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HIGHLIGHT

Corrosion Management in Upstream Oil and Gas Assets

Thermal Insulative Coating in Combating Corrosion Under-Insulation

Using Vapor Corrosion Inhibiting Oil Additives for the Corrosion Protection of Refurbished Equipment in Long-Term Storage

Technoeconomic of Repurposing Natural Gas Pipelines to Carry Carbon Dioxide: Malaysia Landscape

From Raw Materials to Composites: Different Fabrication Techniques for Unsaturated Polyester/ Coconut Coir Fibre Composites

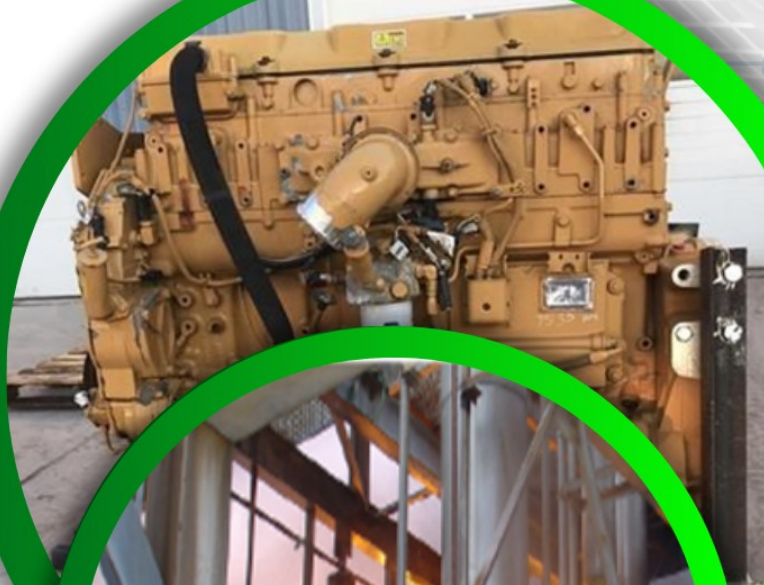


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-  Initial Date register as member: 5 November 2023
-  Expiry Date: 4 November 2024



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The Institute of Materials, Malaysia (IMM) is a professional society and certification body that promotes honorable practice, professional ethics and encourages education and skills in materials science, technology and engineering. Engineers, academicians, technologists and technicians, skilled workers and other professionals are amongst its members and number more than 6000.

Vision

To be internationally recognized competency certification institution in Materials Science, Technology and Engineering

Mission

1. To be the technical authority on Materials Science, Technology and Engineering
2. To positively contribute to society and quality of life
3. To become an internationally recognized certification body
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**Theme: Corrosion and Integrity Management
In the Digital World**

CONFERENCE

Date : 16 October 2025

Time : 8:00 am - 5:00 pm

**Venue: DoubleTree by Hilton
Kuala Lumpur Hotel**

PLANT VISIT

Date : 17 October 2025

Time : 9:00am - 2:00pm

Venue: TBA

ABOUT THE CONFERENCE

The Institute of Materials, Malaysia (IMM) proudly announces its annual Corrosion Conference for the year of 2025. This conference is more than just an annual event; it's a catalyst for innovation. This year, we're pushing the boundaries of traditional corrosion and integrity management by embracing the power of digital technologies.

In partnership with Materials Technology Institute (MTI), we invite you for 1- day session of insightful presentations, engaging discussions, and a unique plant visit. This annual conference offers a platform for researchers, engineers, and industry professionals to share progressive knowledge, network with peers, and gain valuable insights into the challenges and opportunities in the field of corrosion and integrity management.

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08:00 am	Registration, Light Breakfast & Tour Exhibition	14:30 pm	A Non-Conventional Coating and Insulation Repair Approach to Mitigate CUI In Pressure Vessels by Mr Raizal Azhar, PTTEP
09:00 am	Welcome Note by Emcee & Safety Briefing by hotel	14:50 pm	Digitalizing Corrosion Under Insulation (CUI) Maintenance: A Data-Driven Approach to Predictive Maintenance & Sustainability by Mr Arve Martinsen, Kaefer blu AS
09:10 am	Opening Speech by Dr Chew Khoon Hee IMM President	15:10 pm	Corrosion Under Insulation: A Costly Problem with a Proven Solution by Ms Azanie Azmi, Rockwool Malaysia Sdn Bhd
09:20 am	Opening Speech by Ms Heather Allain, MTI President	15:30 pm	Tea Break/ Visit to Exhibition
09:30 am	Knowledge Management Strategies for the Process Industries by Mr Kirk Richardson, Materials Technology Institute	16:00 pm	Digital Transformation in Corrosion Management: A Comparative Study of Manual and Online Thickness Measurement in CO2 Removal Systems by Dr Rao Guang Bin, BASF (China) Co. Ltd & Ir. Chew King Vee, BASF Petronas Chemicals Sdn Bhd
09:50 am	A New Universal Alloy for Offshore O&G Production by Mr Dragon Hao, Alleima (Shanghai) Materials Technology	16:20 pm	An Assessment of Microbiological Monitoring Techniques for Microbiologically Influenced Corrosion (MIC) in a Large Onshore Oilfield by Mr Douglas Bennet, Intertek CAPCIS
10:10 am	Microscopic Investigation of Liquid Migration in Open-Cell Insulation and Its Impact on Heat Loss and Energy Efficiency in Piping by Mr David Chen Chin Liang, Aspen Aerogels, Inc	16:40 pm	Advancements in Field Online Corrosion Monitoring Techniques- Its Data Integration for AI and ML Model Development by Mr Amish Gandhi, Progressive Impact Corrosion Sdn Bhd
10:30 am	Emerging Approaches in Equipment Reliability Management: Bridging Technology and Business Performance by Mr David Lim, Pluperfect Technology Sdn Bhd	17:00 pm	Closing remarks by Ir Ong Hock Guan, Chairman of IMM Corrosion Committee
10:50 am	Tea Break/ Visit to Exhibition	17:15 pm	Adjourn
11:30 am	Full Cathodic Protection Survey for Subsea Buried Pipeline by Using Non-Contactable Field Gradient Sensor by Ts Lai Kok Leong, Sarawak Shell Bhd		
11:50 am	Digital Twins of Gas Transmission Pipelines by Mr Isya Muhajirin, BJ Services (M) Sdn Bhd		
12:10 pm	Enhancing Cathodic Protection with Modelling and Digital Twin Technology by Mr ShiLiang Johanthan Tan, Matcor Technology & Services Pte Ltd		
12:30 pm	TBA by H.Rosen Engineering Sdn Bhd		
12:50 pm	Group Photo		
13:00 pm	Lunch/ Visit to Exhibition		

WHO SHOULD ATTEND

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- Maintenance and Reliability Engineers
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- Digital Transformation Specialists
- Inspection Engineers
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COVER STORY

CORROSION MANAGEMENT IN UPSTREAM OIL AND GAS ASSETS

Ir. Eur-Ing. Ong Hock Guan

Institute of Materials, Malaysia (IMM)

IMM Honorary Treasurer and Chairperson, Corrosion Committee (2024-2026)

The world is still a long way from relinquishing oil and gas assets from the global energy mix despite the recent year's significant shift towards renewable energy sources. Fossil fuels remain dominant in the overall global energy mix, with oil and gas demand still growing strongly, particularly in Asia. Hence, effective corrosion management is still pivotal to the successful operation of upstream oil and gas assets. (c.f. Figure 1.) This can not only prolong the life of assets, i.e., structures, facilities, wells, and pipelines, further it can also reduce the uncontrolled release of toxins and harmful by-products into the environment due to loss of containment (LOC).

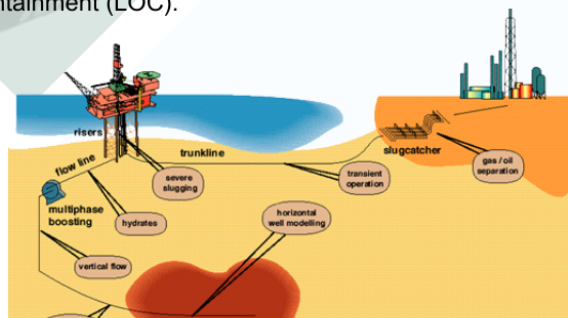


Figure 1: Upstream oil and gas facilities, pipelines and wells.

2. WHY EFFECTIVE CORROSION MANAGEMENT IS ESSENTIAL IN UPSTREAM OIL AND GAS ASSETS

Corrosion can lead to premature failures of oil and gas assets. The resulting loss of containment leading to gas leaks and oil spills can be dangerous to the environment, human health, and potential human fatalities. It can also increase the cost of operating upstream oil and gas assets by requiring frequent inspection, monitoring, repairs and replacement of corroded components and equipment.

Therefore, it is important to implement effective corrosion management strategies to ensure the long-term viability, safe and reliable operation of oil and gas assets. This will earn the "Licence to Operate" for the operators.

3. WHAT CAUSES CORROSION ATTACKS IN UPSTREAM OIL AND GAS ASSETS?

Corrosion in upstream oil and gas assets is caused by a combination of factors, including exposure to harsh hydrocarbon. The main causes of corrosion in these assets is the presence of high concentrations of water, hydrogen sulfide (H_2S), carbon dioxide (CO_2), mercury, High Pressure/High Temperature (HPHT) etc. in the upstream oil and gas assets.

High temperatures can accelerate the corrosion process, particularly in areas where CO_2 is in contact with water or other acids like organic acid which can lead to "Top of Line" (TOL) corrosion in a high temperature and high pressure (HTHP) pipeline. Additionally, high temperatures can cause metal components to expand and contract, which can lead to stress on the materials and accelerate corrosion.

Other factors that can contribute to corrosion in oil and gas assets include exposure to other contaminants, such as sulfur compounds, chlorides, H_2S , mercury, as well as the presence of microorganisms, such as bacteria leading to Microbial Induced Corrosion (MIC) in oil pipelines. Interaction with CO_2 , H_2S , and water will create an environment that is corrosive to metal surface. i.e. carbonic acid.

4. EFFECTIVE CORROSION MANAGEMENT STRATEGIES IN UPSTREAM OIL AND GAS ASSETS

Currently, there are several strategies that can be used to manage corrosion in upstream oil and gas assets during operated phase. In project design phase, a proper material selection shall be thoroughly studied and a comprehensive Risk Based Inspection plan shall be established aligned with Corrosion Management Framework (CMF) and Corrosion Management Manual (CMM). Of course, regular inspection/monitoring and maintenance is crucial, as per the established Risk Based Inspection (RBI) plan for the assets.

"Fit For Purpose" Material Selection

Material selection is a crucial aspect of corrosion management in oil and gas assets. The use of corrosion-resistant materials, such as stainless steel, can significantly reduce the risk of corrosion. However, it's important to note that no material is completely immune to corrosion, and other strategies such as coatings/cathodic protection, and corrosion inhibitors should be considered.

Risk-Based Inspection (RBI)

RBI is a methodology used to prioritize inspections of equipment based on risks assessments, it assesses the Probability of Failure (POF) and the Consequences of Failure (COF) to rank equipment for inspection, focusing limited resources on high-risk items with specific corrosion mechanisms while minimizing inspections of low-risk assets. It is a best practice for a new project to deliver a baseline RBI plan to the assets operators as part of the project handover deliverable.

Regular inspection/monitoring and maintenance

Regular inspection/monitoring and maintenance are essential for the early identification and addressing of corrosion threats. This includes visual inspections, conventional and advanced non-destructive testing, and real-time remote monitoring of corrosion rates.

Advanced Non-Destructive Testing (NDT) techniques like phased array ultrasonic testing (PAUT) or advanced eddy current testing (EcT) become essential. The maintenance Planning will anticipate and address potential corrosion issues before they escalate, extending the life of aging assets.

Coatings/Cathodic protection (CP) and corrosion inhibitors. Coatings/CP and corrosion inhibitors can be used to protect metal surfaces from corrosion. Coatings, such as paint or epoxy, can provide a physical barrier to prevent external corrosion.

Inhibitors, such as corrosion inhibitors, can be added to slow down the corrosion process within acceptable limits. Corrosion inhibitors are generally preferred in closed systems where the presence of the inhibitor can be more easily maintained. These are commonly used in oil and gas assets and can be effective in slowing down corrosion, but it's important to note that the selection of the right coating or corrosion inhibitor depends on the specific conditions of the asset. The corrosion inhibitor selection may be subjected to a proper protocol laboratory testing. Regular monitoring and maintenance are still needed from the asset's operator.

5. HOW DOES CORROSION ATTACKS OCCUR IN UPSTREAM OIL AND GAS ASSETS?

The corrosion of different materials used in upstream oil and gas assets can occur in different ways, depending on the specific properties of the materials used and the environmental conditions.

The common types of corrosion found in upstream Oil and Gas assets are as follows:

Uniform Corrosion

This is the most common type, occurring evenly across the metal surface, often due to chemical or electrochemical reactions. e.g. atmospheric corrosion on valves, tubular, equipment, etc. stored in open storage yard without preservation.

Intergranular Corrosion (IGC)

IGC is a type of corrosion that occurs along the boundaries of metal grain, rather than on the surface. It is often associated with local differences in compositions such as the precipitation of chromium carbides in stainless steels. This depletion creates anodic zones that are more susceptible to corrosion.

Sulfide Stress Cracking (SSC)

SSC is a form of hydrogen embrittlement that occurs in metals when exposed to H_2S and other sulfide ions in

humid environments and cracks under stress. In recent years, many new recovered fields in Malaysia have high contaminants of H_2S which poses technical challenges in their field development.

Hydrogen Induced Cracking (HIC)

HIC is a form of material degradation that occurs when atomic hydrogen diffuses into a metal or alloy, often in an environment with hydrogen or H_2S . This process can lead to the formation of hydrogen molecules within the metal's crystal lattices, causing internal pressure build-up and cracking. This occurs when the hydrogen atoms diffuse into steel, leading to internal cracking.

Stress Corrosion Cracking (SCC)

Cracking under tensile stress in corrosive environment. e.g. stainless steel. SCC is difficult to detect early and can lead to catastrophic failures.

Pitting corrosion is the localized corrosion of a metal surface, resulting in small holes or pits. In upstream oil and gas assets, pitting corrosion can occur in pipelines, valves, and other components that come into contact with CO_2 , especially in areas where the CO_2 is in contact with water or other liquids.

Crevice corrosion is a form of localized corrosion that occurs in tight spaces or crevices, such as the area between a gasket and a pipe flange. In upstream oil and gas assets, crevice corrosion can occur in joints and connections, such as pipe support contact points, flanges and gaskets, etc.

Galvanic corrosion is a type of corrosion that occurs when two dissimilar metals are in contact with an electrolyte, such as water or CO_2 . In upstream oil and gas assets, galvanic corrosion can occur in joints and connections where dissimilar metals, such as steel and aluminium, are used. This process accelerates the corrosion of the anodic metal (aluminium) and protects the cathodic metal (carbon steel).

Microbiologically influenced Corrosion (MIC)

MIC is perhaps the least understood corrosion phenomenon. It is a huge threat to oil and gas installation especially the pipeline assets. Sulphate Reducing Bacteria (SRB) are the best known corrosion causing microbes. It affects systems with traces of water and it is predominantly manifested in the form of localized corrosion pitting. MIC occurs when sessile microorganisms alter the physiochemical conditions on the metal internal surface of a carbon steel pipeline.

For example, carbon steel is a commonly used material in upstream oil and gas assets due to its lower costs and availability, but it is also highly susceptible to pitting, crevice and other types of corrosion in the presence of CO_2 , H_2S , and water. Corrosion-resistant alloys (CRAs) such as Stainless steel, on the other hand, is more resistant to corrosion but can still be affected by high temperatures and the presence of other corrosive agents. e.g. H_2S and chlorides.

6. THE FUTURE OF CORROSION MANAGEMENT IN UPSTREAM OIL AND GAS ASSETS

Managing corrosion in upstream oil and gas assets requires a multi-faceted and multi-disciplined approach, and the best strategy for a specific asset will depend on the specific conditions and materials used. For example:

- Material selection can significantly reduce the risk of corrosion, but it's important to note that no material is completely immune to corrosion. The challenge for the Materials and Corrosion Engineer is to select a "Fit For Purpose" material as a new project viability is based on its CAPEX costs and not on life cycle costs.
- Regular inspection and maintenance are essential for identifying and addressing corrosion threats early on, but they can be costly and time-consuming. Hence, Risk Based Inspection (RBI) plan shall be put in place prior to oil and gas assets actual production to prioritize risks.
- The maintenance Planning will anticipate and address potential corrosion issues before they escalate, extending the life of aging assets.
- Coatings and corrosion inhibitors can be effective in slowing down corrosion, but they can also be costly and require regular monitoring and maintenance.

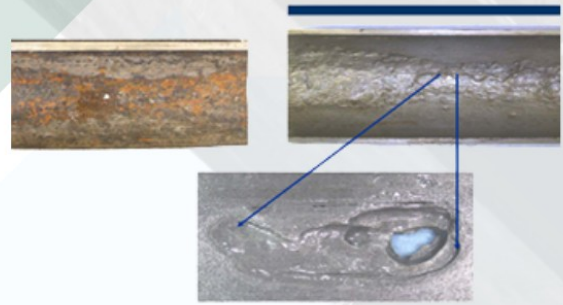


Figure 2: MIC corrosion of carbon steel pipeline.

Corrosion can lead to unsafe operation of upstream oil and gas assets, as well as increasing the cost of operating offshore assets by requiring frequent inspection/monitoring, repairs and replacement of corroded components and equipment.

While current corrosion management strategies are effective at controlling corrosion at upstream oil and gas assets, it is important to continue to research, experiment, and develop innovative techniques/new technologies for enhanced corrosion management. As the technologies and conditions in oil and gas assets evolve, the strategies used to manage corrosion must be adapted in the coming years.

Every improvement that we can make will improve the viability and safety of our oil and gas assets. The Institute of Materials, Malaysia (IMM) is in the perfect position to help industry and academia deliver these improvements.

APPROVED TRAINING BODIES AND TESTING CENTRES UNDER THE INSTITUTE OF MATERIALS, MALAYSIA (IMM)



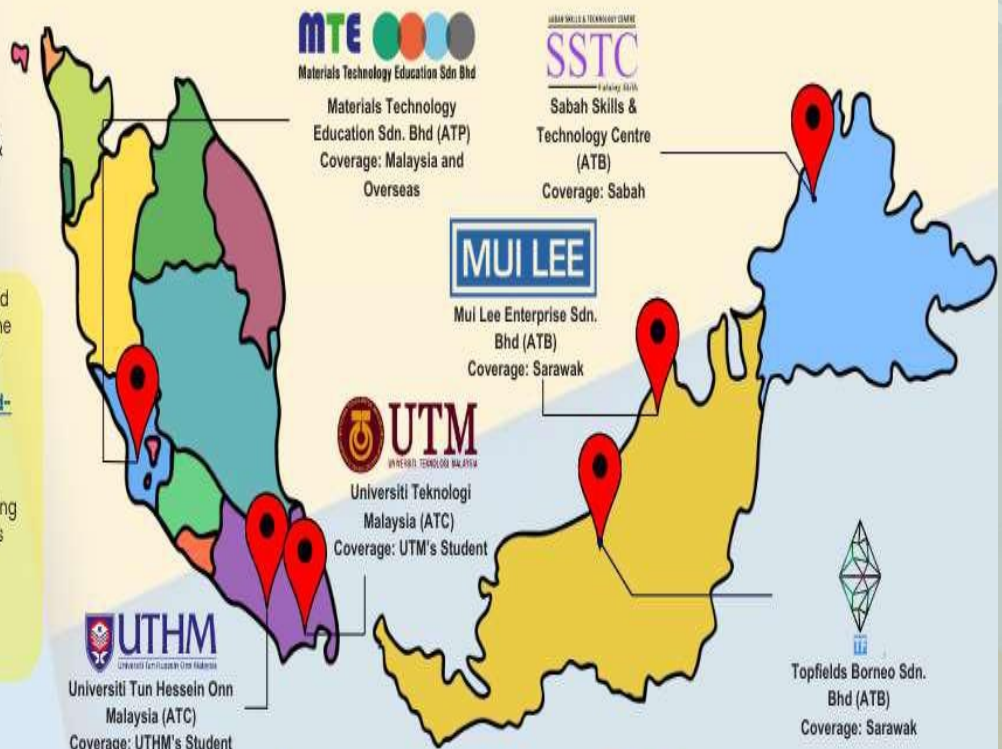
The Institute of Materials, Malaysia (IMM) is pleased to announce the official list of **APPROVED** training bodies & testing centre authorized to conduct IMM Certification and/or Non-Certification Training Programmes.

To ensure authenticity, always verify a training provider's and testing centre legitimacy before enrolling in any program. The official list of approved training bodies is available on our website [<https://www.iomm.org.my/imm-authorized-training-bodies-atbs-authorized-testing-centre-atc-and-associate-training-partner-atp/>].

⚠ Beware of Unauthorized Training Providers!

Only organizations listed by IMM are recognized for IMM training and certification. Be cautious of any unauthorized providers falsely claiming affiliation with IMM.

For further inquiries, please contact us at secretariat@iomm.org.my @ +60 18-911 3480





CODE : CPP1

OBJECTIVES

COURSE CONTENT

- Electricity relevant to CP applications and measurements
- Corrosion, electrochemistry and coatings relevant to CP
- Theory, principles and criteria of CP
- Requirements related to application of CP
- Application methods of CP, galvanic anodes, impressed current
- CP Measurements and test procedures
- Relevance of voltage gradient errors and influence on structure to electrolyte potential measurement
- Factors influencing the correct selection of reference electrodes for potential measurements
- Effects of excessive CP on coatings, high-yield strength steels and corrosion-resistant alloys
- Diagnostics of CP systems
- Interference conditions (alternating current and direct current)
- Standards and Codes of Practice relevant in CP practices.
- Health, Safety and Environmental issues relating to CP practices.
- Code of Ethics and Professional Conduct of all CP persons.
- Interpersonal communication skills.

WHO SHOULD ATTEND

School-leavers, technicians, fresh graduate scientists and engineers having interest or already involved in cathodic protection systems and corrosion management and control, who have undergone sufficient basic training in this field.

PRE-REQUISITE

- Minimum academic qualification - SPM or equivalent* OR
- Attended relevant academic Cathodic Protection Practitioner dedicated to the IMM Cathodic Protection Practitioner Level 1 Certification with at least 3 months of practical field experience in cathodic protection.

CERTIFICATE

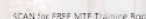
IMM Certified Cathodic Protection Practitioner Level 1

LANGUAGE

English

COURSE DURATION

4 Days



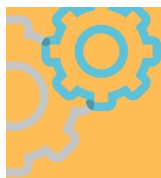
13-2, Pusat Dagangan Shah Alam. Lot 13,
Persiaran Damai, Seksyen 11, 40100 Shah Alam,
Selangor, MALAYSIA

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- ☎ 014-377 3704
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TECHNICAL TRAINING AND CERTIFICATION PROGRAM



CODE : CMP-1

CERTIFIED CORROSION MONITORING PRACTITIONER LEVEL 1



This certification program will assess candidates who either have some experience, or have undergone training, in corrosion monitoring covering corrosion inhibition monitoring and cathodic protection monitoring.

OBJECTIVES

This program will enable candidates to be assessed on their understanding of the key-points on corrosion inhibition and cathodic protection monitoring and process corrosion monitoring; to retrieve and change-out of coupons and probes; to carry out measurement and interpretation of corrosion rates; to use retrieval tools, service valves, back-pressure pumps and surge tubes; to conduct the cathodic protection monitoring and inspection techniques.

WHO SHOULD ATTEND

School-leavers, technicians, scientists, engineers, metallurgists, inspectors and inspection supervisors interested in corrosion monitoring and inspection and who wish to pursue a career as an IMM Certified Corrosion Monitoring Practitioner.

PRE-REQUISITES

- Minimum academic qualification - SPM or equivalent* OR
- Attended relevant academic Corrosion Monitoring Practitioner dedicated to the IMM Corrosion Monitoring Practitioner Level 1 Certification with at least 6 months of field experience in Corrosion Monitoring work-scope from employer
- The applicant must pass the Eye Acuity Examination, with or without corrective lenses, to prove near vision acuity on Jaeger J2 at 12" or greater (≥ 30.5 cm). All applicants shall take a colour perception test

COURSE CONTENT

- Fundamental of corrosion
- Forms of corrosion
- Corrosion inhibition & preservation
- Corrosion control techniques (includes coatings)
- Corrosion monitoring techniques
- Corrosion monitoring probes & coupons
- Equipment installation & retrieval process
- Key points monitoring
- Ultrasonic thickness measurement - effectiveness and usage
- Cathodic protection principles
- Cathodic protection inspection techniques and surveys
- Standards and Codes of Practice
- Health, Safety & Environment considerations in corrosion monitoring activities
- Ethnic and Professional Conduct
- Interpersonal skills

COURSE DURATION

4 days

CERTIFICATE

IMM Certified Corrosion Monitoring Practitioner Level 1



13-2, Pusat Dagangan Shah Alam, Lot 13,
Persiaran Damai, Seksyen 11, 40100 Shah Alam,
Selangor, MALAYSIA

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🌐 www.mte.com.my

IMM MATERIALS FAILURE INVESTIGATION PRACTITIONERS CERTIFICATION SCHEME



CERTIFIED MATERIALS FAILURE INVESTIGATION PRACTITIONER - LEVEL 1

Materials Failure Investigation is a process that involves systematically inspecting and analysing a failed or malfunctioning material or component. The process entails a thorough investigation to determine the underlying causes and mechanisms that contributed to the failure. The goal of material failure investigation is to avoid similar failures in the future.

The MFIP training and certification courses are aimed classified candidates into different levels according to the required knowledge and competence. The IMM Certified Materials Failure Investigation Practitioner (MFIP) Level 1 Training and Certification Program will train and assess candidates who have the necessary experience in supporting Materials Failure Investigation in sample collection and testing, and undergone training in the field of Materials Failure Investigation.

OBJECTIVES

- To appreciate and identify the most likely failure/damage mechanisms for common metals & their alloys used in the oil & gas, petrochemical and shipbuilding industries.
- To apprehend the appropriate use of engineering material requirements deemed necessary for safe design, construction and installation of pressurized components, piping, pipelines, and structures.
- To recognize fitness-for-service (FFS) concepts for evaluating in-service degradation of pressure containing components/equipments.
- To assess candidates who have the necessary experience in supporting Materials Failure Investigators in sample collection and testing, after having undergone the required technical training in the field of Materials Failure Investigation.

COURSE CONTENT

- Determine When, Where & How the Failure occurred
- Collect Samples for Laboratory Examination
- Take on-site photographs
- Identify Defects Non-Destructively
- Conduct appropriate Chemical Analyses
- Confirm material composition & identify contaminants through EDS analysis
- Analyse via Fractography & Metallography
- Conduct Appropriate Mechanical & Materials Testing and Analysis
- Determine type of failure
- Linage of Design, Inspection & Assessment Codes
- Sequence in Materials Failure Analysis & Investigation
- Assessment Techniques for Materials Failure Analysis
- Case Studies on Selected Industrial Damage Mechanisms

PREREQUISITE

- Technical vocational education (minimum Level 4), technician certificate or equivalent, plus specialized training and education in the field of materials
- SPM/STPM (requires basic mathematical skills) plus specialized training and education in the field of materials.

WHO SHOULD ATTEND

School-leavers, technicians, laboratory personnel and anyone who have been involved in testing for Materials Failure Investigation activities.

CERTIFICATE

IMM Certified Materials Failure Investigation Practitioner Level 1

COURSE DURATION

3 days (training + assessment)



***In-house Training available - Upon Request

In order to meet the specific learning goals of your team, you can request IN-HOUSE TRAINING (also available online) to be organized for your company.



+6014-377 3704

Materials Technology Education Sdn Bhd

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TECHNICAL ARTICLE 1

Thermal Insulative Coating in Combating Corrosion Under-Insulation (CUI)

Jason Yap Haw-Shin, Brain Lim Siong-Chung
Pluperfect Technology Sdn. Bhd. (PTSB)

Corrosion Under Insulation (CUI) is a major common problem on a worldwide basis that is shared by all the refining, petrochemical, power, industrial, onshore and offshore. The term "Corrosion Under Insulation" describes the external corrosion of piping, vessels and other equipment that occurs beneath conventional insulation system follow water ingress. CUI tends to remain undetected until the insulation is removed for inspection or when corrosion damage progresses to the point of failure and leak occurs as a result of Loss of Containment (LOC). Figure 1 - A serious process fire safety incident.



Figure 1: CUI failure on piping leading to a process fire safety incident

Many studies have shown that the highest incidence of leaks in the petroleum industry is due to CUI failures and not due to process corrosion. This phenomenon is known to be highly random in nature and tends to remain undetected until complete removal of insulation to thoroughly inspect the condition of insulation/metal surfaces. Figure 2 - CUI exposed under insulation and Figure 3 - Grossly reduced wall thickness loss due to CUI after opening up insulation.

The best CUI mitigation measure is to avoid insulation on equipment and piping that does not require thermal insulation in the first place. This article discusses the general overview of corrosion under insulation (CUI), an environment that is often overlooked until a loss of containment occurs in the operated phase of facilities. Thermal insulation is usually employed due to process reasons:

- to minimize heat gain or loss, personnel protection – from heat or cold burns, acoustic reason
- to manage noise control and fire protection
- to protect equipment and piping from heat radiation.

Traditionally, conventional insulation system usually consists of insulating materials such as mineral wool, cellular glass, calcium silicate, phenolic foam, and etc. followed by an outer layer of jacketing or cladding.

Insulation system is designed with aims that water ingress and capillary action is not possible and that potential leaked product and water vapour or condensation can escape or drain off. Despite a carefully designed insulations and great emphasis given to sealing joints, termination system and

protrusions during insulation, water ingress over time is inevitable and is a given. Mechanical damage such as personnel stepping on it (Figure 4) and degradation of sealants will contribute to the water ingress through the insulation system. CUI can also occur if equipment and piping sweat.

Once the insulation is breached, a highly aggressive environment beneath the insulation materials is created, in combination with the lack of visibility; CUI can lead eventually to catastrophic and expensive failures (Figure 1).



Figure 2: CUI exposed under insulation

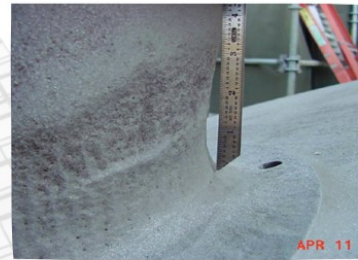


Figure 3: Wall thickness loss due to CUI

2. DESIGN OF INSULATION SYSTEM

There are three combinations that lead to CUI, susceptible temperature, susceptible material and ineffective barrier (water ingress). Therefore, it is imperative to identify the needs for and the criteria in designing an insulation system as a good engineering practice. Typical considerations during the design stage are the application of the proper protective coating system, insulation system specific to the environment and proper insulation installation.

A high CUI corrosion rate is anticipated in the temperature region between 50 degrees Celsius to 110 degrees Celsius and a reasonably low corrosion rate as the temperature goes below 50 degrees Celsius or higher than 110 degrees Celsius. (c.f. Figure 5).

Other than technical requirements, economic consideration plays a vital role to ensure the insulation system is capable of remaining under the expected conditions of service life. There are numerous cases where insulation is designed on equipment and piping even though it is not required. This

will add to the maintenance cost for inspection activities which could be time-consuming and expensive. One of the reports shows that most piping leaks (81%) occur in a diameter smaller than 4" nominal pipe size. Hence, this goes back to the basis of design consideration; do the equipment or piping need thermal insulation in the first place.



Figure 4: Personnel stepping on and damaging the cladding

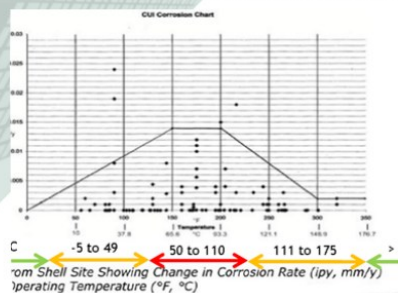


Figure 5: CUI Corrosion Chart

During the design stage, it is crucial to understand the potential risk and the barriers management associated with the failure of CUI. Risk management requires a systematic approach of analyses from various technical disciplines in order to support any decision. Meanwhile, barrier management is established to maintain barriers at any given time by preventing an undesirable incident from occurring or by limiting the consequences in case of unwanted incident happens.

3. NON-DESTRUCTIVE EXAMINATION METHODS

To date, there are numerous non-destructive methods available to inspect the presence of CUI without removing the insulation. Neutron backscatter, thermography, radiography (real-time or computed radiography), ultrasonic thickness measurement (guided-wave testing), pulse eddy current, magnetostrictive sensor technology to mention a few. However, none of them is 100% reliable.

4. SUSCEPTIBLE MATERIALS AND PROCESS SAFETY

CUI can occur in carbon steel, low nickel steels and low alloy steels. The primary consideration is temperature. External CL-SCC can occur in austenitic stainless steel typically SS304L, SS316L, SS321, SS347 and associated weldments. Alloys containing more than 32 % Ni are generally not susceptible to external CL-SCC. e.g. Alloy 825 CUI failure can often lead to process safety incidents where the management of hazards that covers major accidents involving the release of potential dangerous material, release of energy (such as fire and explosion) or both is not effective.

5. CUI MITIGATION - AN ALTERNATIVE OPTION

The most common CUI mitigation plans include one or more of the following: application of protective coating, periodic stripping of cladding for visual inspection and periodic Non-Destructive Evaluation (NDE) activity for maintenance. In recent years, with the availability of thermal insulative coatings in the market. One of the CUI mitigation approaches is through the application of protective thermal insulative coating (e.g. fluid-applied acrylic). Thermal insulative coating has additional advantages compared to conventional insulation systems as follows:

- Resistance to moisture infiltration which is a primary cause of CUI. The insulating value does not drop after exposure to water.
- Exceptional corrosion under insulation resistance. Most conventional forms of insulation are not bonded directly to the substrate, thus creating air gaps where moisture can collect to initiate corrosion under insulation.
- Excellent substrate bonding and durability. The durable, water resistant barrier effectively resists moisture infiltration.
- Trouble-free labour saving touch-up/repair via visual inspection on the conditions of the thermal insulative coating.



Figure 6: Pictures of Aerolon thermal insulative coating application on vessel and piping.

Until today, the key challenge with corrosion under insulation (CUI) mitigation programme is still to do with the issue that there is no cost effective and no 100% reliable non-destructive examination to inspect or detect corrosion under insulation. The most effective and lowest cost to prevent CUI is to avoid insulation on equipment and piping that does not require thermal insulation in the first place. The design consultant and the client engineer have to work closely together to ensure compliance.

Essentially, CUI cannot be entirely eliminated; however, it can be managed with the most cost effective mitigation approach depending on the situation. Hence, applying thermal insulative coating on vessels, tanks, valves, structural steel, and piping within the thermal insulative coating upper temperature limit is a cost effective alternative option to effectively mitigate and combat the risks of CUI in the plant facilities during project design phase where thermal insulative coating is specified upfront by client engineer and in operate phase where conventional insulation system is replaced by thermal insulative coating within its upper temperature limits during asset turn around.



QUALITY OBJECTIVES AND POLICY

The Institute of Materials, Malaysia (IMM) which promotes honourable practice and professional ethics, and encourages education and skills in materials science, technology and engineering shall carry out its activities and services as a certification body with integrity and credibility.

IMM and its personnel are required to be totally committed to quality, and adopt a culture of impartiality and continuous improvement, and be responsible to uphold this policy and the related procedures established by IMM and in accordance with the requirements of ISO/IEC17024.

Impartiality

IMM fully acknowledges the importance of impartiality in carrying out its certification activities. The Management of IMM shall not compromise impartiality and be diligent on an ongoing basis against potential threats to the impartiality and abuse of its certification process.

Integrity of Services

All IMM certification services is undertaken professionally and honestly in accordance with agreed standards, policies and procedures. IMM maintains its independence of judgement in the delivery of its services and decision-making and does not surrender to pressure and inducements to misrepresent findings or after the results of its examination, certification and competency.

Conflicts of Interest

IMM is devoted to conduct all certification and related services in an honest and ethical manner, which includes undertaking to behave responsibly in the personal and institutional management of conflicts of interest and will follow relevant procedures to ensure that the conflicts of interest be avoided.

Confidentiality

IMM respects and protects the confidentiality of information obtained or created during the process of certification, membership and related services and prohibits unauthorised disclosure of information.

Security

IMM as a certification body ensures examination materials are processed, stored and handled in a confidential and secured manner at all times to maintain a high level of integrity in the certification examinations.

Environment, Health and Safety

IMM is fully committed to ensure a safe environment and the health and safety of all personnel involved in IMM's activities and services so as to prevent accidents and loss/damage to assets or property.

Intellectual Property

IMM protects its own intellectual property and respects the intellectual property of others and shall prevent exploitation of intellectual property in its services.

Bribery and Corruption

IMM will not engage in bribery or corruption of any form. IMM do not allow the acceptance and/or offer of any personal gifts, hospitality or entertainment from/to external parties for the potentiality of creating any improper influence on its services and decision-making.

Fraud and Deceit

IMM protects the credibility of its certification and will not hesitate to suspend, withdraw or revoke certification if qualified persons are found to abuse through deceit, fraud or misrepresentation, or not in compliance with the certification ethics.

Ts. Dr. Chew Khoo Hee
President
Institute of Materials, Malaysia

29th March 2024



INSTITUTE OF MATERIALS, MALAYSIA

CONTINUING PROFESSIONAL DEVELOPMENT REPORT

NAME: YEAR:.....
 IMM MEMBERSHIP NO:..... CERTIFICATION NO:.....
 IMM CERTIFICATION:.....

CONTINUING PROFESSIONAL DEVELOPMENT (CPD) LOG (Supporting documents to be submitted wherever applicable)

Date or Period	Professional Development Activity Code & Description	Role	No. of Activity Hours	Weightage	No. of CPD Points
TOTAL					

Professional Development Activity Code	Professional Development Activity Scope	Weightage Factor
A	Attending Online or Physical Training Courses/Workshops	4
B	Online or Physical Course Trainer/Facilitator/Examiner/Conference Presenter	3
C	Attend Online or Physical Seminar/Conference/Webinar	2
D	Paper Author Main Author (max 30 hours/year) Co-author (max 10 hours/year)	2
E	Attend Online or Physical Committee Meeting	1
F	Fieldwork (max claimable 480 hours per year) **	0.1

- ** 1. Need to submit an endorsement from the superior/supervisor as evidence.
 2. Calculated based on the assumption that the minimum project duration of 3 months and 8 hours per day for 20 days.
 3. The minimum number of CPD Points accumulated for 5 consecutive years shall be 100 points.

CPD Points per year : **10 points minimum.**
 CPD Points per 5 year for re-certification : **100 points.**

Year						Total CPD Points
CPD Points						

I hereby declare that the information and particulars provided by me in this form is true and correct.

.....
 (Signature)

.....
 (Date)

TECHNICAL ARTICLE 2

Using Vapor Corrosion Inhibiting Oil Additives for the Corrosion Protection of Refurbished Equipment in Long-Term Storage

Tom White

Marketing Manager, Northern Technologies International Corporation

Corrosion is one of the most persistent and costly challenges faced by industries that rely on metal assets, especially in the heavy equipment, automotive, and energy sectors. When metal surfaces are exposed to moisture, oxygen, and contaminants such as chlorides, they undergo electrochemical reactions that lead to rust and degradation. This is particularly problematic for internal systems such as engines, gearboxes, and hydraulic components, which are challenging to inspect and costly to rework once corrosion sets in. Therefore, effective corrosion management is essential to extend equipment lifespan and reduce downtime, maintenance costs, and safety risks.

In one case, a heavy-duty equipment service center in the Pacific Northwest—known for high humidity and fluctuating temperatures—was tasked with rebuilding several large engines, axles, and hydraulic systems for a construction equipment fleet. After refurbishment, the equipment was to be stored for up to one year before being put back into service. This presented a significant corrosion risk, particularly to the internal surfaces of oil-filled components that could not be easily accessed once assembled. To address this, the maintenance team explored Vapor Corrosion Inhibiting (VCI) oil additives as a protective measure during storage (Figure 1).



Figure 1: Refurbished Equipment in Long-Term Storage

VCI technology releases corrosion-inhibiting molecules into enclosed spaces, forming an invisible, molecular-level shield on the metal surfaces that interrupts the corrosion process. Unlike surface-applied oils or coatings that require post-storage cleaning, VCI oil additives are designed to remain suspended in the host lubricant—such as engine oil, axle oil, or hydraulic fluid—providing ongoing protection without affecting the base fluid's performance. The additive is flushed out once the equipment is put back into service.

In this particular application, the VCI oil additive was introduced directly into the crankcase, rear axle, and

hydraulic systems during the final stages of the rebuild. Initially, the additive was intended only for use in the engine crankcase. However, after consultation with a corrosion specialist, the team expanded its use to include other systems that presented similar corrosion risks. This approach allowed uniform protection across multiple critical components with minimal process changes or additional labor. Because the additive is delivered through existing oil circulation, it provides complete internal coverage without requiring additional coating or wrapping procedures.

Over the course of nearly a year in storage, the refurbished equipment remained in a climate-controlled facility. Periodic inspections revealed no signs of corrosion or degradation in the protected components. This outcome validated the VCI oil additive's performance and reinforced the importance of integrating corrosion protection into preventive maintenance and storage workflows. The success of this strategy has since encouraged the service center to adopt similar protective measures across other sites and equipment categories.

This case highlights how VCI oil additives can be an effective and efficient tool in comprehensive corrosion management plans. Their compatibility with standard lubricants, ease of application, and ability to protect complex internal geometries make them particularly useful for long-term storage scenarios, equipment mothballing, and intermodal shipping. As industries face increasing pressure to reduce waste, extend asset lifecycles, and optimize maintenance practices, adopting such protective technologies offers economic and operational benefits.

ZERUST® VCI Oil Additive Protects Refurbished Engines While Left in Storage

Who? A service center and dealer specializing in heavy-duty construction equipment.

What? Applied corrosion inhibiting oil additives to protect refurbished engine, axle, and hydraulic systems.

Why? To maintain the integrity of rebuilt components during extended indoor storage for up to one year.

How? A VCI oil additive was blended into the crankcase, axle, and hydraulic oil systems before storage to protect internal metal surfaces from rust and corrosion.

Case Summary

A heavy-duty equipment dealer located in a humid region of the Pacific Northwest was refurbishing several large engines for storage prior to reinstallation. Recognizing the risk of corrosion during downtime, the maintenance team sought an oil-based corrosion protection method that would integrate seamlessly into existing lubrication systems. After consulting with a corrosion specialist, they applied a VCI oil additive not only to the engines but also expanded its use to include rear axles and hydraulic systems. The use of the additive provided a protective vapor layer that inhibited corrosion without requiring component disassembly or additional cleaning steps post-storage.

Results

After nearly a year in storage, the refurbished equipment remained corrosion-free, demonstrating the effectiveness of VCI oil additives in preserving internal systems during idle periods. This approach highlights a practical corrosion management strategy that can be adapted for similar applications in equipment maintenance, refurbishment, and storage planning.



RE-CERTIFICATION IMM CERTIFIED PROGRAMS

HOLDERS OF IMM COMPETENCY CERTIFICATES THAT HAVE
EXPIRED OR SOON-TO-EXPIRE ARE ENCOURAGED TO APPLY
FOR RE-CERTIFICATION.

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For IMM-JWES, kindly email to nurhasanahs.imm@gmail.com

NEW IMM PROFESSIONAL MEMBERS

IR. NIK AMIRUDDIN SIRU BIN CHE MUSTAFFA



Age: 43 years old

Organization: SBM Offshore Group HSSE & CoE

Position: Group Technical Authority – Materials & Corrosion Protection

Working experience(s):

- 3 years as Group Technical Authority – Materials & Corrosion Protection at SBM Offshore Group HSSE & CoE
- 3 years as Principal Engineer/DLE for Material & Corrosion Protection (MCP) at SBM Schiedan, NL
- 2 years as DLE for Material & Corrosion Protection (MCP) at SBM Kuala Lumpur
- 1 year as DLE for Material & Fabrication Group at SBM Houston, USA
- 2 years as Deputy Lead/Senior Engineer for Material & Fabrication Group at SBM Houston, USA
- 6 years as Materials & Corrosion Protection (MCP) at SBM Kuala Lumpur

Qualification(s):

- Foundation in Science [Universiti Malaya]
- Bachelor Degree in Materials Engineering [Universiti Malaya]

Professional membership(s):

- Member of Institute of Engineers Malaysia (IEM)
- Member of National Association of Corrosion Engineers (NACE)
- Member of American Petroleum Institute (API)

Involvement in IMM committees: NIL

Age: 33 years

Organization: Universiti Teknologi MARA Arau, Perlis

Position: Senior Lecturer

Working experience(s):

- 1 year as Gas Engineer at Bumifocus Sendirian Berhad
- 4 months as Research Assistant at Universiti Malaya
- 3 years 8 months as Graduate Research Assistant at Universiti Teknologi MARA
- 1 year 5 months as Postdoctoral Researcher at Universiti Teknologi MARA
- 7 months as Senior Lecturer at Universiti Teknologi MARA Arau, Perlis

Qualification(s):

- Bachelor of Science (Physics) [Universiti Malaya]
- Master of Science (Physics) [Universiti Malaya]
- PhD (Science) [Universiti Teknologi MARA]

Professional Membership: NIL

Involvement in IMM committees:

- Student member (2020-2021) - Involved in the seminars or conferences held by the organization.

DR. MUHAMMAD ZHARFAN BIN MOHD. HALIZAN



Age: 41 years

Organization: Intertek Malaysia

Position: Country Business Line Leader

Working experience(s):

- 2 years as Field Scientist at Commercial Microbiology
- 1 year as Senior Field Scientist at Commercial Microbiology
- 3 years as Consultant at Intertek Commercial Microbiology
- 2 years as Bugtracker Account Manager at ExxonMobil and Wood Group
- 6 years as Manager Microbiology SE Asia at Intertek Malaysia
- 4 years 10 months as Country Business Line Leader at Intertek Malaysia

Qualification(s):

- Bachelor of Environmental Biology [Strathallan School Scotland]

Professional Membership:

- ICORR Member
- SPE Member
- NACE Member

Involvement in IMM committees: NIL

DOUGLAS BENNET



DR. SHAHID BASHIR



Age: 39 years old

Organization: Universiti Malaya

Position: Senior Lecturer (Assistant Professor)

Working experience(s):

- 10 months as Quality Control Analyst at Premier Paper Industry
- 2 years 3 months as Chemistry Lecturer at KIPS College
- 3 years 10 months as Research Assistant at Universiti Malaya
- 4 years as Postdoctoral Research Fellow at Universiti Malaya
- 2 years 3 months as Senior Lecturer (Assistant Professor) at Universiti Malaya

Qualification(s):

- Bachelor of Science : Physics, Mathematics, Chemistry [Bahauddin Zakariya University]
- Master of Science : Analytical/Inorganic Chemistry [University of the Punjab]
- PhD : Physical Chemistry [Universiti Malaya]

Professional Membership:

- Member of Waste Management (UMPEDAC Universiti Malaya)
- Committee Member (International Journal of Renewable Energy Resources [UMPEDAC] Universiti Malaya)

Involvement in IMM committees: NIL

TECHNICAL ARTICLE 3

Technoeconomic of Repurposing Natural Gas Pipelines to Carry Carbon Dioxide: Malaysia Landscape

Yoga Sugama SALIM, Robert SHANDRO
Cetim-Matcor, 3 Aerospace Link, 797550 Singapore

Modern gas transmission pipelines are usually engineered to remain operational for the next 40 to 50 years or even more. Design considerations for transmission and distribution pipelines are different as the distribution pipelines goes through populated areas. With efficient maintenance and effective management practices, it is possible to extend the service life of the pipeline by an additional 25 to 30 years beyond its original design life. The natural gas pipelines account for about 70-80% of the global pipeline network, with the remaining shares primarily dedicated to the transportation of oil, refined petroleum and chemicals. Currently, the global network of natural gas transmission and distribution pipelines that are in operation spans about 1 million kilometres. As the global energy transition advances, the integration of renewable energy sources with existing gas systems offers a practical and efficient approach to reduce carbon footprints. Furthermore, the increasing focus on hydrogen and carbon capture, utilization, and storage (CCUS) technologies is driving the repurposing and modernization of existing natural gas pipelines.

By repurposing the existing natural gas pipelines, the costs for the activities above can be significantly minimized by leveraging the existing infrastructures that are already in place. This approach not only extends the operational relevance of the pipelines but also aligns with global decarbonization goals. The objective of this report aims to assess the techno-economic and environmental challenges that can be considered when repurposing natural gas transmission pipelines to carry CO₂.

2. Technical Feasibility

CO₂ exhibits unique phase behavior transitioning between gas, liquid, and supercritical states depending on pressure and temperature. The phase behavior significantly impacts its flow characteristics within pipelines. At low pressures and high temperatures, CO₂ exists as a gas. In this state, it behaves similarly to natural gas, with relatively low density and high compressibility. At high pressures and low temperatures, CO₂ exists as a liquid. This phase has a higher density and lower compressibility compared to the gas phase, affecting flow rates and pressure drops. Above the critical point (73.8 bar and 31.1°C), CO₂ exists in a supercritical state. This phase has properties intermediate between those of a gas and a liquid, with high density and low viscosity. The supercritical CO₂ can exhibit complex flow behavior, including density stratification and phase separation, which can lead to operational challenges.

The maintenance of CO₂ pressure and temperature within the desired phase range is crucial for efficient and safe transportation to ensure continuous flow of CO₂. If not controlled properly, the CO₂ can undergo phase separation leading to the formation of liquid and gas slugs and eventually lead to significant fluctuations in pressure and flow rates. The choice of pipeline material must consider the corrosive nature of CO₂. The requalification process of the pipeline for CO₂ transport has been proposed and documented in DNV-RP-F104 [1]. The integrity of the pipeline needs to be first assessed for its condition. Supervisory Control and Data Acquisition (SCADA) system was suggested to be identified and applied as a basis for identifying gaps towards the requirements for CO₂ pipelines. Following the integrity assessment, a flow assessment should be conducted to identify the feasibility of refurbished pipelines. Based on flow assessment, the requirement for modifications can be identified and evaluated. Other requirements such as additional block valves, leak detection upgrades etc. can be identified along the way.

2.1 Materials

All materials should withstand the operating pressure of CO₂. The CO₂ pipelines operate at pressure ranges from 1250-2200 psi (Type II and Type III pipelines), while the NG pipelines operate at pressure ranges 1200 psi and below (Type I pipelines). The specific requirements for each parameter vary depending on the type of CO₂ stream [2]. The choice of pipeline material has evolved over the years, which is driven by factors such as increasing pressure requirements, safety concerns, and technological advancements. Grade A and Grade B carbon steel have limited pressure-bearing capacity compared to higher-grade steels. As the natural gas industry has progressed over the years, there has been a demand for higher-pressure pipelines to transport larger volumes of gas efficiently. Higher-grade steels, such as X65 and X70, offer significantly higher yield strength and tensile strength, making them suitable for high-pressure applications. The high toughness of API 5L grades also helps resist cracking under pressure, which is crucial when transporting NG at high velocities or in regions with significant pressure fluctuations.

Low-carbon steels, like those used in NG pipelines, have an additional advantage in their weldability, making them easier to join during pipeline construction and repair. Welding is a common method used to connect pipeline segments, and materials that are highly weldable, like API 5L grades, help ensure the structural integrity of the system.

DNV-RP-F104 stated that carbon-manganese steel pipelines can be used for CO₂ pipelines where the water content in the CO₂ stream is controlled.

2.2 Degradation resistance

NG pipelines generally contain H₂S moisture and other impurities. Impurities in CO₂ transport such as water vapor, oxygen, and sulfur compounds can react with the steel surface, forming corrosive compounds that weaken the material. The combined effect of CO₂ and its impurities can be more severe than either factor alone. The pipelines are often coated with external protective layers or internal liners to minimize corrosion. While carbon steel grades are generally suitable for NG transport, certain steel grades and materials are not compatible due to their susceptibility to corrosion failure. For example, low-alloy steels that contain higher amounts of sulfur, sulphide inclusions or phosphorus can be prone to embrittlement or stress corrosion cracking, especially in sour gas environments where H₂S is present. Steels with poor resistance to hydrogen embrittlement, such as some high-strength, low-ductility alloys, would also be unsuitable for NG pipelines, as they could develop microcracks that lead to failure over time.

The welding area is considered the weakest point in the entire pipeline due to a higher possibility for the presence of defects and inconsistency. Some evidence suggested that robotic welding can achieve an overall high quality and consistency of the welds; however the human welding has the edge to possibly identify the errors straightaway during the welding, unlike robotic welding. Regardless of the welding process used, if a pipeline weld in a specific area requires rework, both the weld material and the existing pipeline material must be compatible and free of contaminants. Higher levels of sulfur (more than 0.05%) and phosphorus (more than 0.04%) in steel give a negative impact to the mechanical properties.

Another concern for old pipelines is fatigue, which is classified as mechanical failure. After numerous stress cycles during operation, fatigue in the pipeline would have been initiated and developed. If both fracture initial control and fracture propagation control cannot be ensured, fracture arrestors can be considered. The proportion of fatigue severity is linked to the stress-concentration features.

2.3 Pipeline integrity

Several factors must be considered when repurposing pipelines for CO₂ transportation. The primary concern is the pipeline's current condition. Some key questions to address include:

- What existing defects are present, where are they located, and how severe are they?
- Can the existing corrosion management plan be adapted to accommodate CO₂ transportation, or will modifications be necessary?

To answer these questions, a comprehensive inspection is necessary to identify any existing defects or damages on the pipelines, such as corrosion, dents, or cracks. The inspection program typically begins with a desktop review of all available information including pipeline records, material specifications, and operating history. Following the review, a visual inspection is required to identify any external damage on the above-ground components as well as the right-of-way.

Advanced inspection techniques such as in-line inspection (ILI) are then employed to assess the internal condition of the pipeline. Before ILI is performed, the pipeline needs to be thoroughly cleaned of debris and ensured that it is free of obstructions. As ILI tool (smart pigs) travels through the pipeline, simultaneous data such as wall thickness, metal loss, geometric deformations, internal corrosion, and external corrosion are collected.

Besides ILI techniques, there are some other Non-Destructive Testing (NDT) that are employed such as magnetic flux leakage (MFL), ultrasonic testing (UT), Eddy current testing (ECT), and radiographic testing (RT). Different tools have varying sensitivities to debris. For instance, ultrasonic tools are more susceptible to soft materials like wax and paraffin, while magnetic flux leakage tools are relatively robust against most types of debris. Additionally, fluid density and pipe wall thickness can affect tool performance. Heavy crudes and thick-walled pipes pose specific challenges, requiring specialized tools and techniques. A summary of NDT techniques used to inspect pipelines is shown in Table 1.

Table 1: Summary of NDT techniques used to inspect pipelines

NDT Technique	Detection of Defects	Requires Access to Both Sides		Material Type	Disadvantages
		Surface	Subsurface		
In-Line Inspection (ILI)	Yes	Yes	No	Most materials	Requires pipeline preparation Can be costly
Magnetic Flux Leakage (MFL)	Yes	Limited to near-surface	No	Ferromagnetic materials	May not detect deep subsurface defects
Ultrasonic Testing (UT)	Yes	Yes	No	Most materials	Requires skill operators Time-consuming for large-scale inspections
Eddy Current Testing (ECT)	Yes	Yes	No	Conductive materials	Not suitable for thick-walled pipelines Requires skill operators
Radiographic Testing (RT)	Yes	Yes	Yes/No (depends on technique)	Most materials	Time-consuming for large-scale inspections Expensive

The data collected from various inspection and testing methods is analyzed to identify potential risks and prioritize areas for maintenance or repair. A comprehensive maintenance and repair plan needs to be developed to address the identified issues and ensure the continued integrity of the pipeline. Pressure testing and hydrostatic testing are then employed to identify leaks or weak points in the pipeline after NDT test (Figure 1). After the inspection program, laboratory testing can be sought. It provides essential insights into the material's mechanical properties (e.g., tensile strength, yield strength, and ductility) and its compatibility with CO₂.

3. Economic viability in Malaysia

Table 2 provides an estimated breakdown of costs associated with pipeline repurposing by assuming that the project is performed in Malaysia. If we look past the historical report about the capital expenditure (CAPEX) of building new pipelines in Malaysia, it was reported that NG allocated RM 1.4 billion to build an 800-km pipelines [3]. This suggests that the cost is around RM 1.75 million per kilometre of building new pipelines. Based on our projected cost for repurposing 20-30 years old natural gas pipelines in Malaysia, the best-case scenario has an estimated cost of RM 1.10 million per kilometre of old natural gas pipelines. As such, the repurposing offers significant savings of ~37%. For worse case scenario where half the welded joints for 1 km of pipeline have failed and require replacement, the cost will be a staggering ~60% higher than building the new pipelines, which is at RM 2.80 million per kilometre. It is therefore necessary to conduct a thorough pipeline integrity assessment to determine actual retrofitting requirements and costs. Factors such as operational risks, regulatory requirements, and potential carbon credit benefits for CO₂ transportation need to be considered when evaluating the repurposing of natural gas pipelines against the new construction of pipelines for CO₂ transportation.

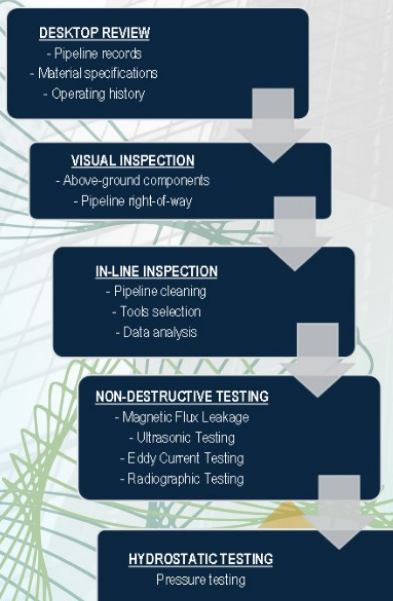


Figure 1: Refurbished Equipment in Long-Term Storage

According to a study by the European Union Agency for the Cooperation of Energy Regulators (2021) – Transporting Pure Hydrogen by Repurposing Existing Gas Infrastructure, it was estimated that the cost of repurposing ranges from 10-35% [4, 5]. Our estimation of 37% cost saving is closed to the estimated cost by Det Norske Veritas (DNV). It should nevertheless be noted that this range may differ significantly if the conditions of the pipelines require the owners/operators to repair the damaged parts extensively and significantly.

4. Conclusion

Repurposing existing NG pipelines for CO₂ transport presents a promising avenue for accelerating CCS deployment and reducing carbon emissions. However, it requires careful consideration of technical, economic, and environmental factors. While carbon steel is suitable for both NG and CO₂, specific considerations are necessary to address the potential impacts of CO₂ on material properties, including corrosion and embrittlement. Rigorous assessments of pipeline integrity, including wall thickness, corrosion, and fatigue, are crucial to ensure safe operation. The unique flow characteristics of CO₂, particularly in the supercritical phase, must be carefully considered to optimize pipeline design and operation.

Repurposing appears economically beneficial when a thorough pipeline integrity assessment reveals minimal required repairs. The estimated CAPEX for repurposing a 1-km pipeline in Malaysia ranges from RM 1.1 million (best case) to RM 2.8 million (worst case). Compared to building new pipelines (estimated at RM 1.75 million per km), repurposing offers potential savings of 37% in the best-case scenario. The economic viability of repurposing depends heavily on the pipeline's condition. Factors like the percentage of welded joints requiring replacement and the need for extensive repairs significantly impact the costs. In the worst-case scenario with extensive repairs, repurposing might be more expensive than building new pipelines.



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Table 2: Estimated cost for repurposing of NG pipelines to carry CO₂ in Malaysia.

	Estimated cost
Advanced ultrasonic testing (PAUT or ToFD)	<p>RM 1,000 – 3,000* per day</p> <p>A full-length inspection for 1 km pipeline was estimated to consume around 9** days by assuming the team inspects 15 welds per day for every 12 meters (weld-focus inspection).</p> <p>*Applicable for experienced engineer (reference: personal communication with industry players)</p> <p>**This number may vary depending on the accessibility of the pipeline (it takes longer time if the pipeline runs through challenging terrain), crew and equipment efficiency, and other factors that may arise.</p> <p>The inspection cost was estimated to be RM 3,000 per day x 9 days = RM 27,000</p> <p>It will take additional time for mobilization/de-mobilization and setup (2 days), and report preparation (7-10 days). Hence, it arrives to the following costs</p> <p><u>Mob/demob</u></p> <p>Travel distance of RM 2.00 per km for fuels, tolls, and vehicle wears. Assumption for 350 km. Hence, the cost is RM 2 per km x 350 km x 2 (for round trip) = RM 1,400</p> <p>Labour costs for engineer = RM 150 per hour. 8 hours working. Hence, the cost is as follows, RM 150 x 8 hours = RM 1,200</p> <p><u>Set-up cost (2 days with 1 engineer and 1 technician)</u></p> <p>Experience engineer's daily rate = RM 3,000 per day x 2 days = RM 6,000</p> <p>Support technician = RM 500 – 800 per day. Assumed the experienced technician was deployed. Then RM 800 x 2 days = RM 1,600</p> <p><u>Report preparation (assumed 10 days for experienced engineer)</u></p> <p>Report preparation rate = RM 3,000 per day x 10 days = RM 30,000</p> <p>The TOTAL estimated cost for 1 km pipeline inspection using PAUT = RM 27,000 + RM 1,400 + RM 1,200 + RM 6,000 + RM 30,000 = RM 65,600 (excluding hotel, administration fee, and other applicable taxes which can have additional 10-20% additional cost).</p>
Pigging (ILI)	<p><u>Cleaning</u></p> <p>Preparation for cleaning = 1 day</p> <p>Cleaning runs assuming heavy cleaning is required to remove significant debris and other restrictions = 3-5 days</p> <p>Using the rate of experienced engineer above, the total number of days = 6 days x RM 150 per hour x 8 hours per day = RM 7,200</p> <p><u>Pigging</u></p> <p>Final preparation and planning for pigging = 1-2 days</p> <p>Tool run time: 1 day</p> <p>Post-run activities = 1-2 days</p> <p>Using the rate of experienced engineer above, the total number of days = 7 days x RM 150 per hour x 8 hours per day = RM 8,400</p> <p><u>Mob/demob</u></p> <p>Travel distance of RM 2.00 per km for fuels, tolls, and vehicle wears. Assumption for 350 km. Hence, the cost is RM 2 per km x 350 km x 2 (for round trip) = RM 1,400</p> <p>Labour costs for engineer = RM 150 per hour. 8 hours working. Hence, the cost is as follows, RM 150 x 8 hours = RM 1,200</p> <p><u>Report preparation (assumed 14 days for experienced engineer)</u></p> <p>Report preparation rate = RM 3,000 per day x 14 days = RM 42,000</p> <p>The TOTAL estimated cost for 1 km pipeline inspection using ILI = RM 7,200 + RM 8,400 + RM 1,400 + RM 1,200 + RM 42,000 = RM 60,200 (excluding hotel, administration fee, and other applicable taxes which can have additional 10-20% additional cost).</p>
Material Integrity analysis	RM 25,000 – RM 45,000 depending on the complexity of analysis.
Welded joint materials	<p><u>Valves</u></p> <p>Replace existing valves with CO₂-compatible ones capable of handling dense-phase CO₂ pressures (80-150 bar).</p> <p>Manual valve: RM 35,000 – 55,000 per valve</p> <p>Automated valve: RM 65,000 – RM 120,000 per valve</p> <p>Assumption was made that 100-km pipeline requires 10 valves. This suggests the cost per km is around RM 5,500 per km for manual valve at higher range of price and RM 12,000 per km for automatic valve at higher range of price.</p> <p><u>Compressors</u></p> <p>RM 500,000 – 1,500,000 depending on capacity and design</p> <p><u>Pipeline linings and repairs</u></p> <p>RM 100-300 per meter x 1 km pipeline = RM 300,000 based on the maximum range of charges</p> <p><u>Leak detection systems</u></p> <p>RM 100,000 – 200,000 per setup</p>
-	<p>The total estimated CAPEX cost for repurposing natural gas pipeline in Malaysia under certain scenario is as follows,</p> <p>~RM 1,100,000 per km (best case scenario with the most competitive rates (lowest cost for retrofitting components, lowest replacement costs for welded joint materials and best rates for material integrity analysis), and 10% of the welded joint requires replacement, and pipeline linings repairs for the entire 1 km pipeline)</p> <p>~RM 2,800,000 per km (worst case scenario with the most expensive rates and 50% of the welded joint requires replacement, and pipeline linings repairs for the entire 1 km pipeline)</p>

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STUDENT
EDITORIAL

From Raw Materials to Composites: Different Fabrication Techniques for Unsaturated Polyester/ Coconut Coir Fibre Composites

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Introduction

Generally, polymer composites consist of fibres embedded in the polymer to enhance mechanical properties of the composites. The fibres in these polymer composites can be varied in form, composition, orientation, length-to-diameter (L/D) ratio and size. Each of these variations affects the mechanical properties of the polymer composites (Callister and Rethwisch, 2020).

Additionally, there are several fabrication methods for composite materials, such as injection moulding, autoclave moulding, filament winding, pultrusion, resin transfer moulding (RTM), hand lay-up, spray lay-up, compression moulding and vacuum infusion (Nagavally, 2017; Rajak, 2019). The current study focused on composite materials made from natural fibre and thermosetting matrix, primarily using three different fabrications, which are compression moulding, hand lay-up and vacuum infusion processes. Both compression moulding and vacuum infusion moulding are closed moulding processes, while the hand lay-up is an open moulding process (Nagavally, 2017). Different fabrication methods for polymer composites result in different mechanical properties and the choice of fabrication method also depends on the specific application and its requirements (Rajak, 2019).

Hong et al. (2024) studied denim fabric-reinforced unsaturated polyester composites produced using various processing methods. Their research highlighted that different fabrication methods for thermosetting composite materials result in varying mechanical properties. The variation is due to defects such as void formation, delamination and reinforcement agglomeration, which occur differently depending on the fabrication methods and affect the properties of the composites.

In the present study, coconut coir fibre-reinforced unsaturated polyester composites were prepared using different fabrication techniques and the tensile properties of these composites were investigated.

Materials

Coconut coir fibre in mat form (CCM) and unsaturated polyester (UP) were used as the raw materials of the thermosetting composite. CCM acted as reinforcement

while UP acted as the polymer matrix. Both CCM and the UP were purchased from Taurenz Resources, Kedah, Malaysia. The CCM was in randomly orientated fibre in mat form. Before preparing the UP/CCM composite samples, 1 wt % of hardener, which is methyl ethyl ketone peroxide (MEKP) was mixed with the UP before proceeding to produce the thermosetting composite samples using different techniques. Additionally, the gel time of the UP resin was 20 minutes with the addition of 1 wt % of MEKP at room temperature. Hence, all fabrications of composites were done within 20 minutes to avoid the composite sample cured during the fabrication process.

Preparation of UP Composites with Different Techniques
1 wt % of the MEKP was mixed with the UP resin and stirred for 2 minutes. A total of 100 g of this mixture was used for the different fabrication methods, as explained below:

Compression moulding

The releasing agent was applied on the mould and the CCM was placed on the mould. The UP resin was then poured onto the CCM and impregnated using a brusher to press the UP resin into the CCM. The compression pressure of 2.1 MPa was applied to compress the UP composite for 10 minutes and force out any trapped air bubbles. No heat is required for this process. The UP/CCM composite was left for curing at room temperature for 24 hours. The setup of the compression moulding technique was shown in Figure 1.

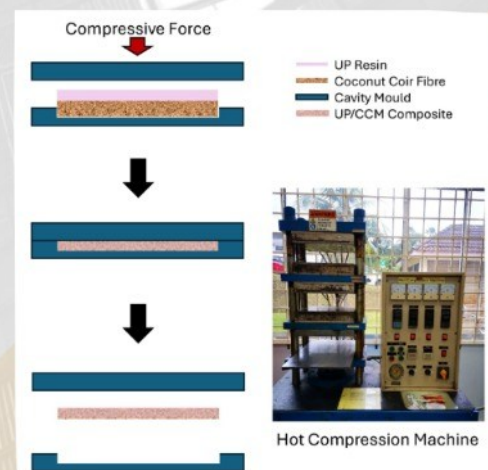


Figure 1: The setup of compression moulding

Hand Lay-up

The UP resin was applied to the CCM layer by layer using a brush, impregnating the CCM. A roller was used to remove air bubbles from the UP composite. The UP/CCM composite was then left to cure for 24 hours. Figure 2 shows the fabrication method of hand lay-up.

Vacuum Infusion

The vacuum infusion setup was presented as shown in Figure 3. Releasing agent was first applied to the acrylic mould to ensure easy removal of the UP composite from the mould. The CCM was put on the acrylic mould and covered with peel ply, infusion mesh layer and vacuum bag. The vacuum bag was sealed to the acrylic mould using sealant tape to ensure proper sealing. The vacuum pump was then connected, and the UP resin was sucked into the mould through the vacuum process, which removed air and impregnated the CCM with the UP resin. After curing and hardening within the vacuum bag for 24 hours, the UP/CCM composite was demoulded by removing the vacuum bag.

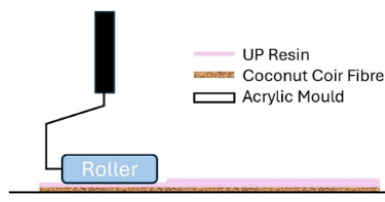


Figure 2: Fabrication method of hand lay-up

Post-curing Process

After curing for 24 hours at room temperature, all samples from compression moulding, hand lay-up and vacuum infusion were removed from moulds and placed in an oven at 60 °C for 1 hour for post-curing. This step was to ensure that all samples were fully cured.

Tensile Test

The tensile properties (ultimate tensile strength, modulus of elasticity and elongation at break) were measured using 10 Tons Universal Tensile Tester (Shimadzu's AGS-X Series). Each specimen was cut to the standard Type IV dimensions according to ASTM D638. A total of 5 specimens from each fabrication method were tested to get an average value. The tests were conducted at a crosshead speed of 10 mm/min and performed at room temperature.

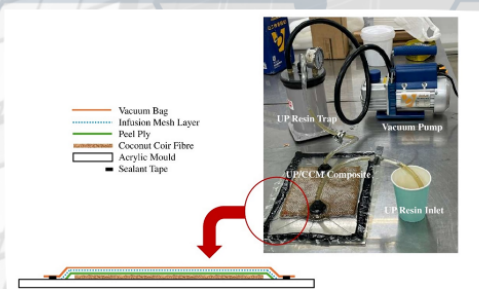


Figure 3: Setup of vacuum infusion moulding

Results and Discussion

Figure 4 shows that the tensile strength of the UP/CCM composites increased as compared to neat UP, regardless of the fabrication method used. This is due to the incorporation of the CCM, which reinforces the tensile strength of the composites, allowing them to withstand more stress than neat UP before failure. The stress transferred from UP matrix to the CCM fibres within the composites. El-Wazery et al. (2017) also stated that when the fibres reinforcements are incorporated into a weak polymer matrix, the reinforcements share the major load. Therefore, the strength and stiffness of the composite materials depend on the strength and stiffness of the reinforcement.

When comparing different fabrication techniques, the results show that the UP/CCM composite produced by compression moulding shows the highest tensile strength, followed by the vacuum infusion UP/CCM composite, with the hand lay-up UP/CCM composite having the lowest tensile strength. The higher tensile strength of the compression-moulded composite has fewer trapped air bubbles, as the compressive force is applied during the process, which effectively removes most of the air bubbles from the composites. These bubbles act as weak points in the specimen, causing stress concentrations that initiate cracks and lead to failure during tensile testing.

In vacuum infusion, the vacuum pump helps to extract air bubbles, many of which become trapped on the infusion mesh layer, resulting in fewer bubbles within the composite as compared to hand lay-up composite. However, in the hand lay-up method, it is difficult to remove bubbles from the composite using the roller, leading to more air being trapped in the composite. These trapped bubbles weaken the composite, resulting in the lowest tensile strength among the three fabrication methods.

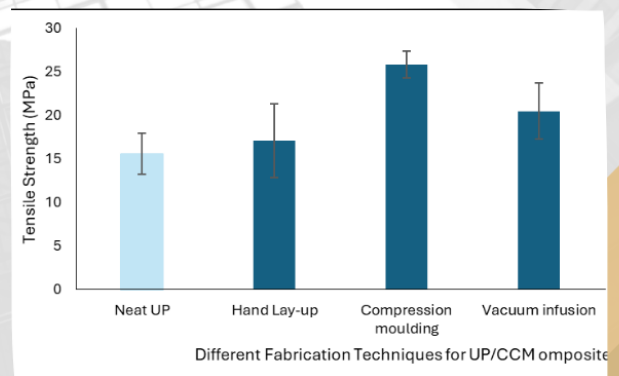


Figure 4: Tensile strength of neat UP and UP/CCM composites produced using different fabrication methods

Based on Figure 5, the modulus of elasticity of all UP/CCM composites is higher than neat UP. This increase is attributed to the incorporation of the higher stiffness fibres, which improves the overall stiffness of the UP/CCM composites. The modulus of elasticity results for the specimens produced using the three different fabrication techniques follow the same trend as the tensile strength results.

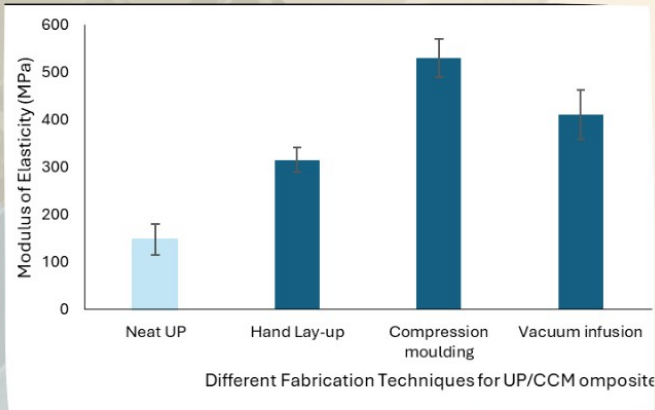


Figure 5: Modulus of elasticity of neat UP and UP/CCM composites produced using different fabrication methods

Figure 6 shows the elongation at break for both neat UP and UP/CCM composites. The neat UP shows higher elongation at break than all UP composites. This is likely because the incorporation of the fibres reduces the chain mobility of the UP, increasing the rigidity of the composites. Among of three fabrication methods, the compression moulded composites showed the highest elongation at break, followed by vacuum infusion composites, with the hand lay-up composites showing the lowest. This is due to the fact that the presence of numerous air bubbles in the hand lay-up composites leads to rapid crack formation when subjected to tensile forces.

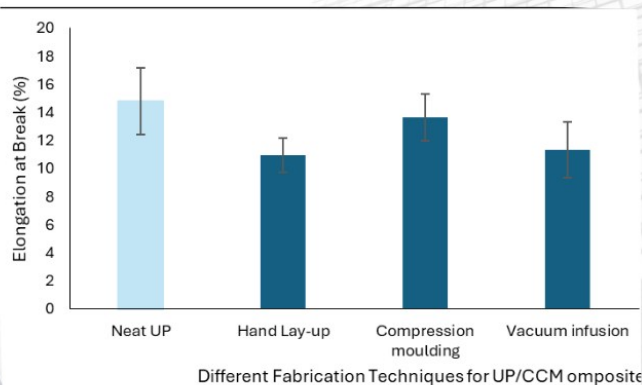


Figure 6: Elongation at break of neat UP and UP/CCM composites produced using different fabrication methods

Conclusion

In summary, the incorporation of CCM into UP enhances the ultimate tensile strength and modulus of elasticity but reduces the elongation at break of UP/CCM composites across all three fabrication techniques. Among the fabrication techniques, compression-moulded specimens showed the highest ultimate tensile strength, modulus of elasticity and elongation at break. This could be due to using the compression moulding process, which more effectively removes the air bubbles from the UP composites as compared to the vacuum infusion and hand lay-up. The presence of the air bubbles can create stress concentrations and initiate the failure during testing.

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IMM TRAINING AND CERTIFICATION PROGRAM OVERVIEW

The Institute of Materials, Malaysia (IMM) offers engineering & technical professionals and practitioners a range of Certification Schemes and technical training courses to meet the requirements of the oil & gas, refining, petrochemical, transport, construction and other industries. Our programs have been developed together with the industry, academia and relevant stakeholders to ensure that the technical training and certification provided meet the relevant industry standards and requirements.

PROGRAM: COATING

IMM Certification Schemes and Courses	Technical Training Courses (Non-certification)
<ul style="list-style-type: none"> • Certified Protective Coating Technician (Blaster and/or Painter) Level 1 and Level 2 • Certified IMM-B1/B2 Assistant Blaster & Painter • Certified Coating Inspector Level 1 • Certified Coating Inspector Level 2 • Certified Blasting and Painting Supervisor • Certified Thermal Spray Coating Applicator • Certified Coating Quality Control Technician 	<ul style="list-style-type: none"> • Refresher Course of Certified Protective Coating Technician (Blaster and/or Painter) Level 1 and Level 2 • Refresher Course of Certified Coating Inspector • Basic Knowledge on Corrosion Protection for Technicians and Engineers • Corrosion Control by Protective Coating • Basic Corrosion & Coating Course

PROGRAM: COATING FINGERPRINTING

IMM Certification Schemes and Courses	Technical Training Courses (Non-certification)
<ul style="list-style-type: none"> • Certified Coating Fingerprint Quality Controller Level 1 • Certified Coating Fingerprint Quality Controller Level 2 • Certified Coating Fingerprint Trainer 	<ul style="list-style-type: none"> • Coating Fingerprint Foundation Course • Refresher Course of Certified Coating Fingerprint Quality Controller Level 1/Level 2

PROGRAM: CORROSION

IMM Certification Schemes and Courses	Technical Training Courses (Non-certification)
<ul style="list-style-type: none"> • Certified Corrosion Monitoring Practitioner Level 1 • Certified Corrosion Monitoring Practitioner Level 2 • Certified Corrosion Monitoring Practitioner Level 3 • Certified Cathodic Protection Practitioner Level 1 • Certified Cathodic Protection Practitioner Level 2 • Certified Cathodic Protection Practitioner Level 3 • Certified Cathodic Protection Engineer 	<ul style="list-style-type: none"> • Corrosion Control by Cathodic Protection

PROGRAM: VIBRATION

IMM Certification Schemes and Courses	Technical Training Courses (Non-certification)
<ul style="list-style-type: none"> • Certified Vibration Practitioner Category 1 • Certified Vibration Practitioner Category 2 • Certified Vibration Specialist Category 3 • Certified Vibration Specialist Category 4 	-



PROGRAM: MECHANICAL JOINT INTEGRITY (MJl)

IMM Certification Schemes and Courses	Technical Training Courses (Non-certification)
<ul style="list-style-type: none"> • Certified Technician in Mechanical Joint Integrity (MJl) for Flange Bolted Connection • Certified Technician in Mechanical Joint Integrity (MJl) for Small Bore – Piping, Tubing, Valves 	<ul style="list-style-type: none"> • Mechanical Joint Integrity • Pressure Safety Valve • Small Bore Tubing

PROGRAM: THERMAL INSULATION

IMM Certification Schemes and Courses	Technical Training Courses (Non-certification)
<ul style="list-style-type: none"> • Certified Thermal Insulation Installer 	<ul style="list-style-type: none"> • Introduction to Thermal Insulation

PROGRAM: WELDING

IMM Certification Schemes and Courses	Technical Training Courses (Non-certification)
<ul style="list-style-type: none"> • Certified Welding Inspector • IMM-JWES Certified Associate Welding Engineer • IMM-JWES Certified Welding Engineer • IMM-JWES Certified Senior Welding Engineer 	<ul style="list-style-type: none"> • Repair Welding of Pressure Equipment in Refineries & Chemical Plants • Welding & Joining Technology for Non-Welding Personnel • Steel Technology for Non-Technical Personnel

MISCELLANEOUS MATERIALS SCIENCE AND TECHNOLOGY (NON-CERTIFICATION) COURSES

Technical Training Courses	Technical Training Courses
<ul style="list-style-type: none"> • Materials Selection & Corrosion • Metallurgical Failure Investigation • Basic Course on Operation of Mobile Air Compressor • Competent Mobile Industrial Compressor Operator • Competent Mobile Industrial Equipment Inspector • Practical Approach to Inspection and Maintenance of Steam Turbine 	<ul style="list-style-type: none"> • Practical Approach to Precision Alignment Methods • Practical Approach to Precision Balancing Methods • Reciprocating Compressors: Operations, Maintenance, Inspection and Troubleshooting • Troubleshooting Techniques for Rotating Equipment • Valve Operations, Maintenance and Inspection Including Flange Breaking

Note: A certificate of attendance will be issued to all participants of non-certification professional development training courses while candidates who pass the assessment/examination of IMM-certification schemes will be certified with the issue of IMM competency certificate and IMM certification ID card in addition to the certificate of attendance.

More information on training and certification is available on IMM's website at www.iomm.org.my.

For further enquiries:

Email : secretariat@iomm.org.my
 WhatsApp : +6018 911 3480

INSTITUTE OF MATERIALS, MALAYSIA

Suite 1006, Level 10, Block A, Kelana Centre Point, No. 3 Jalan SS 7/19,
 47301 Petaling Jaya, Selangor.

Materials Lecture Competition 2024 & Young Person's World Lecture Competition 2024

Prepared by: Dr. Abdul Hakim Md Yusop, Chairperson, IMM-MLC Committee

Edited by: Dr. Nor Akmal Fadil, Co-Chairperson, IMM-MLC Committee



Date: 3rd, 24th Sept, 28th November 2024
Venue: Zoom Online Platform

Materials Lecture Competition 2024 (MLC 2024)

Universiti Malaya (UM) has been selected as the host for the Materials Lecture Competition 2024 (MLC 2024). The MLC 2024 semi-final and final round were held online on 3rd Sept 2024 and 24th Sept 2024, respectively, by UM in collaboration with the Institute of Materials, Malaysia (IMM) and the Institute of Materials, Minerals and Mining UK (IOM3-UK). Both events were held on the Zoom online platform and aired live on the Facebook page of the Faculty of Mechanical Engineering, UM. Since the year 2020, national and international competitions have been held online due to the continued Covid-19 pandemic situation.

The aim of the event was to provide a platform for young talents to exhibit effective and impressive presentation skills in delivering topics in the field of material science and engineering. The MLC 2024 semi-final event was officiated by Dr. Abdul Hakim Md Yusop, the Chairperson of the IMM-MLC Committee. The semi-final and final judging panels comprised experts from academia and industry, mirroring international standards to ensure competition quality (Table 1).

The MLC 2024 semi-final competition was aimed at selecting five finalists among participants from fourteen Malaysian universities, as shown in Table 2. The first five participants in Table 2 were the MLC 2024 top five finalists who won the semi-final round. The top five finalists had competed in the MLC 2024 final round, hosted online by UM. The MLC 2024 Final event was officiated by the Head of Centre of Advanced Materials (CAM), Universiti Malaya, Assoc. Prof. Dr. Hendrik Simon Cornelis Metselaar. The half-day competition ended with closing remarks given by Ir. Hisyam Yahya, representing Ts. Dr. Chew Khoo Hee, President of IMM.

Jerome Liew from Universiti Malaya was the winner of MLC 2024, while Ainaa Amirah Marzuki from Universiti Teknologi Malaysia and Aslam Hadi from Universiti Teknikal Malaysia came in second and third place, respectively. The winners received cash prizes of RM 3,000, RM 2,000 and RM 1,000, respectively, while the last two finalists received consolation prizes of RM500 each. The cash prize was sponsored by IMM. Jerome Liew represented Malaysia in the Young Persons' World Lecture Competition (YPWLC 2024) in November, which was organised by IOM3-UK via an online competition.

Table 1: The panel of judges for the MLC 2024 semi-final and final

MLC 2023 Semi-final	MLC 2023 Final
1. Assoc. Prof. Ir. Ts. Dr. Wan Sharuzi Wan Harun (Moderator), Universiti Malaysia Pahang	1. Assoc. Prof. Dr. Norkhairunnisa Mazlan, Universiti Putra Malaysia (Moderator)
2. Dr. Firdaus Suhor, PETRONAS Research Sdn Bhd,	2. Mr. Kang Kim Ang, CORTRROL Group of Companies
3. Ir. Hanafi Ali, Sarawak Energy Berhad,	3. Ir. Ts. Noor Hisham Yahaya, Safe Asbestos Solutions Sdn. Bhd.
4. Assoc. Prof. Dr. Sarizam, Universiti Kelantan.	4. Prof. Dr. Mariyam Jameelah, Universiti Malaysia

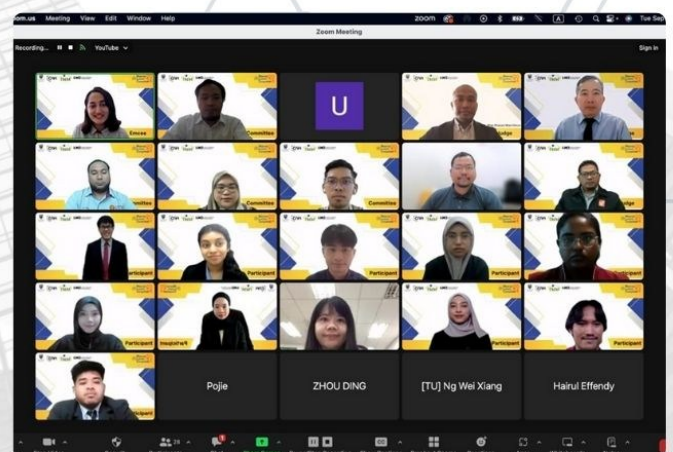


Figure 1: Webex screenshot of the thirteen MLC 2024 semi-final participants with IMM representative, MLC Chairperson, MLC committee members, and the judges



Figure 2: MLC 2024 top five finalists

Young Persons' World Lecture Competition 2024 (YPWLC 2024)

The IOM3 Young Persons' World Lecture Competition (YPWLC) has been held annually in different locations around the globe, including Brazil, South Africa, Malaysia, and Australia, since 2005 in London. The YPWLC 2024 took place virtually on 28th November 2024 at 20:00 – 11:30 MYT (12:00 – 15:30 GMT). This is the fourth time the competition has been held virtually due to the Covid-19 pandemic. The competition was organized by the IOM3 Student & Early Career Committee and participated by the finalists from around the world (Malaysia, South Africa, United Kingdom, and Hong Kong) who had won their respective finals and represented their countries at this year's final.

Malaysia's representative, Jerome Liew, a postgraduate student from Universiti Malaya, won the third prize in the prestigious competition with his topic 'MXENE: Pursuing Fast-Charging Battery' to bring home a prize of £1,400. Besides, he was awarded a free one-year IOM3 membership to be part of a dynamic and vibrant professional community.

The judging panel of YPWLC 2024 included the President of IOM3 as the Chair of the judging panel, Dr. Kate Thornton CEng, CSci, FIMMM, IOM3 President; Dr. Ilija Rasovic MIMMM, Event Co-ordinator and the Vice-Chair, Student & Early Career Committee; Dr. Michael Kenyon MIMMM, Vice-Chair, Student & Early Career Committee; and Mr. Martyn Jones CEng, FIMMM, Chair, Members' Board.

The first prize went to Sebasa Theresa Ramahlare, representing South Africa, with her talk on 'Biodegradable Mulch Biofilms Potential Environmentally Friendly Alternative for Agricultural Mulching'. Oliver Preuß from FEMS - Federation of European Materials Societies won the second place for his lecture 'Dislocation-Based Toughening and Damage-Tolerance in Oxide Ceramics'.

The main objective of the YPWLC competition is to encourage young materials scientists and engineers to develop their communication and presentation skills. Delivering informative complex technical knowledge enthusiastically and understandably to a non-specialist audience has become an essential communication skill in today's dynamic world.

Since 2013, Malaysian finalists selected via the IMM Materials Lecture Competition have consistently secured the top-three prizes at the YPWLC, including 2024's third prize. Over 12 years, Malaysia, through IMM, has maintained a continuous presence at the event, with unwavering support from both public and private universities nationwide.



Figure 3: Malaysia finalist, Jerome Liew from Universiti Malaya (UM) won third place at YPWLC 2024 (source: <https://www.instagram.com/umresearch/p/DDD2zTWyX15/>)

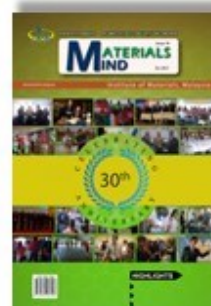
Table 2: MLC 2024 semi-final participants and the top five finalists

Name	Title
1. Jerome Liew, Universiti Malaya, (UM)	1. MXene: The Future of Fast-Charging Battery
2. Ainaa Amirah Binti Marzuki @ Mahadi, Universiti Teknologi Malaysia (UTM)	2. Materials Then and Now: Exploring the Potential of Magnetorheological (MR) Foam
3. Aslam Hadi Bin Hamzah, Universiti Teknikal Malaysia Melaka (UTEM)	3. Investigation of Recycled PET based on Mechanical Properties through Fused Deposition Modelling (FDM) Process
4. Normaiza Binti Nordin, Universiti Malaysia Sabah (UMS)	4. Nafion Membrane in Microbial Fuel Cell: Properties and Proton Transfer Mechanism
5. Natasya Salsabilla, Universiti Tun Hussein Onn Malaysia (UTHM)	5. Effect of Amine and Thiol as Functional Groups on Gold Nanobipyramids Properties for Glucose Sensing
6. Ong Kar Kien, Tunku Abdul Rahman University Of Management And Technology	6. Ionic Liquid as promising material to optimize the EDLC performance
7. Sitti Shalyza Qasidah Binti Salleh, Universiti Teknologi Petronas (UTP)	7. Advancing Durability: Self-Healing Coatings
8. Ahmad Firdaus Bin Amran, Universiti Kebangsaan Malaysia (UKM)	8. The Effect of Heat Treatment on the Microstructure and Strength of Graphene Nanoplatelet Reinforced Aluminium Composite
9. Ng Wei Xiang, Taylor's University	9. The Application of Pearlite and Coir as Filter Media for Lake Water Treatment
10. Sarveishini Yogendran, Universiti Putra Malaysia	10. Revolutionizing Aircraft Efficiencies: The Impact of Carbon Nanotubes (CNTs) on Fuel Reduction
11. Clara Edah Norman, Curtin University Malaysia	11. Utilising Fish Bone Meal in Fish Feed Formulation
12. Yogasri A/P Chandren, Universiti Selangor (UNISEL)	12. Optimizing Solid State Fermentation of <i>Fusarium oxysporum</i> for Effective Polyethylene Terephthalate (PET) Biodegradation
13. Kummudasri A/P Uthayarajan, Universiti Tenaga Nasional	13. From Trash to Treasure: Transforming Black Plastics to High-Tech Carbon Nanotube



MATERIALS IND

Quarterly Magazine of Institute of Materials, Malaysia



General Information

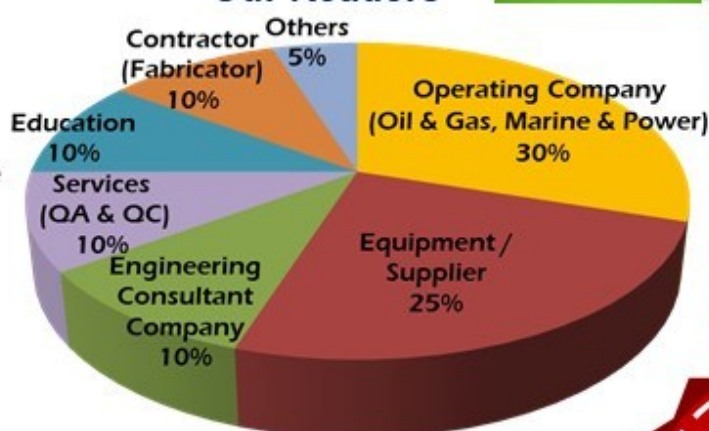
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Institute of Materials Malaysia



Launch of IMM Materials Failure Investigation Practitioner (MFIP) Certification Scheme

Reported by: Aberamy Dayalam, Manager of IMM Secretariat



Date: 29th October 2024

Venue: Nottingham University Future Students Centre, Menara Axis, Petaling Jaya

The IMM Materials Failure Investigation Practitioner (MFIP) Certification Scheme Launch Event was successfully held on the 29th October 2024 at Nottingham University Future Students Centre, Menara Axis, Petaling Jaya. The event, hosted by the Institute of Materials Malaysia (IMM), aimed at introducing the MFIP Certification Scheme to industry professionals. The launch served as a platform to highlight the significance of certified materials failure investigation practitioners in ensuring industry standards and best practices.



Figure 1: The Launching of the IMM MFIP Certification Scheme



Figure 2: Welcoming remarks by Ts. Dr. Chew Khoon Hee. The event commenced with the registration of invitees. Attendees, including professionals from various industries, gathered to witness the official introduction of the MFIP Certification Scheme.

The event began with welcoming remarks delivered by the IMM President, Ts. Dr. Chew Khoon Hee. In his speech, Dr. Chew emphasized the importance of material failure investigation in industrial applications and the role that the MFIP Certification Scheme would play in strengthening industry expertise.

Following the welcoming remarks, Ir. Ong Hock Guan, Chairman of the IMM Corrosion Committee, provided an in-depth introduction to the MFIP Certification Scheme. He elaborated on the objectives, structure, and benefits of the certification, highlighting its relevance to professionals in the field of materials failure investigation.



Figure 3: Introduction session by Ir. Ong Hock Guan

A Q&A session was held, allowing attendees to seek clarification on the MFIP Certification Scheme. This interactive segment provided valuable insights into the certification's requirements and benefits.

Then, the IMM MFIP Certificates were presented to Level 4 recipients. The recipients of this prestigious certification were:

- Assoc. Prof. Eur-Ing. Nigel Patrick Brewitt
- Assoc. Prof. Dr. Andrew Spowage
- Prof. Dr. Ir. Cheong Kuan Yew
- Ir. Dr. Edwin Jong Nyon Tchan
- Dr. Tan Keng Soong

These individuals were recognized for their exceptional contributions to the field of materials failure investigation and their achievement in obtaining Level 4 certification.



Figure 4: Q&A session handled by Ir. Max Ong Chong Hup & Ir. Ong Hock Guan



Figure 5: IMM MFIP Level 4 certificate presented to Assoc. Prof. Dr. Andrew Spowage



Figure 6: IMM MFIP Level 4 certificate presented to Assoc. Prof. Eur-Ing. Nigel Patrick Brewitt

The formal session was followed by a lunch and networking session. This provided attendees with the opportunity to engage with industry peers, discuss potential collaborations, and share insights on materials failure investigation practices.

The event marked the successful launch of the MFIP Certification Scheme. The IMM expressed gratitude to all attendees for their participation and support, reinforcing its commitment to advancing materials science and professional certification in Malaysia.



Figure 7: Networking session

The launch of the MFIP Certification Scheme represents a significant milestone for the IMM and the materials engineering industry. By establishing a structured certification process, IMM aims to enhance industry competency, improve failure investigation methodologies, and ensure a higher standard of professional practice. The event successfully created awareness and set the stage for future advancements in materials failure investigation certification.



ANNOUNCEMENT

CHANGING OF IMM MEMBERSHIP & COMPETENCY CERTIFICATE

With effective date 01 October 2023, we will be using the new design template and **ONLY digital certificate** will be issued for:

- IMM Membership Certificate *AND*
- IMM Competency Certificate

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One-Day IMM Corrosion Conference 2024 and Plant Visit to Sumisaujana TCM Chemicals Sdn. Bhd.

Reported by: Syarifah Nur Asyura Binti Syed Mohamad Sazly,
Materials Technology Education Sdn. Bhd.

Date: 17th October 2024
Venue: Sheraton Imperial Kuala Lumpur Hotel

The Institute of Materials, Malaysia (IMM) Corrosion Committee successfully hosted the 1-Day Conference titled Navigating Corrosion Challenges in the 2020s: Sustainable Practices for a Resilient Future on Thursday, October 17, 2024, at the Sheraton Imperial Kuala Lumpur Hotel. The event attracted a remarkable crowd, with 145 participants and 46 exhibitors.



Figure 1: Group photo of speakers and IMM Members

This year's theme, *Sustainable Practices for a Resilient Future*, focused on leveraging advanced technologies to tackle corrosion challenges. The conference emphasized cost reduction through proactive measures such as predicting and preventing equipment failures, enhancing plant and equipment availability, and optimizing inspection and monitoring techniques.



Figure 2: Participants getting ready for the conference to begin



Figure 3: Opening Speech by IMM Deputy President

The day commenced at 8:00 a.m. with 13 insightful presentations delivered by experts from diverse sectors, including operators, contractors, and vendors. Between sessions, participants explored exhibition booths featuring cutting-edge technologies and innovative solutions for corrosion control. These breaks also provided opportunities



Figure 4: Presentation by EPOMS and Ankaa Consulting



Figure 5: Questions from participants



Figure 6: Participants visited the exhibition booth



Figure 7: Presentation by Petronas Carigali and Sabah Shell Berhad



Figure 8: Panel Discussion

for meaningful discussions and networking, fostering the exchange of ideas between attendees and exhibitors.

The event concluded with an engaging panel discussion moderated by the Chairman of the IMM Corrosion Committee, Ir. Ong Hock Guan, alongside all 13 speakers.

On the following day, participants were invited to a half-day technical visit to Sumisaujana TCM Chemicals Sdn. Bhd., located at No. 57, Jalan Tiaj 2/1, 42300 Puncak Alam, Selangor. The visit included an insightful tour of the facility, showcasing the company's latest laboratory services and technologies. It was an eye-opening experience for the attendees, sparking numerous intriguing questions during the walkabout. IMM extends its heartfelt appreciation to Sumisaujana TCM Chemicals Sdn. Bhd. for hosting this enriching visit.



Figure 9: Plant Visit to Sumisaujana



Oil & Gas Asia (OGA) 2024

Reported by: Zeti Aisyha M.A.Razali, Intern IMM Secretariat
Reviewed by: Aberamy Dayalam, Manager of IMM Secretariat



Date: 25th – 27th September 2024
Venue: Kuala Lumpur Convention Centre (KLCC)

Oil & Gas Asia (OGA) 2024 is Malaysia's leading event for the oil, gas, energy, and petrochemical industries and marked its 20th edition in 2024. The event was held over three days, which took place from 25th – 27th September 2024 at Kuala Lumpur Convention Centre (KLCC).

Through its partnerships with key organisations such as the Malaysian Petrochemicals Association (MPA) and the Malaysian Oil, Gas & Energy Services Council (MOGSC), OGA offers an essential platform for business collaboration and knowledge sharing throughout the energy value chain.

OGA promotes innovation, investment, and sustainable practices in the industry through exhibitions, conferences, and networking events. Serving as a hub for industry leaders, OGA fosters growth and advancement in Malaysia's oil, gas, energy, and petrochemicals sectors, as well as in related industries globally.



Figure 1,2: The IMM Secretariat explained the details of the IMM Training & Certification Programs to the visitors at OGA 2024.

Over 2,000 companies were present at the event, with 25,000 professional and trade visitors from more than 100 countries. The Institute of Materials, Malaysia (IMM) participated as an exhibitor and as one of the supporting associations. The IMM booth was located in Hall 6, booth number 6028. Materials Technology Education Sdn. Bhd. (MTE) and Topfields Borneo Sdn. Bhd. (Topfields) were invited to join IMM as exhibitors. However, Topfields Borneo Sdn. Bhd. participated as a visitor.

Nearly 300 visitors, including students, lecturers, and parents, visited the IMM booth. IMM successfully promoted and introduced its certification programs, memberships, and upcoming conference to the visitors. Additionally, students, lecturers, and parents expressed interest by asking several questions related to IMM's certification programs. Four courses were highlighted in the IMM Certification Programs: the Coating Certification Scheme, the Corrosion Certification Scheme, the Mechanical Joint Integrity Certification Scheme, and lastly, the Welding Certification Scheme. Furthermore, IMM, MTE, and Topfields successfully organized several activities to attract visitors.



Figure 3: IMM Booth Setup at OGA 2024.



Figure 4: A group photo at IMM Booth. From Left Behind : Mr. Abang Mohammad Khairie (Manager Materials Technology Education Sdn. Bhd), Mr. Syafiq Zaini (IMM Secretariat), Mr. Muhammad Iqram Izham (Materials Technology Education Sdn. Bhd.).

In addition, the IMM booth was visited by the IMM Management Committee, IMM Council Members, and IMM members during the OGA 20th Anniversary. Throughout the event, they offered free Inside Scoop ice cream, Touch 'n Go (TnG) cards, HealthLand Family Wellness Centre vouchers, OGA pins, tote bags, and coffee. They also organized games such as golfing, chess and tic-tac-toe. Two conferences were held over three consecutive days: MOGSEC 2024 and the Petrochemicals Sustainability Conference (PSC) 2024.



Figure 5: A group photo at IMM Booth with Ir. Ts. Haji Affandi Majid (Chairperson Coating Committee) and with our two training bodies (MTE & Topfields)



Figure 6: A group photo at IMM Booth with Mr. Rehan Ahmed (IMM Council Members) and Ms. Karen Cheng (Director of Materials Technology Education Sdn. Bhd.).



Figure 7: A group photo at IMM Booth. Centre : Dr. Maxine Yee Swee Li (IMM Council Members)
Right : Ir Max Ong Chong Hup (IMM Council Members).

The key highlights for OGA 2024 included SPEAK OGA, OGA x MOGSC Innovation Working Group, OGA x TalentCorp Malaysia, OGA x Malaysian Gas Association (MGA), OGA x MATRADE, and OGA x Society of Petroleum Engineers (SPE) KL and networking night.

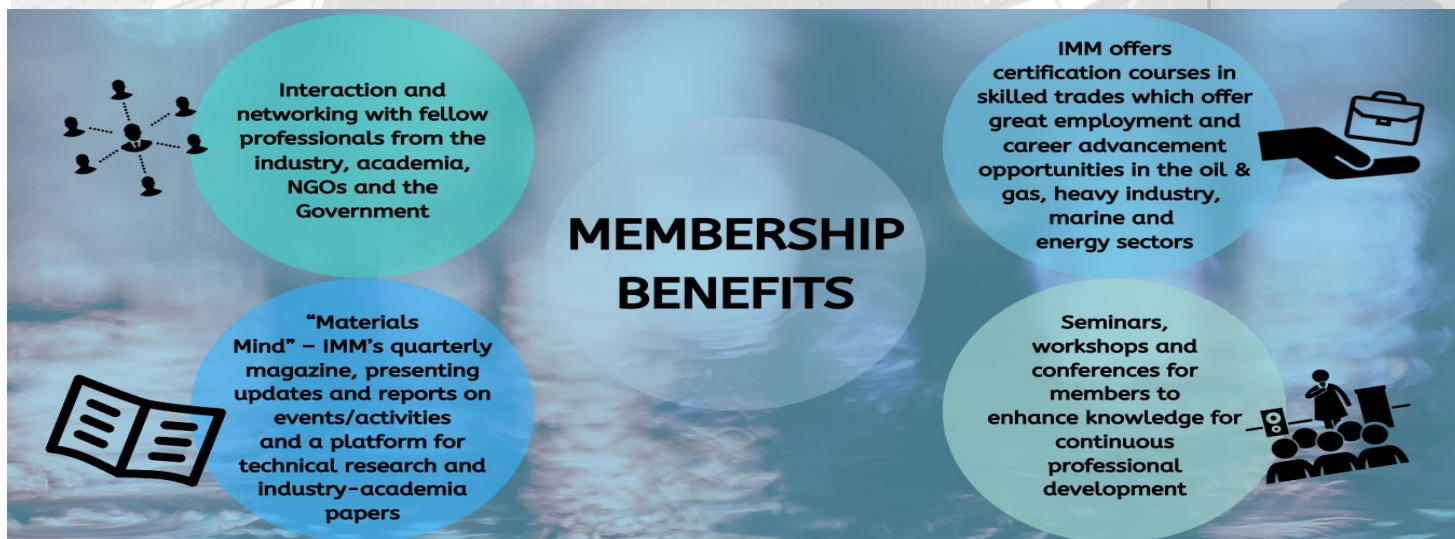


Figure 8,9: IMM Secretariat promoted the IMM Training & Certification Programs to the visitors at OGA 2024.

Overall, OGA 2024 has created a great opportunity for IMM to promote and introduce its courses and certification programs to students, lecturers, and parents as part of their future planning to upskill. The focus is not only on competency certification but also networking and the exchange of knowledge across a wide variety of specialized areas of expertise.























Figure 10,11: IMM Secretariat promoted the IMM Training & Certification Programs to the visitors at OGA 2024.



IMM AUTHORISED TRAINING BODIES (ATBs)/ ASSOCIATE TRAINING PARTNER (ATP) FOR IMM COURSES & CERTIFICATION

AUTHORISED TRAINING BODIES (ATBs)

(Offer IMM Certification Training Programs and Courses)

ATBs	Training Programs & Courses
 Topfields Borneo Sdn. Bhd. (Sarawak)	<u>Coating</u> <ul style="list-style-type: none">  Certified B1B2 Assistant Blaster & Painter Level 1 & Level 2  Certified Protective Coating Technician (Blaster and/or Painter) Level 1 & Level 2  Certified Blasting and Painting Supervisor  Certified Coating Inspector Level 1 & Level 2  Certified Quality Control Technician  Certified Thermal Spray Coating Applicator  Basic Knowledge on Corrosion Protection for Technicians and Engineers  Corrosion Control by Protective Paints  Corrosion Control by Protective Coating
	<u>Coating</u> <ul style="list-style-type: none">  Certified Protective Coating Technician (Blaster and/or Painter) Level 1 & Level 2  Certified Coating Inspector Level 1 & Level 2
 Sabah Skills & Technology Center (Sabah)	<u>Coating</u> <ul style="list-style-type: none">  Certified B1B2 Assistant Blaster & Painter Level 1 & Level 2  Certified Protective Coating Technician (Blaster and/or Painter) Level 1 & Level 2  Certified Blasting and Painting Supervisor  Certified Coating Inspector Level 1 & Level 2  Refresher Course of Certified Coating Inspector for Recertification  Refresher Course of Certified Protective Coating Technician (Blaster and/or Painter) Level 1 and Level 2 for Recertification
 Mui Lee Enterprise Sdn. Bhd. (Sarawak)	

ASSOCIATE TRAINING PARTNER (ATP)

(Offers IMM Certification Training Programs and Courses)

ATP: Materials Technology Education Sdn. Bhd.
(Malaysia and Overseas)**IMM Training Programs & Courses****Coating**

- 🌀 Certified Protective Coating Technician (Blaster and/or Painter) Level 1 & Level 2
- 🌀 Certified Protective Coating Technician (Blaster and/or Painter) Level 1 Refresher and Assessment
- 🌀 Certified Protective Coating Technician (Blaster and Painter) Level 2 Refresher and Assessment
- 🌀 Certified Blasting and Painting Supervisor
- 🌀 Certified Coating Inspector Level 1 & Level 2
- 🌀 Certified Coating Quality Control Technician
- 🌀 Certified Thermal Spray Coating Applicator
- 🌀 Refresher Course of Certified Coating Inspector for Recertification Painter) Level 1 and Level 2 for Recertification

Thermal Insulation

- 🌀 Introduction to Thermal Insulation
- 🌀 Certified Thermal Insulation Installer

Corrosion

- 🌀 Certified Corrosion Monitoring Practitioner Level 1
- 🌀 Certified Corrosion Monitoring Practitioner Level 2
- 🌀 Certified Corrosion Monitoring Practitioner Level 3
- 🌀 Certified Cathodic Protection Practitioner Level 1
- 🌀 Certified Cathodic Protection Practitioner Level 2
- 🌀 Certified Cathodic Protection Practitioner Level 3
- 🌀 Certified Materials Failure Investigation Practitioner Level 1
- 🌀 Certified Materials Failure Investigation Practitioner Level 2
- 🌀 Certified Materials Failure Investigation Practitioner Level 3
- 🌀 Certified Materials Failure Investigation Practitioner Level 4

Vibration

- 🌀 Certified Vibration Practitioner Category 1
- 🌀 Certified Vibration Practitioner Category 2
- 🌀 Certified Vibration Specialist Category 3
- 🌀 Certified Vibration Specialist Category 4
- 🌀 Certified Maintenance & Troubleshooting of Rotating Equipment Level 1
- 🌀 Certified Maintenance & Troubleshooting of Rotating Equipment Level 2

Mechanical Joint Integrity

- 🌀 Certified Mechanical Joint Integrity for Small-bore Piping, Tubing and Valves
- 🌀 Certified Mechanical Joint Integrity for Flange Bolted Connections
- 🌀 Certified Mechanical Joint Integrity for Small-bore Piping, Tubing and Valves Refresher and Assessment
- 🌀 Certified Mechanical Joint Integrity for Flange Bolted Connections Refresher and Assessment

Welding

- 🌀 Certified Welding Inspector
- 🌀 Certified Associate Welding Engineer (AWE)
- 🌀 Certified Welding Engineer (WE)
- 🌀 Certified Senior Welding Engineer (SWE)

Updated on 30th December 2024

Institute of Materials, Malaysia (IMM) is a non-profit professional society that promotes honourable practice, professional ethics and encourages education in materials science, technology and engineering. Engineers, academicians, technicians, skilled workers and professionals are amongst its members exceeding 6800.

Registered with the Registrar of Societies on 6th November 1987, the Malaysian Materials Science & Technology Society (MMS) changed its name to the Institute of Materials, Malaysia (IMM) on 16th June 1997. The objectives of IMM include the training and development of individuals and companies in Malaysia to attain professional recognition in various fields of materials science, technology and engineering.

IMM is administered by a council of 30 members, with volunteers leading more than 15 materials committees and more than 4 regional chapters, and supported by a secretariat with full time staff.

IMM Vision

To be internationally recognized competency certification institution in Materials Science, Technology and Engineering.

IMM Mission

- (1) To be the technical authority on Material Science, Technology and Engineering.
- (2) To positively contribute to society and quality of life.
- (3) To become an internationally recognized certification body.
- (4) To develop and enhance competency and skills for all categories and practitioners.
- (5) To be the platform for industry and academia collaboration.

The IMM membership is categorised into 6 different grades and open to anyone above the age of 17 years - individuals and companies keen in developing and contributing towards the growth of materials science, technology and engineering in Malaysia.

Over the years, IMM have conducted courses on coatings, coatings fingerprinting, corrosion, welding, vibration etc in support of the oil and gas industry in Malaysia. Over 750 Coatings Inspectors have been trained and certified as well as more than 3300 Blasters & Painters, Supervisors, Corrosion Technician and Vibration Practitioners. Its certification programmes are recognized by PETRONAS and all oil & gas operators. Since January 2011, more than 80 Associate Welding Engineers, more than 90 Welding Engineers, more than 30 Senior Welding Engineers and more than 45 Coating Fingerprint Quality Controllers were trained and certified.

IMM has also organised 10 International Materials Technology conferences (IMTCE) on a biennial basis, and numerous technical seminars, educational programmes, technical visits, and materials awareness programmes since 1988.

Public courses, such as Microbiologically Influenced Corrosion (MIC) and Welding Technology for Non-Welding Personnel, are being offered occasionally. Training on materials awareness has also been conducted in public listed companies.

The courses and programmes are being organised by Authorized Training Body/Bodies and Authorized Event Organizer/Organizers.

Collaborations with the Asian Welding Federation, Sabah Skills Technology Centre (SSTC), and local universities continue to be part of IMM's vision and long term mission to educate, train and serve the materials fraternity.



GENERAL INFORMATION ON MEMBERSHIP

The IMM Membership is open to all individuals and companies in developing the contribution of Materials science, technology and engineering towards industrial growth in Malaysia. The technology of materials is advancing day-to-day throughout the world. Membership to the IMM will enable networking and exchange of knowledge from a very wide variety of specialised areas of expertise. Please feel free to download or print a copy of the application form together with the IMM regulations. If you have any doubt, please do not hesitate to contact our secretariat through the phone; +603-76611591 or email to secretariat@iommm.org.my

Annual subscriptions shall be payable in advance on 1st January of each year. Those admitted into the IMM between 1st July and 31st December in any year shall pay only half the annual subscription. Seniors (above 55 years old) get 50% discount off their annual subscriptions.

We have an online application for membership for selected grades. Membership application forms in document format can be accessed from www.iomm.org.my.

IMM SECRETARIAT

Suite 1006, Level 10, Block A, Kelana Centre Point,
No. 3 Jalan SS 7/19,
47301 Petaling Jaya, Selangor

IMM MEMBERSHIP BENEFITS

- (1) IMM activities offer members to interact and network with representative from the industry, academia and government related to the Materials profession.
- (2) Members will gain knowledge on career opportunities for their children, friends etc as IMM offers certification courses in skilled trades e.g. Welding, Painting, Inspection, Corrosion etc.
- (3) IMM-JWES Welding Engineer Certification program leading to a Welding Engineer Certification which offers great employment opportunities in the oil & gas, heavy industry, marine and energy sectors.
- (4) IMM publications – quarterly magazine plus annual conferences offer presenters an opportunity for their technical research or industry-academia papers to be published in ISI- and Scopus-index journals.
- (5) IMM organizes many free technical events for members to acquire new knowledge and networking opportunities. Participants to these events will also receive Certificate of Attendance for their Continuing Professional Development records.

IMM MEMBERSHIP FEES SCHEDULE AS PER BELOW:

Description	Amount			
	Entrance Fee	Processing Fee	Transfer Fee	Annual Subscription
Fellow (F.I.M.M)	-	RM 300.00	RM 10.00	RM 150.00
Professional (M.I.M.M)	-	RM 150.00	RM 10.00	RM 100.00
Associate (A.M.I.M.M)	-	RM 150.00	RM 10.00	RM 80.00
Company	RM 50.00	-	-	RM 200.00
Ordinary	RM 20.00	-	-	RM 50.00
Student	RM 10.00	-	-	RM 10.00
Ordinary/ Company	RM 40.00/ RM 50.00	-	-	NIL



Updated on 30th December 2024

REGULATIONS GOVERNING ADMISSION AND TRANSFER OF MEMBER GRADES

The Council shall establish a Membership Committee which will be responsible for these Regulations and for review of applications for new membership and transfer to other grades (upgrades). The Membership Committee shall recommend for Council approval for admission and transfer of membership. All grades of memberships are awarded at the discretion of the Council and may be withheld or withdrawn in the event of conduct likely to prejudice the standing of the Institute. Every member shall receive a membership certificate.

Every application for membership, individual or company, shall be proposed and seconded according to these regulations and shall be forwarded to the IMM Secretariat who on behalf of the Honorary Secretary will process for consideration and approval of the Membership Committee before tabling for Council's endorsement. The Council may at its discretion reject any application without assigning any reason thereof. The Council may use its discretion to exempt the need for proposer and seconder for Student, Ordinary and Company membership.

Each company on admission as a member shall be entitled to nominate one representative to exercise all rights of membership. Only representatives of Company membership, as well as Fellows (F.I.M.M.), Professional Members (M.I.M.M.) and Ordinary members shall have the right to vote and to hold office in IMM.

Only Malaysian Citizens can become Ordinary Members, Associate Members (A.M.I.M.M.), Professional Members (M.I.M.M.) and Fellow Members (F.I.M.M.) with voting rights. Foreigners can have membership to similar grades but shall have no voting rights.

MEMBERSHIP GRADE & REQUIREMENT

Honorary Fellow (Hon. F.I.M.M.)

The Council shall have the power to elect Honorary Fellows who shall be persons of eminence in science or industry. The election shall be based on a majority vote within the Council. Honorary fellows shall enjoy such privileges as may from time to time be determined by the Council.

Fellow (F.I.M.M.)

A person at least 35 years of age with approved academic qualifications, training and 8 years relevant responsible experience who has made significant contributions to the science and practice of profession of Materials Science and Engineering or has given distinguished service to industry or education.

Professional Member (M.I.M.M.)

A person at least 25 years of age, with approved academic qualifications and training, having at least 3 years responsible experience in Materials Science and Engineering, or a person at least 40 years of age, with at least 15 years of experience with practical responsibility, as demonstrated by thesis/dissertation or report and interview.

Associate Member (A.M.I.M.M.)

A person at least 25 years of age, who possesses an interest in Materials Science and Engineering but have not acquired the necessary experience or obtained the qualification, governing entry to Member grade. An Associate Member, on obtaining the necessary qualifications, may apply for transfer to Member grade.

Company Member

Any company that is involved or has interest in Materials Science and Engineering will be qualified to join as a company member.

Ordinary Member

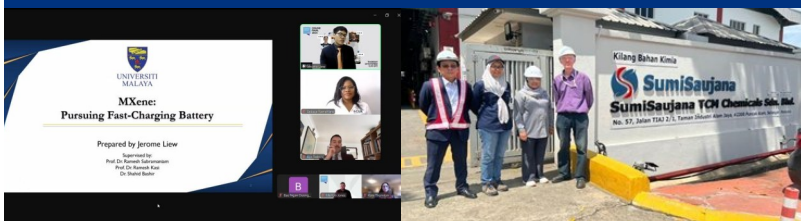
Any Malaysian Citizen and above the age of 18 years engaged in activities related to research, development and applications in Materials Science and Engineering shall qualify for Ordinary Membership. Only Ordinary Members who meet the necessary minimum requirements may apply for transfer to membership grades of Fellow, Member and Associate Member and may use the abbreviated titles upon transfer.

Student Member

A student member shall be a person not under 17 years of age who at the time of application satisfies the Council that he has received a good general education and is studying subjects related to Materials Science or Engineering. A student member shall transfer to the grade of Ordinary Member after graduation provided he or she is suitably qualified and as soon as he or she is earning a full-time salary. A Student shall not become member of the IMM without the prior approval of the Vice-Chancellor or Head of Department of the university or relevant authority concerned.



36th IMM Anniversary Celebration



YPWLC 2024 competition

One-Day IMM Corrosion Conference 2024 and Plant Visit to Sumisaujana TCM Chemicals Sdn Bhd

FREE Ordinary Membership for Affiliates:

The Institute of Materials, Malaysia will recognize members of various professional institutions and societies for membership at "Ordinary Grade" without any annual subscriptions. Such members shall submit to IMM proof of their current membership of the respective institutions together with their application.

Members of the following institutions and societies are eligible to apply for affiliate membership:

- 1.American Welding Society
- 2.Asian Welding Federation
- 3.Board of Architects Malaysia
- 4.Board of Engineers, Malaysia
- 5.Engineering Institutes under the Engineering Council of UK
- 6.Geological Society of Malaysia
- 7.Institut Kimia Malaysia
- 8.Institute of Corrosion UK
- 9.Institute of Materials Singapore
- 10.Institute of Physics Malaysia
- 11.Institution of Engineers, Malaysia
- 12.Jabatan Minerals & Geoscience
- 13.Malaysian Medical Association
- 14.Malaysian Nurses Association
- 15.Malaysian Society for Non-Destructive Testing
- 16.Malaysian Welding & Joining Society
- 17.Persatuan Arkitek Malaysia
- 18.Plastics & Rubber Institute of Malaysia
- 19.Singapore Welding Society
- 20.Society of Petroleum Engineers

FREE Company Membership for Affiliates:

The Institute of Materials, Malaysia will recognize various professional institutions and associations for membership at "Company Grade" without any annual subscriptions.

Companies registered with the following Trade Associations are recognized for Affiliate Company Memberships:

- 1.Federation of Malaysian Manufacturers (FMM)
- 2.Malaysian Offshore Contractors Association (MOCA)
- 3.Malaysian Oil & Gas Engineering Council (MOGEC)
- 4.Malaysian Oil & Gas Services Council (MOGSC)

The companies shall submit to IMM proof of their current membership at the respective trade associations together with their application.

NOTE: The above provisions for affiliate membership for individuals and companies was approved by the IMM Council in accordance with the powers vested in the Council as per Clause 6.1.3 of the IMM Constitution and was subsequently endorsed by members at its 21st Annual General Meeting held on 19th March 2011.



ANNUAL REPORT OF THE COUNCIL

(FOR THE YEAR ENDING 31ST DECEMBER 2024)

Dear IMM Members,

On behalf of the IMM Council, I am pleased to present the report of the activities of IMM covering the period from 1st January 2024 to 31st December 2024.

(I) IMM MANAGEMENT COMMITTEE AND COUNCIL-MEETINGS

Date	Management Committee Meeting (Term 2024-2026)
3 rd Feb 2024	8 th Meeting (Term 2022-2024)
20 th Apr 2024	1 st Meeting
20 th Aug 2024	2 nd Meeting
19 th Oct 2024	3 rd Meeting

Date	Council Meeting (Term 2024-2026)
1 st Mar 2024	8 th Meeting (Term 2022-2024)
3 rd May 2024	1 st Meeting
9 th Aug 2024	2 nd Meeting
8 th Nov 2024	3 rd Meeting

(II) IMM ACTIVITIES CARRIED OUT IN THE YEAR 2024

Date	Activity
20 th Feb 2024	1 th Meeting ADS Module 2
22 nd Feb 2024	IMM Coating Committee Meeting
19 th Mar 2024	31 st Meeting of MFIP-WSC
22 nd Mar 2024	34 th Annual General Meeting
2 nd Apr 2024	32 nd MFIP Meeting
29 th Apr 2024	Hari Raya Celebration Lunch
28 th May 2024	1 st MLC Committee Meeting
13 th June 2024	1 st Corrosion Committee Meeting
22 nd -23 rd June 2024	IMM Retreat Meeting
24 th June 2024	MS ISO/IEC 17024 Audit Refresher Workshop for Internal Auditors
27 th - 28 th June 2024	Sabah Oil & Gas Conference & Exhibition (SOGCE)
15 th Jul 2024	Opening Meeting Internal Audit MS ISO/IEC 17024
15 th - 19 th Jul 2024	IMM Internal Audit MS ISO/IEC 17024
25 th Jul 2024	1 st ECP Committee Meeting (Term 2024-2026)
29 th Jul 2024	Closing Meeting Internal Audit ISO
3 rd Aug 2024	Discussion (a face-to-face meeting) - Execution of IMMR Sdn Bhd
5 th Aug 2024	Online Meeting with MJIC (Ts. Mohd Azmi)
6 th Aug 2024	1 st CPPL4 WG Meeting
8 th Aug 2024	1 st Vibration Committee Meeting (Term 2024-2026)
28 th Aug 2024	Short Meeting with Welding Committee (Mr. Zamri & Dr. Christine)
3 rd Sept 2024	Semi-Final Materials Lecture Competition 2024
3 rd Sept 2024	2 nd CPPL4 WG Meeting
9 th Sept 2024	2 nd Vibration Committee Meeting (Term 2024-2026)

Date	Activity
10 th Sept 2024	3 rd CPPL4 WG Meeting
10 th Sept 2024	1 st Impartiality Committee Meeting (Term 2024-2026)
17 th Sept 2024	1 st Meeting of RBIP Working Sub-Committee Kick Off
23 rd Sept 2024	2 nd Meeting ADS Module 2
24 th Sept 2024	Final Materials Lecture Competition 2024
25 th - 27 th Sept 2024	Oil & Gas Asia Conference & Exhibition 2024
9 th Oct 2024	2nd Corrosion Committee Meeting
17 th - 18 th Oct 2024	IMM One-Day Corrosion Conference & Plant Visit
23 rd Oct 2024	Meeting with UMPSA (Dr. Hafiz)
24 th Oct 2024	IMM CPD Meeting
29 th Oct 2024	IMM MFIP Certification Scheme Launch Event
4 th Nov 2024	Vibration Committee Visit IMM Meeting
13 th Nov 2024	Meeting with Entruss Ventures Sdn. Bhd. (Prof. Emeritus Dr. Che Husna Azhari)
27 th Nov 2024	Meeting with Macroperi Engineering Sdn. Bhd.
5 th Dec 2024	3 rd Corrosion Committee Meeting
13 th Dec 2024	IMM Induction Program for Chairpersons Session 1
16 th Dec 2024	IMM - MTE Coordination Meeting
18 th Dec 2024	Management Review (MR) Meeting
20 th Dec 2024	IMM Induction Program for Chairpersons Session 2

(III) HIGHLIGHTS OF ACTIVITIES IN 2024

FULL REPORT ON SECTION (III) CAN BE ACCESSED ELECTRONICALLY ON IMM WEBSITE (www.iomm.org.my).

(IV) SUMMARY AND MOVING FORWARD

The IMM Management Committee and the IMM Council would like to extend their heartfelt gratitude to all Working Committee members, Regional Chapter members, IMM Secretariat staff, and other stakeholders for their continued efforts and support in helping IMM achieve its goals in 2024.

IMM will continue to develop new initiatives and enhance existing systems to remain relevant and competitive. We look forward to a

On behalf of the Council



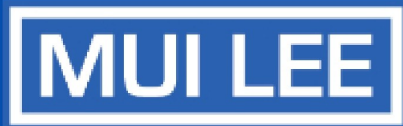
Assoc. Prof. Ts. Dr. Tay Chia Chay Honorary Secretary (Acting), IMM

Date:

Due to limited printed pages, the full article can be accessed electronically on IMM website or through scanning



Scan the QR Code



ADVANCE YOUR CAREER WITH IMM CERTIFIED COURSES

Available Courses :

Protective Coating Technician Level 1 / Level 1 & 2 / Refresher

Master essential skills for blasters and painters to apply protective coatings - across any industry.

Coating Inspector Level 1 / Refresher

Gain the foundation skills to inspect, assess and ensure coating quality

Coating Inspector Level 2 / Refresher

Advance your inspection expertise with higher-level assessment and reporting capabilities

Other available courses:

***BPS - Certified Blasting
and Painting Supervisor***

***ABP - B1B2 Assistant
Blaster & Painter***



Contact for more info :

+6013-818 9954

chung@muilee.com.my

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Lot 959, Block 4, Piasau Industrial Estate,
98000 Miri, Sarawak

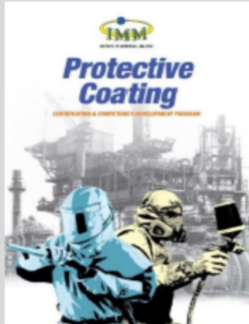


TOPFIELDS BORNEO SDN. BHD.
(1294574-M)
(formerly operating as TOPFIELDS BORNEO PLT since 2017)



IMM Authorized Training Body (ATB - Sarawak)

Calibrated Inspection Equipment Supply
Fabrication & Maintenance Painting Services
Manpower Supply Services
Specialized Composite Wrapping (Leak Sealing/Pipe/Structural Strengthening)



Certified Protective Coating Technician (Blaster and/or Painter) Level 1 & Level 2 (PCT L1 and/or L2)

Become a certified Blaster Painter with IMM PCT L1L2 program today.

This certification scheme will enable the candidates to have an understanding and exposure on the subject of Blasting and Painting, mainly in the oil & gas and heavy engineering industries. The participants will be assessed both in the theory and practical aspects of Blasting and Painting which will determine their competency in accordance to the terms and conditions of IMM Coating Certification Scheme

IMM Coating Inspector Level 1 & Level 2 (CIL1 & CIL2)

IMM Coating Inspector is the most sought after certification to become a coating inspector within Malaysia & is widely accepted by all industries including Oil & Gas.

Other IMM Courses Offered:

Certification:

1. Certified Blasting & Painting Supervisor
2. B1B2 Assistant Blaster Painter
3. Certified Thermal Spray Coating Applicator
4. Certified Quality Control Technician - Coatings

Non-Certification Courses:

1. Basic Knowledge on Corrosion Protection for Technicians & Engineers
2. Corrosion Control by Protective Coatings

For Registrations:

Contact our Registration Team :

Office: +6 086 - 317 248
Mobile: +6 014 - 6685845
(Devin)

E-mail :
info.topfieldsborneo.com



WORKSHOP FACILITIES



CLASSROOM FACILITIES



BLASTING PAINTING FACILITIES



2020/2021



2022/2023



2024/2025

