology scouting and benchmarking efforts. This included a visit to a prominent OOC startup located in Berlin, Germany, which included extensive tours at its laboratories and manufacturing facilities, allowing SIRIM's team to

garner firsthand observation of the technology's practical applications.

Valuable insights were gained through discussions with the startup's team of experts as well as their academic collaborator from Charite, University of Berlin, further deepening understanding and paving the way for the implementation of the technologies at SIRIM.

This led to the implementation of an RM7 million *Inisiatif Ekonomi MADANI* project titled "Pembangunan Fasilitas Pengujian dan Validasi Precision Medicine untuk Melonjak Perkembangan Industri Farmaseutikal Tempatan." This project was approved by the Economy Planning Unit through the Ministry of Investment, Trade and Industry (MITI) for implementation between 2023 and 2025.

The core objective of the project is to elevate domestic pharmaceutical industries by establishing a state-of-the-art research facility that is on par with global counterparts. This initiative aims to provide accessible, efficient and affordable preclinical testing, utilising advanced technologies such as the OOC predictive system. By enhancing market access, the project seeks to drive the innovation and competitiveness of local industries, fostering sustainable growth and development.



ELEVATING CAPABILITIES

The proposed facility is envisioned to revolutionise preclinical testing and validation of precision medicine approaches through its state-of-the-art infrastructure and technology.

"Equipped with advanced laboratory equipment, semi-automated testing

Moreover, OOC platforms can be tailored to simulate various physiological conditions and disease states, providing researchers with versatile tools for studying drug responses, toxicity and disease mechanisms, thus further underscoring the OOC's versatility and potential in biomedical research.

Equipped with advanced laboratory equipment, semi-automated testing platforms and specialised software for data analysis, it will provide a comprehensive toolkit for researchers.

The development of this project will catalyse the advancement of OOC technologies in the country, offering:

- Cutting-edge Research and Testing Infrastructure
- Organ-on-Chip (OOC) Predictive System
- Accessibility and Affordability
- Expertise and Collaboration

The facility will act as a sandbox for new drug discovery, validation and batch production, with a specific focus on benefiting local pharmaceutical companies. By offering advanced preclinical testing capabilities, it provides a platform for pharmaceutical firms and research institutions to innovate and validate new drug candidates. Additionally, it streamlines batch production processes, facilitating the scaling up of promising drug candidates for further clinical trials and eventual commercialisation.

By end of

2025

the facility will be fully operational and equipped with the necessary expertise

Through the establishment of a state-of-the-art facility and the promotion of collaboration, we have the opportunity to drive innovation, create job opportunities and position Malaysia as a leader in precision medicine research and development.

platforms and specialised software for data analysis, it will provide a comprehensive toolkit for researchers,” noted Dr. Nurul Izza.

Furthermore, the facility will improve accessibility and affordability by offering locally available and cost-effective preclinical testing services, thereby eliminating the need for overseas testing facilities and expediting the drug development process. Additionally, it will function as a collaborative hub for expertise in multidisciplinary areas such as in vitro organoid, pharmacogenomics, pharmacokinetic, pharmacodynamic and AI among researchers, clinicians and industry stakeholders to drive innovation in the OOC technologies.

BOOSTING LOCAL ECONOMIES

“The facility will act as a sandbox for new drug discovery, validation and batch production, with a specific focus on benefiting local pharmaceutical companies. By offering advanced preclinical testing capabilities, it provides a platform for pharmaceutical firms and research institutions to innovate and validate new drug candidates. Additionally, it streamlines batch production processes, facilitating the scaling up of promising drug candidates for further clinical trials and eventual commercialisation,” shared Dr. Nurul Izza.

Upon completion, the facility will yield benefits for local economies across various sectors, including cosmetics, medical devices, and other industrial and consumer products.

Dr. Nurul Izza expressed optimism that by the end of 2025, the facility will be fully operational and equipped with the necessary expertise. “Through the establishment of a state-of-the-art facility and the promotion of collaboration, we have the opportunity to drive innovation, create job opportunities and position Malaysia as a leader in precision medicine research and development,” she said.

PROJECT PROGRESSION

The project is currently focusing on planning, infrastructure setup, and talent and competency building. Expected challenges include securing funding, navigating regulatory compliance, acquiring skilled talent, integrating advanced technologies and fostering stakeholder engagement. However, Dr. Nurul Izza is confident that any hurdles can be effectively addressed through strategic partnerships, collaboration with technology providers and transparent communication with stakeholders.

There are currently no universally accepted guidelines or benchmarks for OOC development. “The absence of a gold standard in OOC development presents both challenges and opportunities for Malaysia and SIRIM. While it’s not too late to establish the gold standard, the lack of universal guidelines allows flexibility to address local needs. However, it also underscores the need to establish standards,” explained Dr. Nurul Izza.

SIRIM can take the lead in developing national guidelines, collaborating with international organisations such as the Organization for Economic Co-operation and Development (OECD) to develop standardised testing methods, and supporting research and development in OOC technology.

Moreover, SIRIM seeks to establish Malaysia as a prominent OOC research hub on the global stage. “This not only enhances our reputation in the scientific community but also fosters economic growth through increased investment and collaboration in the field. We are committed to contributing to sustainable development efforts by reducing reliance on animal testing and advocating for ethical research practices,” said Dr. Nurul Izza.

UNLOCKING BOUNDLESS POTENTIAL

OOC technology holds vast potential beyond the medical and pharmaceutical sectors. In fields like cosmetics and personal care, OOCs offer a means to assess product safety and efficacy, reducing reliance on animal testing and providing more accurate results.

“Additionally, OOCs can simulate human responses to environmental toxins and pollutants, aiding in toxicological studies and environmental risk assessments,” said Dr. Nurul Izza.

OOC applications also extend to food and agriculture, where it can evaluate food safety and nutritional quality and the impacts of agricultural chemicals as well as ensuring food security. In biodefence and biosecurity, OOCs could contribute to the study of infectious diseases and potential biowarfare threats, facilitating the development of countermeasures.

OOCs also hold promise in veterinary medicine for studying diseases and drug responses in animals, thereby enhancing veterinary treatments and care.

Looking ahead, OOC technology is poised for significant advancements over the next decade. “OOCs are likely to become more sophisticated, incorporating multiple cell types, organ interactions and physiological functions to better mimic human biology,” explained Dr. Nurul Izza.

OOC platforms may also be scaled up for high-throughput screening applications, enabling rapid and cost-effective testing of large numbers of compounds and formulations. Furthermore, OOCs could play a crucial role in personalised medicine approaches, allowing for the testing of patient-specific responses to drugs and treatments.

Nevertheless, Dr. Nurul Izza emphasises the need to address ethical concerns regarding the use of human cells in OOC research and ensuring transparent practices. In this context, standardising protocols and implementing quality control measures for reliable results cannot be overstated.

Ensuring researchers have access to OOC technology across different settings, accounting for cost and technical challenges, is essential.

“Clear regulatory pathways are necessary to guide OOC research from the laboratory to clinical applications, while fostering collaboration among various disciplines is crucial for driving innovation in OOC technology,” Dr. Nurul Izza concluded.

SIRIM's Vision for Advancing Organ-on-Chip (OOC) Technologies:

-  Establishing Malaysia as an OOC research hub on par with international counterparts
-  Advancing healthcare innovation with a focus on quality and safety
-  Improving patient outcomes through personalised treatments
-  Contributing to sustainable development by reducing reliance on animal testing

Additionally, OOCs can simulate human responses to environmental toxins and pollutants, aiding in toxicological studies and environmental risk assessments.

OOCs are likely to become more sophisticated, incorporating multiple cell types, organ interactions and physiological functions to better mimic human biology.

Where can OOC technologies be applied?

- Cosmetics & Personal Care
- Toxicology and Environmental Testing
- Food and Agriculture
- Biodefence and Biosecurity
- Veterinary Medicine



Scan to watch the exclusive interview

As the demand for nutrient-rich foods continues to rise, eggs labelled “omega-3” have surged in popularity due to their associated health benefits, opening up a lucrative niche market and boasting strong export potential. While the dependence on expensive imported raw ingredients such as flaxseed and rapeseed for fortification presents financial challenges, a promising solution arises with the utilisation of locally sourced marine microorganisms, particularly thraustochytrids.

With their widespread availability and relatively low cost compared to other protein-rich foods, such as meat and fish, eggs have long been a staple in Malaysian diets.

BOOSTING FOOD SECURITY THROUGH DHA-RICH MARINE MICROORGANISMS

by
Mohd Fairuzuddin Faizan M Yusoff
Researcher, Life Sciences Centre, SIRIM

As the world’s population grows, the need for animal proteins escalates, especially in Malaysia. Poultry eggs, favoured for their affordability and minimal cultural or religious restrictions, are a popular choice in the country.

“With their widespread availability and relatively low cost compared to other protein-rich foods, such as meat and fish, eggs have long been a staple in Malaysian diets,” said Mohd Fairuzuddin Faizan M Yusoff, Researcher, Life Sciences Centre, SIRIM.

Eggs enriched with omega-3 fatty acids are especially favoured. Omega-3 fatty acids are essential nutrients that are important for maintaining overall health, particularly cardiovascular health. They are commonly found in certain types of fish, nuts and seeds.

However, since 2017, there has been a noticeable decline in the production

of chicken and duck eggs. “This decline,” noted Mohd Fairuzuddin, “can primarily be attributed to the rising costs of imported feed.”

In current times, the escalating conflict between Russia and Ukraine has directly impacted the rising costs of imported feed, disrupting the import of raw materials for chicken feed and leading to a significant spike in prices in Malaysia.

Moreover, mounting operational costs are leading small-scale farmers to experience reduced profitability and, at times, the closure of their businesses. As a result, there is a decrease in the availability of eggs in the market.

Mohd Fairuzuddin emphasised, “Ensuring food security hinges on the consistent availability of adequate, safe and nutritious food. In light of the current circumstances, it is imperative to prioritise the utilisation of local sources.”

boosting
food
security



Debut of
**Designer
Eggs**



The introduction of omega-3 eggs in Malaysia is attributed to the Malaysian Agricultural Research and Development Institute (MARDI) around 25 years ago. Basically, the nutritional content of these ‘designer’ or speciality eggs is modified via the chicken’s diet to meet the demands of health-conscious consumers.

MARDI’s chicken feed formulation was subsequently licensed to a local company, LTKM Berhad, one of the leading chicken egg producers in Malaysia. Since then, several other local companies have also begun producing and promoting DHA-enriched eggs to the market.

There are various groups from universities and other research institutions actively engaged in investigating this domain. “We are concentrating on a specific niche segment, aiming to contribute meaningfully to the broader research efforts,” he continued.

While omega-3 eggs are not as widely consumed as regular eggs due to the price difference, he believes that technology can accelerate the production of omega-3 eggs and make them more affordable.

The existing practice in Malaysia involves using imported flaxseed and rapeseed that are rich with oils. “Using flaxseed has one main limitation, it yields eggs with higher levels of ALA rather than DHA. When comparing these two omega-3 fatty acids, DHA is paramount for our health. Its significance lies in its ability to support heart health, brain function and overall wellbeing,” explained Mohd Fairuzuddin.

According to him, while it is possible for our bodies to convert ALA into DHA when we consume eggs or diets rich in ALA, this process can be hindered by the prevalence of omega-6 in our diets.

“Popular local foods like fried chicken and nasi lemak cooked with palm oil are examples of high omega-6 content in our diet,” he added.

Overconsumption of such foods will make the conversion process of ALA into DHA inefficient. This underscores the challenge of achieving optimal omega-3 to omega-6 balance for maintaining overall health.

LOOKING LOCALLY

Researchers are turning to microorganisms, such as microalgae and bacteria, for their oil content, which is rich in DHA. These organisms offer a financially and environmentally sustainable substitute for conventional sources such as imported flaxseed.

“Thraustochytrids stand out with

their high oil content of around 40% to 60% per dry cell weight, with nearly half of this being DHA,” Mohd Fairuzuddin highlighted. He emphasises that harnessing this local resource could enhance poultry product quality and bolster resilience against supply chain disruptions.

Thraustochytrids grow much faster than other types. Unlike some microalgae that take a long time to multiply enough cells, thraustochytrids thrive in closed systems like bioreactors. These controlled environments make it easier to regulate conditions carefully, preventing contamination and ensuring efficient growth.

“Apart from containing high DHA content, thraustochytrids also offer a significant reduction in cultivation time compared to green microalgae, requiring only about five days rather than weeks or months,” said Mohd Fairuzuddin.

SIRIM recently completed a proof-of-concept study on cultivating a local thraustochytrid strain called Langkawi 9 (L9) in a 500-litre pilot-scale bioreactor. Using molasses initially as the main carbon source, the dried cells showed a lipid content of 22% per gram of dried weight, with 40% of their total fatty acids being DHA.

Concurrently, an ongoing field trial at Universiti Putra Malaysia (UPM) aims to evaluate the benefits of L9-supplemented feed on layer hens, focusing on DHA enrichment in eggs and overall laying productivity. Both the proof-of-concept studies from SIRIM and UPM’s trials underscore L9’s significant potential for DHA-rich poultry feed, highlighting the need for further research and development efforts.

The process of incorporating thraustochytrids into chicken feed is relatively simple and straightforward. A small percentage of thraustochytrids, typically ranging from 0.5% to 2%, is mixed with the bran during the formulation of poultry feed. This involves cultivating

Using flaxseed has one main limitation, it yields eggs with higher levels of ALA rather than DHA. When comparing these two omega-3 fatty acids, DHA is paramount for our health. Its significance lies in its ability to support heart health, brain function and overall wellbeing.

Thraustochytrids stand out with their high oil content of around

40-60%

per dry cell weight, with nearly half of this being DHA



Fatty Acids in an Omega-3 Egg

Omega-3 eggs contain three different forms of fatty acids: alpha linolenic acid (ALA), eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). Compared to ALA, however, EPA and DHA are typically not present in significant amounts in omega-3 eggs.



Distinctive Edge of DHA

Supports:

- Heart health
- Brain function
- Overall wellbeing

Taking Advantage of Thraustochytrids

- High DHA content
- Faster growth
- Short cultivation time
- Easier to regulate

Another advantage of using microorganisms is that it allows for endless cultivation in a controlled environment, reducing the dependence on fish as a primary DHA source. This can ideally lead to a shift away from overfishing while decreasing our carbon footprint.

Sweet Catalyst

Molasses play an important role in the agriculture industry, particularly in producing effective microorganisms. The process of molasses mixing or blending in livestock farming can enhance feed quality and preserve the supply chain.

Conversely, a disruption in supply could lead to increased molasses prices which, in turn, can negatively affect local farmers, particularly the smaller ones. However, glycerol has emerged as a promising and cost-effective alternative to address these concerns.



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the cells, concentrating them into a cell slurry and then drying them using a spray dryer to obtain the powder form.

However, a challenge arises with thraustochytrids requiring a carbon source encompassing various sugars, including everyday table sugar and molasses, a by-product of the sugar industry, which can often escalate costs.

Navigating the challenges of scaling up biotechnology research also poses significant hurdles, particularly when transitioning from laboratory-scale experimentation to larger bioreactors.

“The pilot trial highlighted the necessity for a more advanced facility to effectively test various volumes. We are looking to upscale the facility to incorporate 30-litre and 100-litre bioreactors as well as purchasing a spray drier,” said Mohd Fairuzuddin.

Nevertheless, Mohd Fairuzuddin affirms that their endeavours have laid the groundwork for further research and development initiatives, especially on the use of biotechnology, in Malaysia’s animal feed industry.

“To the best of my knowledge, currently there is no Malaysian company that produces thraustochytrids. Therefore, the core focus of this research and development endeavour lies not solely in cell production, but also in pioneering advancements in the field, such as lipid extraction and other lipid-based products like DHA capsules and DHA-rich oil for cosmetics and sustainable aviation fuel,” he said.

Gathering empirical evidence from extensive lab testing at SIRIM and field trials conducted at UPM will provide valuable insights into the feasibility and advantages of incorporating thraustochytrid-enriched feed. This includes assessing its impact on enriching eggs with DHA and enhancing the gut health and productivity of laying hens.

ENHANCING MARKET VALUE

The field trials are aimed at achieving several key objectives to enhance the economic sustainability of the poultry industry. For one, they focus on producing economically viable biomass rich in DHA, which is essential for fortifying poultry feed.

As DHA products in general are anticipated to become more accessible, particularly within Malaysia, this will be a timely step in the right direction to empower local producers to meet domestic demand and even potentially tap into export markets, with countries like Singapore, Thailand, Saudi Arabia, Indonesia and Taiwan identified as key targets.

“Another advantage of using microorganisms is that it allows for endless cultivation in a controlled environment, reducing the dependence on fish as a primary DHA source. This can ideally lead to a shift away from overfishing while decreasing our carbon footprint,” said Mohd Fairuzuddin.

Beyond public acceptance, facilitating technology transfer among biotech companies becomes crucial. Currently, raw resources exist; however there is a limited number of companies capable of producing cells in this manner.

Efforts to make DHA products affordable locally could also enhance competitiveness within the egg industry, offering opportunities for local farmers to adopt DHA production technology. Establishing a localised supply chain for DHA-rich feed also has the potential to enhance affordability, making fortified eggs more accessible to a wider population.

“Ultimately, this not only promotes better nutrition but also contributes to overall food security by ensuring a sustainable source of locally enriched eggs for long-term consumption,” Mohd Fairuzuddin said.

RAISING THE BAR IN EtO STERILISATION

by
Dr. Jamuna Thevi
Senior Researcher, Advanced Material Research Centre

According to the US Environmental Protection Agency, ethylene oxide (EtO) is primarily used to produce other chemicals that are utilised in a wide range of products. Additionally, it is used to sterilise devices that cannot be sterilised using steam or radiation, such as certain medical and dental equipment. Each year, approximately 50% or 20 billion of sterile medical devices are treated with EtO. EtO is also employed to sterilise some food products, including spices, certain dried herbs, dried vegetables, sesame seeds and walnuts.

SIRIM recently established an EtO sterilisation facility in Permatang Pauh, Penang, to address the needs of small and medium enterprises (SMEs) looking to sterilise a low volume of medical devices at a lower cost and fewer cycles. This is the first commercial low-cost small-scale sterilisation facility in the northern region of Malaysia.

“Our new EtO sterilisation facility, which is equipped with six Euro pallet chambers, is a crucial development for supporting related industries, providing a cost-effective solution for sterilising low-volume products,” said Dr. Jamuna Thevi, Senior Researcher at the Advanced Material Research Centre.



EtO sterilisation facility in Permatang Pauh, Penang, which is equipped with six Euro pallet chambers

Each year, approximately
50%
or
20 billion
of sterile medical devices are treated with EtO

Ethylene oxide (EtO) is used in a wide range of products – from antifreeze and detergents to textiles, plastics and adhesives. But did you know that it is also instrumental in the sterilising process?

Our new EtO sterilisation facility, which is equipped with six Euro pallet chambers, is a crucial development for supporting related industries, providing a cost-effective solution for sterilising low-volume products.



SMEs do not produce products at a large scale, and it depends on the product demand. Hence, SIRIM's six-pallet chamber is the best fit to cater to SMEs.

After validation, the company will be able to register its new product in the market upon receiving

ISO 13485 & ISO 11135

product certifications from SIRIM

The sterilisation process is the deciding factor for a product to access the market. This process ensures that end users are not infected or do not transfer microorganisms, significantly reducing hospital-acquired infections.

Such an investment boosts new product penetration into the global market and increases Malaysia's export value.

A low-cost steriliser can enhance

NEW PRODUCT INNOVATION

through comprehensive

R&D

at lower cost

Most EtO sterilisation facilities in Malaysia are designed to accommodate a large volume of products. While this is a boon for multinational corporations (MNCs) with routine sterilisation demands that require a capacity of 120 cycles or more a month, SMEs, that often only need a single cycle capacity each time, are left on the sidelines.

SIRIM's new EtO facility is the only one that has six Euro pallet chambers for contract sterilisation services. This will provide SMEs with an option to produce between one and six pallets in their timeline and sterilise at SIRIM without having to wait to fit in a larger sterilising chamber.

"SMEs do not produce products at a large scale, and it depends on the product demand. Hence, SIRIM's six-pallet chamber is the best fit to cater to SMEs," said Dr. Jamuna.

According to her, SIRIM's target market consists of medical device manufacturers who produce temperature-sensitive products that cannot be sterilised using gamma or steam techniques.

The response has been encouraging so far.

"We have already received inquiries from several companies, and one medical device company has already sent its products for validation," noted Dr. Jamuna, indicating the growing interest and demand for SIRIM's EtO sterilisation services.

After validation, the company will be able to register its new product in the market upon receiving ISO 13485 and ISO 11135 product certifications from SIRIM.

Revolutionising Sterilisation in Northern Malaysia

Pioneering Innovation	SIRIM introduces the first commercial low-cost and small-scale sterilisation system in Malaysia's northern region.
Strategic Location	Situated in Permatang Pauh, Penang, home to the nation's highest concentration of medical device manufacturers, SIRIM strategically positions its facility to cater to industry needs effectively.
Cost-effective Solutions	Offering the smallest chamber in the market, SIRIM ensures cost-effective sterilisation solutions for businesses of all sizes.
Unmatched Facility Features	SIRIM boasts the sole six-Euro pallet chamber for contract sterilisation services, setting it apart from competitors with chambers exceeding 10 pallets.

EtO sterilisation plays a vital role in the supply chain of medical devices, according to Dr. Jamuna. "The sterilisation process is the deciding factor for a product to access the market. This process ensures that end users are not infected or do not transfer microorganisms, significantly reducing hospital-acquired infections," she said.

Furthermore, a low-cost steriliser can enhance new product innovation through comprehensive research and development (R&D) at lower cost, given its low-volume chamber that suits the need to test various products simultaneously.

"Such an investment boosts new product penetration into the global market and increases Malaysia's export value," added Dr. Jamuna.

UPHOLDING INDUSTRY STANDARDS

As EtO is considered a toxic air pollutant, stringent safety and quality measures are a necessity. The best practices for controlling EtO emissions in the air involve adhering to the Department of Environment (DOE) regulations, specifically the Environmental Quality (Clean Air) Regulations 2014.

“Our system could be controlled to emit around 0.2 ppm of EtO, which is less than DOE’s requirements. We have installed EtO gas detectors in the operational area to continuously monitor the air in the vicinity. Yearly monitoring of EtO gas emissions into the air will also be reported to the DOE,” shared Dr. Jamuna.

In addition, SIRIM’s technicians will undergo Certified Environmental Professional in Scrubber Operation (CEPSO) training to ensure continuous monitoring of scrubber operations throughout the year.

Safety practices are based on equipment working instructions and maintenance procedures as outlined in the user manual. Additionally, Department of Occupational Safety and Health (DOSH) regulations are followed by acquiring permits for using pressurised vessels and electric boilers.

A reference to DOSH-registered Major Hazard competent personnel will be made available to ensure the safety practices of the current facility. The facility’s quality is assured through the quality management of medical devices in accordance with ISO 13485 and EtO sterilisation processes in accordance with ISO 11135. Currently, protocols are being developed prior to facility certification and the commencement of operations. A series of training sessions have been provided to the gas handlers, and this will become a yearly practice to ensure proper PPE usage and conduct leakage tests.

The best practices for controlling EtO emissions in the air involve adhering to the **DOE** regulations specifically the Environmental Quality (Clean Air) Regulations 2014

Our system could be controlled to emit around 0.2 ppm of EtO, which is less than DOE’s requirements. We have installed EtO gas detectors in the operational area to continuously monitor the air in the vicinity. Yearly monitoring of EtO gas emissions into the air will also be reported to the DOE.

CEPSO stands for Certified Environmental Professional in Scrubber Operation. CEPSO training is a certification programme aimed at providing technicians with the necessary skills and knowledge to effectively operate scrubbers, which are devices used to control air pollution by removing contaminants from exhaust gases.

In healthcare, safety and quality are paramount. The ISO 13485 was developed to ensure that all medical devices are manufactured to meet the necessary regulatory compliance laws and needs of its customers. It lays out the requirements for a quality management system for the medical devices industry in particular.

ISO 11135, on the other hand, focuses on the sterilisation process of medical devices using ethylene oxide (EtO) in industrial and healthcare settings. It outlines the criteria for the development, validation and routine control of the sterilisation process.



DOSH regulations are followed by acquiring permits for using pressurised vessels and electric boilers

SIRIM's long-term plan is to establish a second line of six Euro pallet chambers and product testing facilities. However, this depends on the demand for using the existing sterilisation line. ●

Having an in-house testing facility not only streamlines operations but also offers the potential for

higher profit margins

Finally, intensive marketing strategies are crucial for effectively promoting EtO sterilisation activities among SMEs, ensuring broader awareness and utilisation within the industry. ●



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Ensuring Safety and Compliance	
EtO Emissions Control	<ul style="list-style-type: none"> Emissions maintained at 0.2 ppm, below DOE requirements Continuous monitoring with EtO gas detectors and annual DOE reporting
Training & Certification	<ul style="list-style-type: none"> SIRIM technicians trained in Certified Environmental Professional in Scrubber Operation (CEPSO) Yearly training sessions for gas handlers on PPE usage and leakage tests
Quality Assurance	<ul style="list-style-type: none"> Adherence to ISO 13485 for medical devices and ISO 11135 for EtO sterilisation processes
Safety Practices	<ul style="list-style-type: none"> Equipment maintenance follows user manual instructions and DOSH regulations Permits acquired for pressurised vessels and electric boilers DOSH-registered Major Hazard competent personnel to ensure safety

ENHANCING EFFICIENCY

SIRIM's Advanced Materials Research Centre (AMREC) supports expert development by providing an adequate number of staff for EtO operations, conducting promotional marketing and facilitating the administration of EtO operations.

The long-term plans for this facility include its expansion to accommodate more chambers. This is crucial to ensure continuous operations and mitigate any potential downtimes.

"SIRIM's long-term plan is to establish a second line of six Euro pallet chambers and product testing facilities. However, this depends on the demand for using the existing sterilisation line," explained Dr. Jamuna.

Additionally, product testing facilities, including product sterility, biological indicated (BI) sterility, bioburden, endotoxin, EtO residuals, bacteriostasis and fungistasis tests, and BI population tests, will be part of the long-term plan to provide a faster low-cost, one-stop solution for medical device manufacturers.

According to Dr. Jamuna, having an in-house testing facility not only streamlines operations but also offers the potential for higher profit margins. These initiatives underscore SIRIM's commitment to enhancing efficiency and the facility's capabilities for sustained growth.

"Finally, intensive marketing strategies are crucial for effectively promoting EtO sterilisation activities among SMEs, ensuring broader awareness and utilisation within the industry," she concluded.



EMBRACING INNOVATIONS TO EMPOWER THE ECONOMY

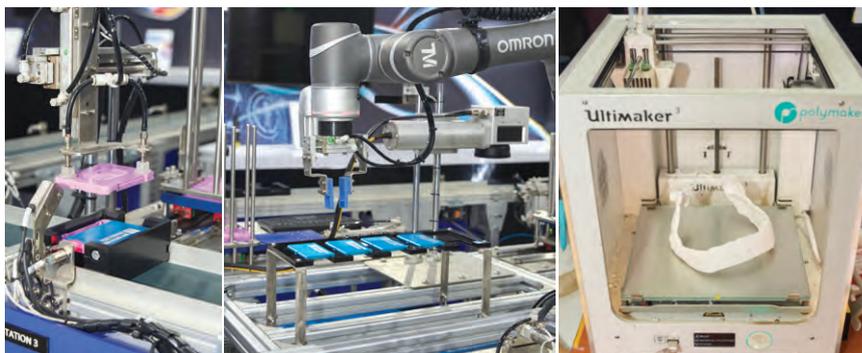
by
 Ir. Ts. Dr. Rohaizat Omar
 Senior Director, Smart Manufacturing Centre

Even in today's digital age, traditional manufacturing setups are still widely found in Malaysia, where the manufacturing equipment operates independently without being connected to any integrated system. Consequently, maintenance processes such as collecting and analysing data to identify defects are performed manually. This is both time-consuming and inefficient.

In alignment with the goals of the New Industrial Master Plan (NIMP), the Ministry of Investment, Trade and Industry (MITI) recently appointed SIRIM to pave the way for the implementation of 3,000 smart factories by 2030. As an initial step, MITI aims to kick-start the establishment of 50 smart factories in 2024.

The smart factory concept, brought forth by Industry 4.0 or the Fourth Industrial Revolution, involves integrating advanced digital technologies and automation systems within manufacturing environments. This integration creates highly interconnected, intelligent and adaptive production systems.

"The smart factory concept represents the convergence of production technology and information technology (IT) systems. Currently the adoption rate of this concept is very low, and SIRIM's role is to encourage as many companies as possible to embrace Industry 4.0," said Ir. Ts. Dr. Rohaizat Omar, Senior Director at the Smart Manufacturing Centre.



A smart factory leverages data analytics, artificial intelligence (AI), the Internet-of-Things (IoT) and other emerging technologies. These technologies incorporate predictive abilities, which can detect the lifespan of machines or selected parts and components to improve operational efficiency.

"Smart factories focus on data exchange between the production equipment and systems. With Industry 4.0, machines are integrated with these systems, allowing for automatic data exchange. This reduces the cost of data collection and analysis, and aids in the decision-making process," explained Dr. Rohaizat.

Malaysia's New Industrial Master Plan (NIMP) introduces a mission-driven initiative to elevate local productivity: by having

3,000

Smart Factories
 across the nation by 2030

MITI aims to kick-start the establishment of

50

Smart Factories in 2024

The advent of smart factories promises to revolutionise manufacturing by establishing a digitally connected supply chain network. Malaysia's New Industrial Master Plan (NIMP) introduces a mission-driven initiative to elevate local productivity: by having 3,000 smart factories across the nation by 2030.



empower
 the
 economy

The smart factory concept represents the convergence of production technology and information technology (IT) systems. Currently the adoption rate of this concept is very low, and SIRIM's role is to encourage as many companies as possible to embrace Industry 4.0.

Smart Manufacturing

- Improves supply chain management throughout the manufacturing industry
- Creates intelligent, interconnected and responsive manufacturing ecosystems
- Enhances operational efficiency
- Enables greater agility and flexibility in response to market demand

Smart factories focus on data exchange between the production equipment and systems. With Industry 4.0, machines are integrated with these systems, allowing for automatic data exchange. This reduces the cost of data collection and analysis, and aids in the decision-making process.

The long-term goals of smart factory initiatives are to create agile, efficient and sustainable manufacturing ecosystems that drive value for customers, stakeholders and society as a whole.

Dr. Rohaizat explains that the low uptake of smart manufacturing is primarily because most manufacturing companies are now prioritising production to enhance productivity and revenue, especially after the COVID-19 pandemic, which disrupted the entire manufacturing process from supply chains to factory operations.

According to him, based on a recent analysis on Industry4WRD Readiness Assessment, where SIRIM gauged companies' readiness to adopt Industry 4.0, most of the companies are newcomers. Although many industry players are aware of smart manufacturing technologies, they prefer to wait and see how the process will be implemented.

Presently, SIRIM is tasked with leading the transformation for selected factories. Every factory involved is assigned a SIRIM engineer, who manages the initiative, ensuring the right solutions are implemented to transition the factory into a smart factory by the end of the project.

"The engineer's role includes developing the appropriate technological solution and partnering with suitable solution providers to achieve the smart factory goals. Essentially, SIRIM acts as a smart factory consultant, guiding companies through the adoption process from start to finish," Dr. Rohaizat elaborated.

BOOSTING BUMIPUTERA ECONOMY FOR NATIONAL PROSPERITY

The widespread application of smart manufacturing holds the potential to significantly uplift the Bumiputera economy within the manufacturing sector, offering broader outreach and opportunities for participation. As these advancements unfold, they pave the way for a more balanced work-life lifestyle, aligning technological progress with socioeconomic development goals.

To ensure that the workforce is adequately prepared for operating in

a smart factory environment, several strategies are being implemented via SIRIM. In accordance with the programme implemented under the NIMP, beneficiaries receive training on the solutions provided to companies, further enhancing their skill set.

"Firstly, ongoing training opportunities are provided through the SIRIM Academy, which offers programmes specifically tailored to the requirements of smart factory operations. These training sessions are claimable via the Human Resource Development Corporation (HRDC), facilitating accessibility for the workforce," said Dr. Rohaizat.

Moreover, a hand-holding methodology is being developed and will be implemented as part of the Smart Factory initiative. This approach aims to provide continuous guidance and support to the workforce, ensuring their effective adaptation to the evolving landscape of smart manufacturing.

STRATEGIES FOR SUCCESS

The most commonly used methods for data communication are Wi-Fi or wired communication lines, which are essential for seamless data exchange. In Malaysia, however, a few traditional industrial areas face challenges due to low connectivity, impeding effective data exchange.

There is a Fourth Industrial Revolution Committee that is currently overseeing a project to upgrade old industrial parks in the country with a focus on enhancing their internet connectivity.

This project is being implemented in stages to incorporate modern connectivity features. While the conversion process prioritises wired connectivity, there are plans to integrate 5G technology later on.

Cybersecurity risks pose a significant threat to the digitally connected supply chain, with potential disruptions from hacking, malware, ransomware and data breaches. Dr. Rohaizat emphasises the importance

of investing in robust cybersecurity measures, including encryption, intrusion detection systems, regular security audits and comprehensive employee training to mitigate this risk.

“In addressing privacy concerns when it comes to data collection of purchasers, companies must prioritise data privacy by implementing privacy by design principles, obtaining explicit consent for data collection and processing, and ensuring transparency about data usage and protection practices,” he added. Additionally, minimising unnecessary data collection and storage is crucial to maintaining individuals’ privacy rights.

Digital divides present another formidable challenge, affecting various socioeconomic, geographic and demographic groups.

“To bridge these divides, initiatives should focus on increasing access to cyber technologies by expanding broadband infrastructure, providing affordable internet access and offering digital literacy programmes,” Dr. Rohaizat elaborated.

By addressing these challenges head-on, companies and governments can pave the way for a more secure and inclusive digital future.

SMART SOLUTIONS FOR THE LONG TERM

The future of SMEs and the manufacturing industry is poised for greater growth as the smart factory concept continues to expand.

“The long-term goals of smart factory initiatives are to create agile, efficient and sustainable manufacturing ecosystems that drive value for customers, stakeholders and society as a whole,” said Dr. Rohaizat.

However, for manufacturers to fully capitalise on these benefits, they must overcome potential challenges such as initial investment costs, technical expertise and

organisational change management.

“At the Smart Manufacturing Centre, our team of experts is readily available to impart knowledge and skills crucial for industry advancement,” said Dr. Rohaizat.

When it comes to the necessary skills for operating effectively in a smart factory environment, proficiency in machinery operation is essential. Additionally, expertise in software engineering is crucial, as smart factories bridge the gap between machinery and systems.

“Once a smart factory is established, the focus shifts towards further enhancements for long-term sustainability. Beyond operational efficiency, the aim is to transform the entire ecosystem into a smart environment,” said Dr. Rohaizat.



This includes optimising energy consumption and efficiency, which are critical for long-term sustainability. SIRIM also provides solutions for energy management and consumption, aligning with the goal of enhancing operational efficiency and reducing environmental impact.

By integrating such solutions, manufacturing plants can not only improve productivity but also contribute to a greener, more sustainable future.

Key Components of Smart Manufacturing

- Connected Systems and Internet-of-Things:
 - whereby production machines are connected to information technology systems
- Data Analytics and Artificial Intelligence:
 - offering real-time data insights and automation to enhance process efficiency, predictive maintenance and quality control
- Automation and Robotics:
 - incorporating intelligent systems and advanced machinery to streamline production and enhance precision
- Digital Twin Technology:
 - creating virtual replicas of physical systems to simulate, analyse and optimise performance in real time
- Cyber-Physical Systems:
 - integrating computation, networking and physical processes to enable intelligent, real-time interactions and control in various applications

Once a smart factory is established, the focus shifts towards further enhancements for long-term sustainability. Beyond operational efficiency, the aim is to transform the entire ecosystem into a smart environment.



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With nearly
30 years of
experience in

the provision of technical and vocational education and training (TVET) programmes
SIRIM Academy is well equipped to lead the way

As Malaysia gears up to boost the manufacturing sector in accordance with our New Industrial Master Plan (NIMP), cultivating a high-skilled workforce has become a necessity to drive sustainable economic growth. Digital platforms are revolutionising the dissemination of technical and vocational education and training (TVET).

SIRIM Academy can contribute in facilitating the upskilling of industry workers so that the organisation's productivity can increase, leading to higher profits and salaries. ●

UPSKILLING PEOPLE TO UPGRADE THE ECONOMY

by
Nik Sazali Nik Hussin
Chief Executive Officer, SIRIM Academy Sdn Bhd

In an era defined by rapid technological evolution and intense global competition, a high-skilled population can contribute significantly to a country's economic growth. Malaysia, via the New Industrial Master Plan (NIMP), sets ambitious goals for the manufacturing sector. One way to achieve these goals is by investing in the education and training of its workforce to ultimately boost the nation's competitiveness.

"SIRIM Academy can contribute in facilitating the upskilling of industry workers so that the organisation's productivity can increase, leading to higher profits and salaries," said Nik Sazali Nik Hussin, Chief Executive Officer of SIRIM Academy Sdn Bhd (SIRIM Academy).

One way it is doing so is via the provision of technical and vocational education and training (TVET) programmes. With nearly 30 years of experience in this area, SIRIM Academy is well equipped to lead the way.



Evolution of
Expertise

SIRIM's journey in training Malaysia's skilled workforce began in 1997 with the provision of ISO and quality training under SIRIM Training Services Sdn Bhd. Over a decade later, it expanded its focus to include technical and TVET-related training, becoming one of eight registered training providers that offer non-destructive testing (NDT) and TVET under the Malaysian Skills Certificate (Sijil Kemahiran Malaysia or SKM) from levels one to three.

In February 2024, the entity rebranded itself as SIRIM Academy Sdn Bhd, signifying its commitment to broadening its training programmes, with a particular emphasis on certification for TVET.

**upskilling
people**



The recent COVID-19 pandemic has expedited SIRIM Academy's digital journey. Since 2022, it has established its own e-learning platform, providing an alternative to conventional training.

"The digital platform is a new frontier, where people are increasingly trusting that careers can be built through gigs. There is a shifting perception about learning and earning online. Therefore, we have moved forward by offering more flexible learning options," explained Nik Sazali.

For example, one course is divided into a few modules that students can take on at their own time. As such, there is no need to physically attend training with a timetable to obtain a certificate. Instead, the student just needs to complete the modules within a set timeframe.

"Following COVID-19, people have transitioned from physical textbooks to e-notes for learning. While the pandemic posed short-term challenges, it has catalysed a new era in education," said Nik Sazali.

With the assistance of e-learning platforms, SIRIM Academy has successfully resumed its operations post-COVID-19 and is committed to contributing 10% or RM100 million towards SIRIM’s revenue target of RM1 billion by the end of 2027.

It currently offers around 30 modules on its e-learning platform, focusing on non-technical training such as quality management systems (QMS). Presently, it receives around 1,000 enrolments a year, but hopes to increase the number to at least 3,000 a year by 2025.

UPHOLDING UPSKILLING OPPORTUNITIES

Empowering Bumiputeras and small and medium enterprises (SMEs) is one of SIRIM Academy’s top priorities. Each year, it trains over 10,000 participants across various fields, demonstrating its commitment to fostering skill development and growth.



Last year, SIRIM Academy launched the SIRIM Personnel Certification Programme (SPCP), a market-driven initiative aimed at enhancing the competencies and capabilities of TVET graduates. Among others, TVET Mechanical Engineering graduates can earn further certifications such as Certified Welding or Certified Quality under the SPCP.

“We do not compete with existing TVET centres. Instead, we complete the TVET ecosystem in Malaysia,” quipped Nik Szali.

SIRIM Academy recently signed a Memorandum of Collaboration (MoC) with Majlis TVET Negara as part of its commitment in providing TVET-related training and upskilling in Malaysia. Additionally, it looks forward to partnering with TVET institutions and higher learning institutions, including universities, polytechnics and colleges.

Apart from certifying TVET graduates, which includes school leavers and university graduates, SIRIM Academy is also focusing its training efforts on another segment: over 20,000 employees from large, medium and small enterprises, who registered with the Human Resource Development Corporation (HRDC) in 2023.

To address this need, it is in the midst of establishing a Centre for Recognition of Prior Experience for working adults, to be known as Pusat Penilaian Amali - Pengiktirafan Pencapaian Terdahulu (PPA-PPT), by the end of 2024. Through this endeavour, workers with experience will be able to obtain up to at least the third level of the Malaysian Skills Certificate (Sijil Kemahiran Malaysia or SKM).

“These workers need to upskill, yet they do not have the time to go through the traditional routes. By recognising the valuable experience of low-skilled

The digital platform is a new frontier, where people are increasingly trusting that careers can be built through gigs. There is a shifting perception about learning and earning online. Therefore, we have moved forward by offering more flexible learning options.

SIRIM Academy currently offers around

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3,000

a year by 2025

We do not compete with existing TVET centres. Instead, we complete the TVET ecosystem in Malaysia.

SIRIM Academy’s

QMS courses cater to diverse sectors such as:

- Food technology safety management systems
- Information security management systems
- Anti-bribery management systems

Our core identity is rooted in a commitment to quality and assurance. This is particularly crucial given the composition of Malaysia's industries, where 97% of business entities are SMEs. It is essential for us to focus on supporting them to build their capabilities.

Advancing AI

SIRIM Academy recently conducted its first Ethical Artificial Intelligence Systems (AIS) Assessor programme with IEEE CertifAIEd criteria, in collaboration with the Ministry of Science, Technology and Innovation (MOSTI) and Institute of Electrical and Electronics Engineers (IEEE). Upon completion of the five-day programme, participants will receive the certification from IEEE, which will be internationally recognised.

We believe that we should be an integral part of the ecosystem to uplift our SMEs. Our TVET certification programmes help to consolidate and standardise the quality of TVET talent in the industry to complement industry needs.



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workers, we elevate their status to semi-skilled workers, enriching Malaysia's workforce portfolio. Their expertise, often spanning a decade, becomes an asset, driving economic growth and attracting investors to our shores," said Nik Szali.

According to him, the certifications will be based on a national standard governed by the Skills Department of Malaysia and internationally recognised.

SIRIM Academy aims to certify at least 1,000 workers with the SKM Level 3 in Quality Assurance and Quality Control by the end of 2025. Subsequently, it looks forward to certifying graduates from TVET colleges, private colleges and universities. To achieve its target, it will leverage its longstanding relationship with the Ministry of Higher Education, further solidified by a Memorandum of Understanding (MoU) signed last year, as well as its recent partnership with Majlis TVET Negara.

"To fund the training and certification, employers can utilise HRDC to upskill their workers. We will work closely with HRDC and related industries, enabling them to utilise the training levy paid to HRDC for financing the training," added Nik Szali.

EMPHASIS ON QUALITY AND ASSURANCE

"Our core identity is rooted in a commitment to quality and assurance. This is particularly crucial given the composition of Malaysia's industries, where 97% of business entities are SMEs. It is essential for us to focus on supporting them to build their capabilities," said Nik Szali.

By doing so, SIRIM Academy aligns with the government's efforts to attract high-value investments into Malaysia, ensuring sustainable growth and development for the country's economy.

"We believe that we should be an integral part of the ecosystem to uplift our SMEs. Our TVET certification programmes help to consolidate and standardise the quality of TVET talent in the industry to complement industry needs," added Nik Szali.



Come September this year, SIRIM Academy will be accredited with ISO/IEC 17024 as an accreditation body, with all its registered programmes receiving ISO/IEC accreditation. It has also signed up as a partner to Global Reporting Institution (GRI), a widely recognised framework for sustainability reporting.

"We are enhancing our capabilities in several areas, including content and module development with international affiliations, our e-learning platform and, of course, recognition through ISO-IEC accreditation.

"Additionally, we continue to strengthen our internal capabilities by mobilising internal trainers and engaging subject matter experts from other business units within our SIRIM family. We also work closely with external professionals, inviting them to join us as associate trainers or consultants to further enhance our expertise and training offerings," Nik Szali concluded.

RESHAPING THE CALIBRATION INDUSTRY

by
Nagyb Shah Abdul Rahim Shah
Head of Technical & Operations Department
SIRIM Calibration Sdn Bhd

The calibration industry is rapidly evolving due to technological advancements and the increasing complexity of modern equipment. The growing adoption of Industry 4.0 technologies such as Internet-of-Things (IoT) is driving demand for more advanced equipment, significantly impacting the need for precise, data-driven calibration services.

“The demand for advanced calibration services is driven by the need for precise measurements and real-time data in modern technologies. These services are crucial in ensuring the accuracy and reliability of sensors and interconnected devices,” said Nagyb Shah Abdul Rahim Shah, Head of Technical & Operations Department at SIRIM Calibration Sdn Bhd (SIRIMCal).

In line with this, the electronics manufacturing sector continues to be a major driver for the calibration market. There is a growing need for precise calibration of instruments used in manufacturing electronic components, ensuring high quality products and reducing defects.

Furthermore, there is an increasing demand for on-site calibration services, which provide the convenience of calibrating equipment at the client's location. This not only reduces downtime but also cuts transportation costs. This is especially significant for prominent industries like manufacturing, healthcare, and oil and gas players, which often handle large or immovable equipment.



ELEVATING CALIBRATION STANDARDS

With over 30 years of experience, SIRIMCal has been a trusted calibration service provider for Malaysian industries. Offering a wide range of comprehensive calibration services, SIRIMCal covers electrical and radio frequency, temperature and humidity, force and pressure, dimensional and mass, as well as volumetric measurements.

“We have been providing on-site calibration services to various industries, including manufacturing, healthcare, and food and beverage sectors. Our new mobile calibration service will also focus on temperature calibration

>30 years of experience

SIRIMCal, a trusted calibration service provider for Malaysian industries

The calibration industry is witnessing three pivotal global trends: the integration of Industry 4.0, surge in electronic manufacturing and expansion of on-site calibration services. These trends are reshaping the landscape, driving innovation and meeting the growing demand for precision measurements in various industries.



reshaping the calibration industry

The demand for advanced calibration services is driven by the need for precise measurements and real-time data in modern technologies. These services are crucial in ensuring the accuracy and reliability of sensors and interconnected devices.

Strategic Calibration Solutions Across Malaysia

Six strategically located offices for local industry service

- Central Region
Shah Alam Calibration Laboratory
- Northern Region
Permatang Pauh Calibration Laboratory
- Southern Region
Senai Calibration Laboratory
- East Coast Region
Kuantan Calibration Laboratory
- Sarawak
Kuching Calibration Laboratory

COMING SOON

New Calibration Laboratory in Kota Kinabalu, Sabah

We have been providing on-site calibration services to various industries, including manufacturing, healthcare, and food and beverage sectors. Our new mobile calibration service will also focus on temperature calibration and cater to customers with large equipment such as cold rooms, refrigerators, ovens and incubators by providing on-site calibration.

SIRIMCal New Services

1) MOBILE CALIBRATION

On-site calibration services directly at customers' premises

2) ONE-DAY CALIBRATION

For high usage or daily-use equipments to minimise downtime

3) CALIBRATION FOR NON-DESTRUCTIVE TESTING (NDT) EQUIPMENT

Reduces equipment downtime from two months (if sent overseas for calibration) to just two weeks

and cater to customers with large equipment such as cold rooms, refrigerators, ovens and incubators by providing on-site calibration," shared Nagyb.

Additionally, SIRIMCal offers temperature profiling for warehouses, ensuring they maintain required temperature levels. This service includes temperature mapping to help warehouses determine if their air conditioning is adequate or needs enhancement to meet customer requirements.

Nagyb emphasised the importance of enhancing SIRIMCal's capabilities by ensuring that the team is multi-skilled, enabling multiple technicians to efficiently handle various tasks to meet customer demands.

"The mobile calibration service, for example, requires a careful balance of manpower, as some staff must handle on-site duties while others remain in the lab. To address this, we are enhancing our workforce to meet both demands effectively. Additionally, they receive ongoing training to stay abreast of the latest trends and calibration procedures," he elaborated.

In a competitive market with numerous service providers, SIRIMCal strives to stay ahead by delivering the best possible service to its customers. "While the industry standard for equipment calibration turnaround time is typically five days, we are determined to meet or exceed this expectation with the provision of swift and reliable services," explained Nagyb.

It is this dedication to efficient service that spurred SIRIMCAL to also offer one-day calibration for equipment used daily. Cognisant of the necessity to minimise disruptions, especially with high-usage equipment, this service ensures that the indispensable machineries are briskly returned to their premises to resume operations. As a norm, customers who send in their equipment in the morning can expect to retrieve it by late afternoon, thus minimising downtime.

"To ensure that quality is maintained, we limit the number of one-day calibrations per day and operate on a reservation basis," said Nagyb. Typically, this service covers equipment from electrical laboratories, such as multimeters and clamp metres, which, while not too complicated, are essential for some industries.

In aligning with its mission to serve the needs of industry players, SIRIMCal identified a significant challenge faced by non-destructive testing (NDT) service providers in Malaysia. "Through our engagement with customers, we discovered that those providing NDT services face challenges finding local calibration houses for their equipment, often needing to send the equipment back to their overseas OEMs for calibration," Nagyb explained.

After thorough research and consultation, SIRIMCal successfully debuted a local calibration service for NDT equipment. "Since its launch, we've received inquiries and anticipate orders soon. This new service significantly reduces equipment downtime from two months to just two weeks, effectively addressing our customers' pain points," he added.

A prime illustration of this need arises in the installation of piping for oil and gas industries. Piping serves various purposes in conveying oil or gas. After welding the piping together to form joints, it becomes imperative to assess the quality of the welds. Testing these joints ensures the integrity and reliability of the welding work performed.

In addition to the demands from oil and gas sectors, SIRIMCal is also fielding inquiries from healthcare industries. These industries are seeking assurance regarding the accuracy of temperature readings in various equipment such as freezers, cold rooms, mortuaries and incubators. Ensuring precise temperature readings is critical for these healthcare facilities to deliver the high-quality services required in this field.



“One example of our calibration process involves large freezers, which often resemble spacious rooms. To ensure accuracy, we strategically place sensors throughout the freezer and monitor them over a designated period, typically spanning 12 hours or longer, depending on the customer’s requirements,” said Nagyb.

For clients seeking more comprehensive data, such as a three-day reading, the monitoring period is extended accordingly. This extended timeframe not only provides a more robust and convincing report but also enhances the overall security of the calibration process compared to shorter durations, such as a 12-hour report.

This growing demand underscores the importance of calibration services in maintaining the reliability and functionality of essential equipment across diverse industries.

POWER OF PRECISION

Achieving accuracy and reliability in equipment calibration is the cornerstone of ensuring safety, compliance and efficiency in various industries.

“We engage with our customers to understand their needs and the purpose of the reports. From there, we collaborate to determine the best course of action moving forward,” said Nagyb.

With precise equipment, errors are minimised, leading to a reduction in rejected items and subsequent cost savings for manufacturers. By avoiding re-engineering work and minimising downtime, operational costs are optimised, contributing to overall cost efficiency.

Moreover, compliance with regulatory requirements, such as ISO standards, mandates regular equipment calibration to demonstrate adherence. ISO certification is crucial for manufacturers as it signifies adherence to global production standards.

Therefore, investing in accurate and reliable calibration services not only enhances operational performance but also ensures regulatory compliance and cost-effectiveness in the long run.

EXPANDING HORIZONS

According to Nagyb, the demand for calibration services is on an uptick in diverse industries. “We have observed a noticeable increase in inquiries, especially from unexpected sectors such as the baking industry, where the professionals are eager to ensure that their ovens maintain even temperature distribution,” he said.

This presents a new market opportunity for SIRIMCal, indicating growth and expansion into previously unexplored territories.

“To capitalise on this momentum, our strategy focuses on ongoing marketing efforts, including seminars and exhibitions, where we highlight the benefits of our services and share success stories from satisfied customers,” added Nagyb.

By leveraging its existing customer base and fostering new relationships, SIRIMCal is set to establish itself further as a leader in mobile calibration services across diverse industries.

Ensuring Integrity

During critical situations like the COVID-19 pandemic, maintaining the integrity of vaccine transportation emerges as a top priority. As the vaccines need to be transported at temperatures as low as minus 80 degrees, calibration services serve as proof to stakeholders that the temperature requirement is being met, ensuring the efficacy of vaccine distribution efforts.

One example of our calibration process involves large freezers, which often resemble spacious rooms. To ensure accuracy, we strategically place sensors throughout the freezer and monitor them over a designated period, typically spanning 12 hours or longer, depending on the customer’s requirements.

We engage with our customers to understand their needs and the purpose of the reports. From there, we collaborate to determine the best course of action moving forward.



Scan to watch the exclusive interview



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Journey Towards ESG



Embarking ESG Journey with SIRIM for Sustainable Future

SIRIM is committed to assist and lead industry towards ESG compliances through its comprehensive and holistic sustainability programmes.

ESG Services Offered by SIRIM

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Training &
Consultancy on
ESG

2

Project
Development

3

GHG Assessment
& Accounting

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Energy
Audit

5

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Development

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