

TECHNICAL ARTICLE

Is There A Better Way to Detect Wet or Saturated Insulation?



Prepared by:
Mr. Danny Tan, IMM Insulation Committee Chairperson

“Wet or Saturated Insulation” in a tightly enclosed insulation after the system has been serviced or installed for an extended period in operations, and the relation of this “Wet, and/ or Saturated” insulation towards its contribution to Corrosion Under Insulation (CUI). There are the pertinent questions asked: is there a better way to detect wet or saturated insulation without opening the cladding? A photo of an insulated pipe with CUI corrosion exposed is shown in Figure 1.



Figure 1: Corrosion of Insulated Pipe (Corrosion Under Insulation)

The phrase “remove all wet insulation” which often appears in insulation specifications or guidelines in insulation technical specifications documents, but the critical action is to detect this wet insulation or to remove “wet insulation” in the enclosed insulation system is the key to mitigating CUI, especially in Malaysia’s high humidity environment perspective. With wet insulation, there will be loss of insulation thermal efficiency, increased energy consumption, and increased insulation weight plus many other issues.

Wet insulation/water ingress is driven by many factors, including dripping water or liquid, condensation, cyclical operating temperatures and all these will lead to CUI on carbon steel and alloy steel surfaces. This is unfortunately a common problem affecting many industries due to ineffective corrosion management programs.

CUI preventive measures should include routine “Moisture Under Insulation” - MUI inspections and maintenance with some form of Non-Destructive Testing (NDT) to identify Wet Insulation, but all these inspections and maintenance programs are on “periodic” basis and could be ineffective in monitoring water ingress or wet insulation as CUI is a hidden issue.

CUI often remains undetected until insulation is removed, either physically or whenever there is a leak or other event, some of which can be extremely hazardous. Routine insulation inspection involves physically removing the insulation and will incur costs for scaffolding, physical inspection, physical repairs and physical replacements after opening the cladding to investigate damaged wet insulation.

Insulation does not cause corrosion until the ingress of water and prolonged contact of the corrosive or conductive water/liquid with the metal surface and the contaminants (salts) leaching out from the insulation blankets.

The water can come from rainwater penetrating cladding leakage, deluge system water, wash water or condensation from the cyclical temperature or low-temperature operation.

In 3 simple terms, CUI occurs when water ingress:

1. Temperature range -4°C to 175°C provides the ideal CUI temperature,
2. Prolonged exposure to moisture or water (wet insulation) and,
3. contaminants (salts) leaching from insulation blankets or from the environment.

Therein lies the core issue – water/moisture /water ingress and that’s why the importance of removing wet insulation or identifying wet insulation becomes critically important.

Smart Water Ingress Detection Device: WI Discovery Leakage Detector is shown in Figure 2.



Figure 2: WI Discovery Leakage Detector



Figure 3: WI Discovery Leakage Detector – A better way to detect water ingress without opening Cladding.

It is important to look for damaged insulation or wet insulation on hot thermal insulation systems where damaged insulation or wet insulation will lead to loss of insulation efficiency, thus heat will transfer to the external metallic cladding surface.

Typically, the surface temperature for any hot thermal insulation cladding should not exceed the ambient temperature and is normally around 32°C - 38 °C in our environment. The “best holistic” approach method to identify wet insulation or damaged insulation is by visual inspection without opening the external cladding using the Smart Thermal Indicating Coating (STIC) tool as an active visual inspection method to determine wet insulation or damaged insulation without opening the external jacketing or external cladding.



Figure 5: Smart Thermal Indicating Coating with an irreversible color change above 60°C as active visual inspection to detect wet Insulation/damaged insulation.

There is no easy answer to the question of how to handle “wet insulation” when it comes to mechanical insulation systems as moisture under insulation is a hidden issue. There are, however, a few basic best practices that may apply to all insulation systems: -

- Keep all insulation materials dry during storage, handling, and installation, until they are totally protected (watertight) with the specified protective covering/external cladding.
- Not all insulations are the same, and each should be addressed given its own characteristics, water resistance, hydrophobic properties, and when in doubt, consult the insulation materials supplier.
- Take into consideration the installation conditions, surrounding environment, and operating temperatures as we are in humid environments and are not the same as those from lower humidity countries.
- Ask these questions – Has the surface been insulated properly with external cladding or coated with the right CUI Coating systems as per NACE 0198-2017 specified Inert Multi-Polymeric Matrix (IMM) Hi-Temp CUI coating systems for cyclical environment insulation system?
- Has the system been designed to allow for the escape or venting of any moisture that may ingress the enclosed insulation systems?

- Has WI Discovery Leakage Detector been considered to detect conductive water/liquid and detect wet insulation at the bottom of the cladding?
- Have the piping and equipment systems been designed with consideration of the insulation system, and the insulation system designed to guard against any areas where ponding or accumulation of water can occur?
- Installations should never take place in rainy weather or when weather is anticipated to rain due to high humidity environment.
- On installed insulation systems, all areas where the protective covering or cladding has been compromised, and other areas that potentially allow for the entrance of moisture or other contaminants, must be examined in a timely manner to determine the extent of any damage to the total insulation systems, and the required repairs/replacement should be executed in a timely and proper manner by experienced insulator personnel.
- For lower temperature insulation requirements, with a temperature lower than 90°C, insulative coatings may be considered instead of the traditional insulation systems for personnel protection as per ASTM 1055/ASTM 1057.
- Pro-active visual inspection tools like STIC to provide early signs of wet insulation or damaged insulation.
- Wet insulation can be visible with irreversible color change from the bottom of the external cladding.
- WI Discovery Leakage Detector, able to detect “conductive water or corrosive water” with LED lighting emitting from the bottom of the cladding.



Figure 6: WI Discovery Leakage Detector with “photos” of installed locations.

In conclusion, early detection of water ingress by “removing wet insulation” via holistic CUI monitoring devices such as WI Discovery Leakage Detector and STIC as an active visual inspection for CUI mitigation scoping is one of the best practices adopted by the oil & gas and petrol-chemicals industries.



MATERIALS IND

Issue 41

October 2024

www.iomm.org.my

Institute of Materials, Malaysia



HIGHLIGHTS

What Are The Key Criteria to Have A Safe and Reliable Installation of Composite Repair System?

Is There A Better Way to Detect Wet or Saturated Insulation?

Sustainable Additive Manufacturing: Exploring Challenges and Opportunities of Recycled Plastic Materials in 3D Printing



ISSN 2289-9030



9 772269 903006

TABLE OF CONTENTS

COVER STORY

What are The Key Criteria to Have A Safe and Reliable Installation of Composite Repair System? 6

IMM COUNCIL MEMBERS 10

TECHNICAL ARTICLE

Is There A Better Way to Detect Wet or Saturated Insulation? 11

STUDENT EDITORIAL

Sustainable Additive Manufacturing: Exploring Challenges and Opportunities of Recycled Plastic Materials in 3D Printing 15

EVENT ARTICLES

Bridging Theory and Practice: IMM's Factory Tour at NOVA FRP Sdn. Bhd. 19

A One-Day Stainless Steel and High-Nickel Alloy Workshop 20

New IMM Professional Members 22

IMM Authorized Training Body (ATB) / Authorized Testing Centre (ATC) / Authorized Training Partner (ATP) for IMM Courses and Certification 25

IMM Profiles 29

Materials Mind Advertisement Rates 31

ANNOUNCEMENT
NEW FORMAT FOR MEMBERSHIP EXPIRY DATE
 With effective date 01 November 2023, all membership applications will use an expiry date format such as the following example:

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

The membership expiration date is the day before the initial date of becoming a member

GO TO WWW.IOMM.ORG.MY FOR MORE INFORMATION

IMM SECRETARIAT Updated 15 July 2024

MANAGEMENT COMMITTEE

- WONG WING KIONG**
GENERAL MANAGER
wkwong.iomm@gmail.com
- ABERAMY DAYALAM**
MANAGER
aberamy.iomm@gmail.com

HR & FINANCE	CERTIFICATION	ADS & MEMBERSHIP
NOR FARAHANI ABDULLAH ADMIN EXECUTIVE norfarahani.iomm@gmail.com	NURHASANAH SAHRI OPERATIONS EXECUTIVE nurhasanah.iomm@gmail.com	AINUR AFINI PUAZE OPERATIONS EXECUTIVE ainurafini.iomm@gmail.com
MUHAMMAD SYAFIQ INTERNS syafiqzaini.iomm@gmail.com	ZETI AISYHA M. A. RAZALI INTERNS zetiaisyha.iomm@gmail.com	NUR FARAHLINA INTERNS farahlina.iomm@gmail.com

INSTITUTE OF MATERIALS, MALAYSIA
 Suite 1006, Level 10, Block A, Kelana Centre Point,
 No. 3 Jalan SS 7/19, 47301 Petaling Jaya, Selangor.
 Tel: 03-76611591
 03-76611592

✉ secretariat@iomm.org.my
 🌐 www.iomm.org.my
 📞 +60 18-911 3480
 📘 Institute of Materials, Malaysia

EDITORIAL BOARD MEMBERS

CHIEF EDITOR
 ASSOC. PROF. TS. DR. TAY CHIA CHAY

DEPUTY CHIEF EDITOR
 DR. HAIRUNNISA RAMLI

MANAGING EDITOR
 DR. NURUL FATAHAH ASYQIN ZAINAL

COMMITTEE MEMBER
 ASSOC. PROF. DR. LIM TECK HOCK
 DR. YOGA SUGAMA SALIM
 IR. MOHD. RAZIFF EMBI
 MS. SITI NURAMIRAH RABBANI MUHAMMAD ZAKI

Disclaimer: The articles written by various authors and news from external sources are published in good faith for the benefit of our readers and do not necessarily reflect the views of IMM. Further, we give no assurance or warranty that the published information is current or accurate and take no responsibility for any losses or consequences arising from its transmittal through the bulletin.