

AIRM 2025

7th Global Conference on Asset Integrity & Reliability Management

09-10 January 2025; Hotel Radisson Blu, Dwarka, New Delhi

Souvenir

Gold Partners



Exhibitor



Special Acknowledgement



Organizer



Co-organizer



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E-mails: registration@airminstitute.org, info@airminstitute.org

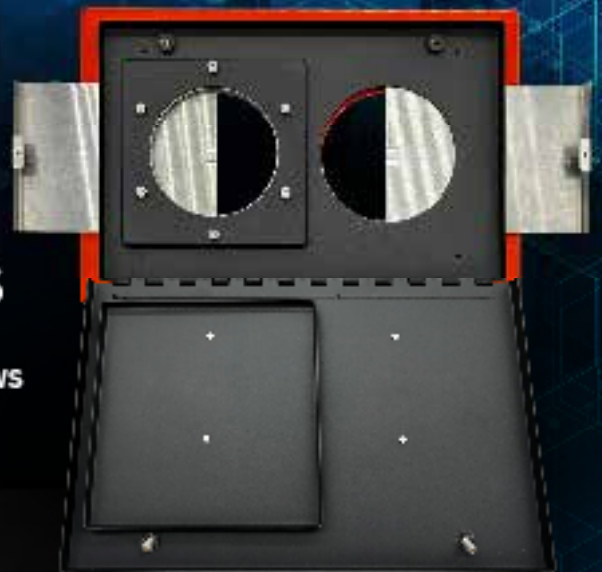
Website: www.airminstitute.org/airm



The Revolution for Furnace Inspections

CAP-HT-100-Series Furnace Inspection Windows

Monitor the health of your furnaces without compromising on safety, efficiency, and accuracy with the world's first and the most reliable furnace inspection windows that allow quick thermal monitoring of furnace internal environment in enclosed conditions.



CAP-HT-100-Series by IRISS Inc. incorporates a series of furnace inspection windows with the optic made up of sapphire crystal glass and a metal body with a dust cover to ensure reliability of the inspection windows in extreme environments encompassing a temperature withstanding capability of 1832°F. An in built provision for TWT correlation and boroscopic thermal imaging, ensures future-proof design with industry trends.

Ensure reliability without mitigating safety.

Faster. Safer. Efficient.

Reformer TWT Correction

Temperature Correlation Service by IRISS Inc. - Correction of the non-contact temperature measurement instruments for TWT (Tube Wall Temperature) monitoring



In a furnace environment, background reflection interference intervenes with the non-contact measurements from pyrometers or thermal imagers. The inaccurate emissivity settings of the on-site reformers also hamper the accuracy of TWT (Tube Wall Temperature) measurements. The criticality of temperature measurements is directly related to the fuel consumption, production quantity, and asset design life.

Correlate Temperature, Enhance Production

The gold cup is a contact-based TWT referencing tool that allows to attain background reflectivity independent tube wall temperature measurements to reset the non-contact instruments settings and ensure reliable temperature measurements in future.



Leading Safety and Reliability

For the people who keep the world running



Vibration Visualisation

Motion Amplification

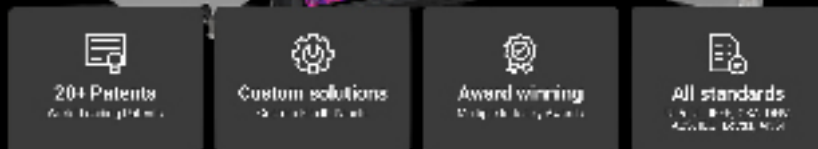
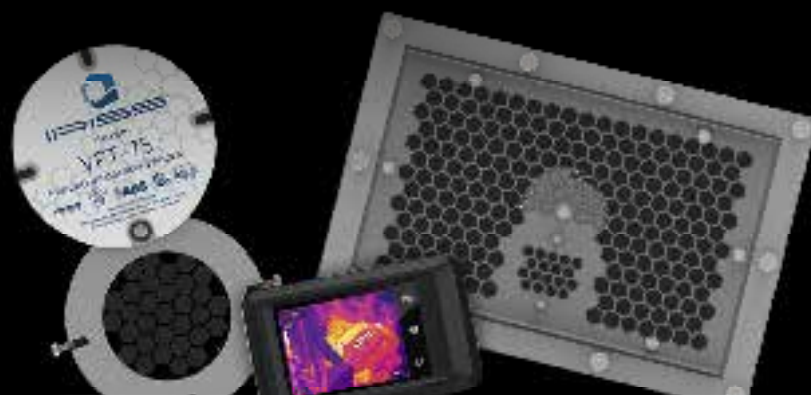
The traditional vibration analysis with contact-based sensors only gives single point measurements and the RCA is very tedious and time consuming and when they fail to detect the fault, equipment suffers with failure and production suffers with downtime.

Motion amplification is a non-contact camera and software-based technology for vibration visualization and analysis that enables you to visualize as well as quantify vibrations invisible to the naked eye and help you perform the RCA in a matter of minutes with millions of data points in contrast to 10-12 from traditional analysis.



World's Most Advanced & Reliable Infrared Inspection Windows

Thermal, Visual, UV, and Partial Discharge Monitoring



IRISS Inc., Bradenton, Florida, USA manufactured Poly-view System highly advanced infrared inspection windows promote an extremely safer way of monitoring electrical assets under energized conditions for detection of anomalies before a functional failure manifests.



Leading Safety and
Reliability

For the people who
keep the world running

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Message



Dear Esteemed Participants,

At the outset, let me wish all of you and your families a very Happy, Healthy & Prosperous New Year 2025. It is my great pleasure to welcome you for the upcoming "7th Global Conference in Asset Integrity & Reliability Management Conference" scheduled on the 09th and 10th of January. Your presence is a testament to your commitment to advancing excellence in asset management, and we will be honoured to have you join this distinguished gathering.

As we convene for this conference, we embark on a collective journey to explore and elevate the practices that underpin asset integrity and reliability management. In a rapidly evolving landscape, where industries are continually challenged by dynamic forces, your participation becomes instrumental in shaping the discourse on sustainable and efficient asset management.

The next two days promise a rich exchange of insights, experiences, and innovative solutions from experts and practitioners in this field. The carefully curated agenda encompasses a spectrum of topics, ranging from cutting-edge technologies to best practices in asset integrity and reliability management. This platform is not only an opportunity for learning but also for networking and forging collaborations that can drive transformative change.

May this conference serve as a catalyst for fruitful discussions, sparking new ideas and strategies that will resonate in your professional endeavours. Let us leverage this collective wisdom to enhance the resilience and longevity of our assets, ensuring a sustainable and prosperous future for the industries.

As you engage in the sessions, workshops, and networking opportunities, I encourage you to seize every moment to connect, learn, and contribute to the vibrant tapestry of knowledge that will unfold over these two days.

Wishing you a fulfilling and enriching experience at the "Asset Integrity & Reliability Management Conference." May this event inspire and empower you to navigate the challenges of today while envisioning a resilient and reliable future.

Thank you for your participation, and I look forward to witnessing the collective impact we can create through our shared dedication to excellence.

Best regards,
Alok Gurtu
Director & Head(O&M)
Reliance Ethane Pipeline Ltd(REPL)

Message



Our life is highly dependent on the Engineering and technological products. Without integrity of these products and reliable performance, none of us can live comfortably, discharge our duties responsibly and ensure reliable services in timebound manner. To ensure efficient, cost effective and safe performance of all our assets deployed to achieve intended service throughout its life cycle, we must have to be abreast with the means to make these assets to perform with full reliability without impacting continuity of service and safety of the personnel.

The role of preventive maintenance of equipment, tests, surveys, inspections, looks to analyze the reports generated, drawing the inferences from the reports to take corrective action etc are extremely important to achieve above goals and we need to have all this knowledge under one roof for seamless diagnosis of problem and solution implementation.

Therefore, it is very important to have a forum on which users from industry, service providers for maintenance / surveys/ inspection/ testing. Technology providers for machine data collection / analysis, researchers & developers and academia to share new challenges faced by them so that innovative, safety & environmental friendly and cost-effective solutions can be provided to industry to ensure Asset Integrity and Reliability of equipment.

I am glad to share that Institute of AIRM (Asset Integrity and Reliability Management) & Matcon has taken this initiative and started "Global Asset Integrity and Reliability Management" Conference and on 09th & 10th January - 2025, 7th edition of this Global conference is being held in New Delhi. This forum has been designed to address the challenges in Asset Management and to help us effectively manage our equipment so that we achieve long-term Plant Reliability, Efficiency, Safety & Profitability.

I take this opportunity to thank the organizer for this able initiative and wish all the participants to have an exceptional learning and troubleshooting experience in two days conference on 9th & 10th January 2025.

Best Regards

Pramod Kumar Sapra

President- Shapoorji Pallonji Birmi Armada

Message



Centre For High Technology

Ministry of Petroleum & Natural Gas

Government of India

Dear Esteemed Participants,

In the heart of our refineries, where towering vessels stand sentinel and intricate pipes weave their silent symphony, lies not just metal and machinery, but the very pulse of our industry. These are the guardians of progress, the silent partners in every barrel transformed into fuel and value. Their unwavering performance is not just about efficiency; it is the bedrock of our safety, stability, and success.

But the stakes are high. The margins are thin. And the consequences of failure are unthinkable. A single compromised element can unleash a ripple effect of environmental damage, safety hazards, and shattered reputations. In this landscape, safeguarding asset integrity and reliability becomes not just an operational imperative, but a moral responsibility.

This critical mission demands a multi-pronged approach. We must build a robust Asset Integrity Management System (AIMS) – a vigilant eye that watches over the entire lifecycle of our equipment, from the blueprint to the decommissioning. Risk-based inspections, predictive maintenance strategies, and a relentless pursuit of improvement are the cornerstones of this system.

But technology alone is not enough. The real heroes are our engineers, technicians, and inspectors. Their expertise, honed through continuous training and a culture of shared responsibility, forms the frontline of this battle. Every individual within our refineries, from the highest executive to the newest recruit, must share the responsibility for safeguarding our assets. Open communication, incident reporting, and knowledge sharing are crucial in creating an environment where every voice is heard and every concern is amplified.

No refinery is an island in this fight. Sharing best practices and innovative strategies with peers, manufacturers, and research institutions strengthens our collective defences against evolving regulations and aging infrastructure. It is in this crucible of collaboration that we forge a future of exceptional asset integrity and reliability, where safety, productivity, and environmental stewardship reign supreme.

Let our unwavering commitment resonate in every barrel transformed, a testament to the silent guardians standing tall amidst the heat and pressure.

Best regards,

Best regards,
Mr. R. C. Agarwal
Executive Director
Centre for High Technology (MoPNG)

Message



Pipeline Infrastructure Limited

Ladies & Gentlemen,

It gives me immense pleasure to be a part of the 7th Global Conference on Asset Integrity and Reliability Management (AIRM 2025). In this global forum, we explore the forefront of asset management, uniting experts and innovators from across the globe.

As India is moving towards its journey of being a developed nation by 2047, the energy demand for the country is on the path of exponential rise and with this Asset Integrity & reliability management becomes a topic of paramount importance.

There is a global race to harness Artificial Intelligence, Robotics, Internet of Things, next-Generation Virtual & Augmented Reality, and PIL has always been at the forefront in imbibing new technologies to strengthen its processes and systems thereby improving its efficiency and delivering the best results. The digitalization journey is a transformative force, revolutionizing the way we monitor, manage and secure our vital energy networks. Upcoming advanced technologies and data driven strategies ensures that our assets operate at peak efficiency while prioritizing safety.

Let this conference be a beacon of inspiration driving us towards a future where our assets not only withstand challenges but thrive in the face of change. Together, lets forge connections, share wisdom and lay the groundwork for a new era in global asset integrity and reliability management.

My Best wishes to the organising team for their efforts towards organising such a global event which utilises the learnings across the globe for a better tomorrow.

Warm regards,
Mr. Pradeep Kr. Chauhan
Chief Operating Officer
Pipeline Infrastructure Ltd.

Message

KALYANI STEELS

CIN - L27104MH1973PLC016350



Dear Learned Professionals,

I express my gratitude to the organisers of the 6th Global Asset Integrity and Reliability Conference to be held on 9th and 10th January 2025, for allowing me to put forth my thoughts through this souvenir on the theme of the conference.

Asset Integrity and Reliability Management is a pillar of Operational Excellence and are non-negotiable imperatives in any manufacturing industry and infrastructural framework, serving as the backbone of operational distinction and long-term sustainability. Be a physical or a digital asset, this discipline ensures that every asset within a facility attains and sustains its full integrity reliably throughout its lifecycle. It demands a holistic and proactive approach, leveraging predictive maintenance, advanced monitoring systems, and rigorous risk assessments—to minimize downtime and enhance asset performance. Failure to prioritize this critical function is tantamount to compromising the organization's future, leaving it vulnerable to financial losses, regulatory penalties, and reputational damage.

In an industry where downtime translates to substantial financial losses and safety lapses can endanger lives, asset integrity and reliability management must be a top strategic priority. The integration of digital technologies, such as AI-driven predictive analytics and IoT-enabled monitoring, application of AI/ML and Digital twins in enhancing process transparency and optimisation, has revolutionized the ability to detect early warning signs of degradation, process and quality infirmities or failures. In order to drive organisational resilience through rigorous asset management practices, organizations must adopt stringent inspection protocols, adhere to international standards, and invest in continuous training to bridge the knowledge gaps and ensure all personnel understand the criticality of maintaining asset integrity.

I am sure that through this conference there will be a significant enhancement of awareness and knowledge on the subject and its correlations with various business attributes, to wade through the unprecedented business challenges of the present time.

My sincere appreciation and thanks to the organiser of the event – the Asset Integrity and Reliability Management Institute, its co-organiser and partners for taking the initiative to organise such an event so important and appropriate for the present environment which is poised to attain more demanding levels with time.

A handwritten signature in blue ink, appearing to read 'Partha S. Ghose'.

Partha S. Ghose, PMP®
Director – Projects



Kalyani Steels Ltd.
Mundhwa, Pune 411036
Website: www.kalyanisteels.com



KALYANI

GROUP COMPANY

KALYANI STEELS LIMITED CORPORATE BUILDING 2ND FLOOR MUNDHWA PUNE 411036 INDIA
PHONE: +91 20 66215000 FAX: +91 20 26821124

Message



Dear Industry Professionals.

Its indeed a pleasure to be part of the “7th Global Conference in Asset Integrity & Reliability Management”, a forum meant for advancing excellence in asset management.

Over the next two days, we will embark on an enlightening journey together, exploring the latest trends, innovative solutions, and best practices in asset integrity and reliability management. Your active participation in the sessions, workshops, and networking opportunities will be a vital contribution to the dynamic discussions that will unfold.

This conference is more than an assembly of professionals; it is a collaborative platform where diverse perspectives converge to shape the future of asset management. We encourage you to engage, share your experiences, and connect with fellow participants. The insights and relationships forged here have the potential to drive transformative change in our industry.

The agenda covers various aspects of Asset Integrity Management, which is crucial for ensuring the safety, reliability and efficiency of industrial facilities and assets. In the new age of Artificial Intelligence and Machine Learning, we need to develop solutions that integrate various processes, technologies and data to monitor, assess and maintain asset integrity.

May this conference be a source of inspiration, sparking new ideas and strategies that resonate in our professional endeavours. Take advantage of this opportunity to learn, collaborate, and contribute to the collective wisdom that will emerge from our shared experiences.

Wishing you an enlightening and enriching experience!

Best regards,

Shailesh Tiwari
Executive Director & Regional Head
Indian Oil Corporation Ltd.
Northern Region Pipelines

Message



Message from the desk of Paresh Haribhakti

It is an honour to contribute to the souvenir of the 7th Global Conference on "Asset Integrity & Reliability Management (AIRM 2025)" being held on January 9–10, 2025, at Hotel Radisson Blu, Dwarka, New Delhi.

Asset Integrity and Reliability Management (AIRM) is vital for ensuring safety, environmental protection, and operational efficiency, especially in refineries and petrochemical plants. These industries are not only the backbone of India's industrial progress but also critical to the global energy supply chain. By adopting cutting-edge tools like Risk-Based Inspection (RBI), Corrosion Management Plans, and Asset Integrity 4.0, India can lead the way in promoting sustainable and reliable operations worldwide.

This conference serves as a platform to drive innovative solutions, foster global collaboration, and address the evolving challenges in asset management. By sharing insights and best practices, AIRM 2025 will empower industries to achieve long-term safety, efficiency, and profitability while contributing to global industrial sustainability.

Wishing AIRM 2025 great success!

A handwritten signature in blue ink, appearing to read 'Paresh Haribhakti', with a horizontal line underneath.

Paresh Haribhakti
Managing Director
TCR Advanced Engineering

Message



Ladies & Gentlemen,

It gives me immense pleasure to invite you to the 7th Edition of the Global Conference on Asset Integrity & Reliability Management (AIRM 2025), scheduled for the 8th & 9th of January 2025 at Hotel Radisson Blu, Dwarka, New Delhi.

This conference stands as a truly global platform, with active participation from leading companies, distinguished speakers, and delegates from across the world. It underscores the critical importance of Asset Integrity & Reliability in ensuring safe, reliable, and sustainable operations across various assets.

The global Asset Integrity Management market, currently valued at over US\$ 20 billion, holds significant growth potential in the Asia-Pacific region. Organizations are increasingly recognizing Asset Integrity Management not merely as a regulatory compliance requirement but as a strategic imperative. By establishing robust systems encompassing people, processes, technologies, and governance, companies can enhance safety performance and, consequently, their bottom-line results.

India, as the world's fastest-growing economy with substantial investments in oil, gas, chemicals, power, renewables, and nuclear sectors, must prioritize safety performance and reliability. Investing in Asset Integrity & Reliability Management strategies is vital to prevent catastrophic events and ensure sustainable growth.

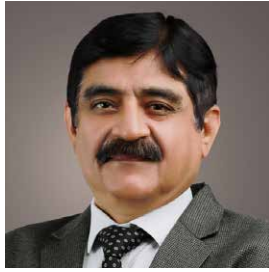
I am confident that AIRM 2025 will serve as an exceptional platform for organizations and professionals to showcase their technologies, share success stories, present case studies, and offer innovative solutions. Participants will gain valuable insights into industry-leading practices and have the opportunity to network with peers, experts, and industry leaders, fostering relationships that extend beyond the conference.

I extend my best wishes to all stakeholders and participants for a highly productive and engaging conference, contributing to enhanced safety and reliability in asset management.

Warm regards,
Suresh Bheema
Sr. Vice President
Metegrity Inc. (Singapore)

Inaugural Dignitaries

Chief Guest



Shri Pramod Sapra
President
Shapoorji Pallonji Bumi Armada

Guests of Honor



Shri R. C. Agarwal
Executive Director
Centre for High Technology
(MoPNG)

Inaugural Dignitaries



Shri Shailesh Tiwari
Executive Director
IOCL - NRPL



Shri Mr. Partha S Ghose
Director Project Management,
Kalyani Steel Ltd.

Plenary Dignitaries



**Shri Jyothikumar
Chandran**
Director BD, IRISS



Shri Manjul Pandey
VP – Industrial Reliability
(India & Middle East),
ACOEM



Shri Hemang Shah
VP – IIoT Solutions
Vegam Solutions



Shri M V N S S Sastry
GM-Inspection
HPCL- VR

Our Partners & Participating Companies

Gold Partners



Exhibitor



Special Acknowledgement



Participating Companies



Eminent Dignitaries and Speakers



Mr. Sahab Gurjar
Founder & Director
PetroBot Technologies



Mr. Paresh Haribhakti
MD
TCR Advanced



Mr. K.N.V. Subrahmanyam,
VP-Operations, VAS
Tribology Solutions



Mr. S. L. Chakravorty
Former ED, IOCL



Mr. Pankaj Sharma
GM O&M
IGL



Mr. Macwan Robert
Advin, Dy. Manager &
Act, Head – RLA & NDT
Section, ERDA



Dr. A. K. Tewari
Former ED
Indian Oil Corp.



Mr. Moinak Banerjee
Co-Founder & CTO
Solinas Integrity



Dr. Vilas Gunjal
Sr. Scientist
ERDA



Mr. J. N. Agrawal
CEO, Corrsol Tech



Mr. Mehran Izadkhah, Global
Engineering Product
Manager, TWI



Mr. Rajesh Uprety
Former GM
Indian Oil Corp.



Mr. K. Pradeep
Chief Manager,
CMRO-Reliability
BPCL, CMRO



Mr. Prashant Kumar Sahu, Senior
Reliability Engineer,
Oceanering



Mr. Santosh Pradhan
Senior Manager –
Inspection, IFFCO



Mr. S Kirubakaran
Senior Manager –
Inspection, HPCL,
Visakh Refinery



Mr. Anoop Saxena
Director (Consultancy
& Training), AMC



Mr. Avinash Sankpal
Senior Manager
Inspection, BPCL,
Kochi Refinery



Mr. Ankit Gupta
Business Development
Manager, Rina
Consulting



Mr. Naveen Kumar Kisalay, Assistant
Manager Inspection
IOCL, Barauni Refinery



Mr. Ramdhari Maddheshiya,
Assistant Manager,
IOCL - Mathura



Ms. Neema Pandey
Assistant manager
Nayara Energy



Mr. Prasanth K. S.
Chief Manager
Reliability-Static
BPCL, CMRO



Mr. P. Subrahmanian
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Inspection, BPCL,
Kochi Refinery



Mr. P. S. N. Swaroop
Chief Manager
Inspection, BPCL,
Mumbai Refinery



Ms. Samiksha Dhote
Operations Officer
HPCL Pipelines



Mr. Krishnakumar V.
Chief Manager
BPCL, CMRO



Mr. Rohith C.
Chief Station In charge
HPCL Pipelines



Mr. Brajesh Kumar
Deputy Manager
Nayara Energy



Mr. Shivakumar G. H.
Project Manager
Pro-Sims



PIPE-TECH 2025

5th Global Pipeline Technology & Development Conference

20-21 August 2025; Hotel Radisson Blu Dwarka, New Delhi

Key Discussion Tracks for Pipeline Design, Construction, and Management

Track 1: Technological & economic impacts for pipeline design & construction

Track 2: Ensuring safer pipelines through integrity management

Track 3: Transporting hydrogen & other biofuels through pipelines

Track 4: Developments & Challenges for Offshore Pipelines

Track 5: Significance of integrity assessment for non-piggable pipelines

Track 6: Challenges to the pipeline industry in the emerging technological scenario

Track 7: Challenges in management of natural gas pipelines & CGD network

Track 8: Compressed Gas Technology & Safety Aspects

Track 9: Smart Gas Distribution Networks

Track 10: Opportunity & Challenges for Hydrogen Blending

Track 11: O&M of energy storage systems

Organizer



Co-Organizer



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E-mail Ids.: **registration@airminstitute.org, info@airminstitute.org**

Website: **www.globalpipetech.com**

About Organizer



Institute of Asset Integrity & Reliability Management

Learn the Strategies for Safety, Reliability and Integrity



Driving Excellence in Asset Integrity & Reliability Management (AIRM)

At the Institute of Asset Integrity & Reliability Management (AIRM), we are committed to empowering industries with the knowledge and expertise to implement the AIRM philosophy and engineering practices. Our mission is to promote long-term plant reliability, efficiency, safety, and profitability on a global scale.

Why Asset Integrity Management Matters

Effective Asset Integrity Management is the cornerstone of maximizing industrial assets' value, profitability, and lifespan while safeguarding people, communities, and the environment. From design and installation to operation and maintenance, assets must consistently perform their intended function—efficiently and effectively—throughout their lifecycle.

The risks are real: physical damage, internal and external corrosion, and premature failure can lead to catastrophic consequences, including safety hazards, environmental damage, reputational risks, and significant financial losses. With many industrial plants and installations—spanning Oil & Gas, Pipelines, Refineries, Power, and Petrochemicals—operating beyond their nominal design life, the need for robust AIRM practices has never been more critical.

A Collaborative Platform for Industry Leaders

The Institute provides an unparalleled platform for technologists, engineers, educators, scientists, and industry professionals to:

Exchange insights and best practices.

Address challenges in Asset Integrity, Reliability, Risk-Based Inspection, and Corrosion Control.

Explore innovations in NDT, Materials, Welding, Fabrication, Process Optimization, and Maintenance.

Shaping the Future of Industry

By integrating design, maintenance, inspection, operations, and management concepts, we ensure the integrity of infrastructure and equipment, equipping organizations to tackle today's challenges and prepare for tomorrow's demands.

Join Us on the Path to Excellence

At AIRM, we cultivate the next generation of industry leaders dedicated to operational excellence. If you're ready to revolutionize how your organization approaches Asset Integrity & Reliability, get in touch with us today to discover how we can help you achieve unparalleled success.

About Co-organizer



Founded in 2013, MatCorr has become a trusted leader in organizing world-class technical conferences, exhibitions, and workshops tailored to drive industry advancements. Our events serve as dynamic platforms for experts and technocrats to exchange cutting-edge ideas and address the evolving needs of professionals and organizations alike.

At the Forefront of Industry Excellence

MatCorr delivers expertise across key sectors, including Oil & Gas, Power & Energy, Chemical & Process Industries, Metals, Steel, and Infrastructure. We are committed to empowering professionals with practical skills and knowledge to excel in their fields.

Why Choose MatCorr?

Comprehensive Events: Our meticulously designed conferences and workshops bring actionable insights and real-world applications to the forefront. **Collaborative Networking:** Engage with leading organizations and professionals, fostering a robust exchange of knowledge that benefits individuals and businesses alike.

Uncompromising Quality: MatCorr ensures every event meets the highest standards of academic rigor and professional management, creating unparalleled learning experiences. Join us at MatCorr—where expertise meets opportunity. Together, we'll shape the future of industries.



AIRM 2025

7th Global Conference on Asset Integrity & Reliability Management

09-10 January 2025; Hotel Radisson Blu, Dwarka, New Delhi

Abstracts

Title: Future of Asset Integrity 4.0: Revolutionizing Maintenance with Acoem's AI and Automation Solutions.

Author: Mr. Manjul Pandey, ACOEM.

Abstract:

In today's fast-paced industrial landscape, ensuring reliable and efficient operations is more challenging than ever. Engineers, CIOs, CTOs, and maintenance leaders are constantly seeking smarter, faster, and more cost-effective ways to manage asset integrity. The question is: how can we harness the latest technologies to stay ahead of the curve?

At Acoem, we've reimagined Asset Integrity 4.0 with solutions that merge Artificial Intelligence (AI), Machine Learning (ML), and Internet of Things (IoT) technologies. This session will explore how Acoem's innovative solutions are transforming maintenance practices and delivering tangible results for industries worldwide.

Our patented Accurex AI platform is at the forefront of this transformation, enabling predictive and prescriptive maintenance that reduces unplanned downtime and enhances operational efficiency. Together with Acoem Smart Devices, which feature edge computing capabilities, we provide real-time actionable insights from Big Data, empowering faster and more accurate decision-making on the field with inter-operable infrastructure to integrate with customers' PLC, SCADA platforms.

We will also showcase Nest i4.0 Vision, our IoT-based decision-making hub that integrates data from multiple systems into a single, actionable interface. These innovations are part of Acoem's Holistic Reliability Ecosystem, a fully integrated approach that combines advanced hardware, software, and expertise to streamline maintenance workflows and fulfill the need of One Reliability Dashboard.

Join us to learn:

- How AI and ML are revolutionizing predictive maintenance with real-world examples.
- The role of edge computing in decentralized, real-time decision-making.

- How IoT and Nest Vision can create a connected, intelligent maintenance framework.
- Steps to build a holistic reliability ecosystem that enhances operational performance.

With real-world case studies and actionable insights, this session is designed to inspire and equip leaders with strategies to future-proof their asset management practices. Let's explore how Acoem's solutions can help you stay ahead in the race for reliability and efficiency.

Title: Asset Integrity Management System (AIMS) at BPCL Group Refineries.

Author: Mr. K. Pradeep, BPCL - Mumbai.

Abstract:

Asset Integrity Management System (AIMS) is a fundamental practice to ensure the safety, reliability, and efficiency of industrial assets throughout their operational lifecycle. In industries such as oil and gas, refining, and petrochemicals, the consequences of equipment failure can be significant, impacting safety, environmental performance, and operational continuity. This paper presents the comprehensive implementation of an Asset Integrity Management System (AIMS) at BPCL (Bharat Petroleum Corporation Limited), utilizing GE Asset Performance Management (APM) software, and highlights how it has helped us manage the integrity of critical assets and optimize their performance.

A key aspect of our AIMS approach at BPCL involves the concept of Operations Driven Reliability (ODR), achieved through the Rounds module in GE APM. This approach empowers field operators to perform regular equipment inspections and data collection during operational rounds. The data gathered through these rounds are systematically fed into the APM system, generating insights into asset health and enabling proactive maintenance decisions. This shift has promoted a culture of collective responsibility for asset reliability across operations and maintenance teams, significantly improving asset performance and reducing unexpected failures.

Furthermore, our integration of Risk-Based Inspection (RBI) and predictive maintenance strategies within

GE APM has allowed us to focus on the most critical equipment, minimizing unnecessary maintenance and optimizing resource allocation. The RBI methodology prioritizes inspections based on the risk profile of each asset, balancing the likelihood of failure with its potential impact. This has resulted in more efficient inspection schedules and improved risk mitigation.

The use of condition monitoring, corrosion management, and real-time alerts generated by GE APM has empowered our team to address issues before they escalate into costly failures or safety hazards. Additionally, the seamless interface between APM's alert management system and our workflow has enabled better coordination between the operations and maintenance teams, ensuring that recommendations from rounds are quickly implemented.

This paper will outline the practical steps taken in the implementation of our AIMS at BPCL, including challenges, key milestones, and the benefits realized. The adoption of ODR through GE APM's Rounds module, combined with advanced analytics and risk-based approaches, has significantly enhanced our ability to maintain asset integrity, reduce downtime, and improve overall operational efficiency.

Title: Evaluating Piping Failures in Regen Drier Systems: Causes and Solutions.

Author: Mr. P. S. N. Swaroop, BPCL- Mumbai Refinery.

Abstract:

This case study of Pipe weld joints of Regen Drier piping circuit of Continuous Catalytic Regeneration Reformer (CCR) unit failing within 1 year of service. MOC of the pipe is SS 304. The dimension of pipe is 12" OD and 6.35 mm thickness. The leaks were noticed during the plant rounds with black deposits on piping. Both vertical and horizontal sections, equipped with electrical tracing and insulation, exhibited multiple leakages persisting from the unit's commissioning, despite full replacement of piping in year 2020.

The failure of pipe initiated at the weld in the form of interdimeric corrosion of weld having carbides. This corrosive process, initiated within the weld microstructure, was aggravated by the presence of chloride ions, which facilitated crevice corrosion upon partial metal wastage. The formation of carbides within the weld zone exacerbates susceptibility to corrosion, compromising the structural integrity of the joint. Moreover, the presence of chloride ions, possibly originating from environmental sources or process fluids, creates an electrochemically aggressive environment conducive to localized corrosion mechanisms. The damage further propagated in the form of chloride induced TGSCC (Trans Granular Stress Corrosion Cracking). Addressing the failure of the regen drier piping circuit necessitates a multifaceted approach encompassing detailed metallurgical

analysis which involved Scanning Electron Microscopy (SEM), Energy Dispersive Spectroscopic analysis (EDS), Visual, Dimensional, DPT, Macro & Micro examinations, Chemical and mechanical testing's. Based on inspection findings such as EDS analysis reveals presence of chloride, sodium and waterborne contamination. Corrosion is seen in the weld initiating from ID and moving towards OD.

To address all these recurring leaks all piping spools were changed to CS metallurgy and Belzona product applied internally which was designed to resist high temperature hydro carbons and aqueous solutions and also this product exhibited excellent chemical resistance contaminated by acid.

In conclusion, the successful deployment of these internal coating methodology demonstrates a proactive approach to maintain the integrity and functionality of piping system.

Title: Improving Reliability and Managing Risk through Integrity Operating Window Implementation - An Innovative Approach.

Author: Mr. Prasanth K. S., Mr. Krishnakumar V, BPCL - Mumbai.

Abstract:

Monitoring the process parameters and analyzing the excursions beyond the established limits through the IOW program provide actionable steps for a proactive planning of mechanical integrity improvements during operation and planned Turnarounds. IOWs are generally considered as Mechanical Integrity function only. However, this paper also provides insights into other critical areas of improvements for process plants such as

- Reliability Improvement
- Energy Efficiency Improvement
- Tool for Turnaround planning
- Integration of IOW with Process Safety Management (PSM)

Title: Pipeline Integrity Assessment Application.

Author: Mr. Rohith C., Ms. Samiksha Umakant Dhote, HPCL - Mumbai.

Abstract:

Pipeline Integrity Assessment Application (PIAA) is a Web based application which is developed inhouse using Python.

It helps in assessing various pipeline integrity related parameter for any deviation by comparing the same with Pipeline base data and previous years values.

Title: Consolidating RCM Base for Asset Diagnostics & AI interface - Maintenance 4.0.

Author: Mr. Anoop Saxena, Director (Consultancy & Training), AMC.

Abstract:

This paper illustrates & highlights methodology applied for Integral RCM base development & its consolidation for Asset Diagnostics, before Introducing/Implementing Maintenance 4.0 for Plant, for successful take-off of advanced AI/Smart Sensors/Domain Interface. IoT-based solutions provides a real-time dashboard of key indicators to support Plant performance. These allow the tracking of alerts to operators via Wi-Fi/ LAN to Laptops/ mobile devices etc.

INDUSTRIES FACES KEY CHALLENGES ON SUCCESSFUL IMPLEMENTATION OF AI/MAINTENANCE 4.0:

- High Cost of Scaling/ Lack of Resources/ Lack of Data Analytics Skills /Risks to Data Security: It's a big challenge to make Plant Process Integrated with AI/ IoT with smart sensors, success at Varied Level & Type of Plant Operations & Processes. Moreover, Expertise differs at each Process & Engineering unit, hence a Uniform Conventional highly structured Approach would not yield desired outcome of Assets. Key Objective is, how do we assess Plant/ Equipment and to consider which Parameters/ Factors contributing to Overall Plant Performance with application of Maintenance 4.0.
- Key Focus- Effective Machine & Process with Strong RCM Base for Integrating Maintenance 4.0: RCM Strategy base developed with Integration of Best Practices on Equipment Management through Implementation of Strong O& M System (Based on Criticality/ Dynamics/ Defects, Deviation control/ Diagnostic, Monitoring, Health Index/ RBI, RCFA) & Integrated Inspection System-To Capture incipient Defects & Kaizen / loss-cost derivation on Plant Process/ Equipment.

KEY STEPS / METHODOLOGY APPLIED FOR TOTAL SYSTEM INTEGRATION:

- Plant/Equipment Drive on Basic condition Improvement with Equipment Off-line /On-line Inspection&Abnormality Identification, with concept of Equipment Integrated Inspection System.
- Focus on CBM, RBI & Health Index with CBM &RBI System Implementation with Integrated Diagnostics techniques applied to assess internal /external condition of both Static & Dynamic Assets.
- Establishing RCM based on Equipment History& Maintenance Strategy as per Failure Mode on (PM/ CBM/ DOM- Modification, Kaizens / Operation/ SOP &Skill &Knowledge Enhancement on RCM, Diagnostic & Use of RCFA & RCM Tools for Reliability Analysis. Plant Equipment Assessment for system implementation.
- Maintenance 4.0 /AI Interface with -RCM Health Index with multiple Parameters weightage /trends

Title: Cracking in HAZ Area of Outlet Piping Weld Joints of Lean Amine Air Coolers of Amine Regeneration Unit After 06 Years of Service.

Author: Mr. Avinash Sankpal, Mr. Gokuldas K. K., BPCL - Kochi Refinery

Abstract:

The primary function of hydrotreaters in refineries is to remove Sulphur and nitrogen from hydrocarbon streams. The vapor products from this process will be rich in hydrogen sulfide and ammonia, depending upon the feed composition. The amine regeneration process uses aqueous amines (LMDEA) to absorb the H₂S and NH₃ from the vapor streams. LMDEA after absorbing H₂S and NH₃ becomes Rich Amine (RMDEA). The rich amine (RMDEA) is then fed to a stripper column that liberates the H₂S and NH₃ from the amine. The H₂S and NH₃ gases are then sent to the sulfur recovery unit (SRU) for Sulphur production. The resulting lean amine is then recirculated to the absorber column after cooling LMDEA in shell & tube exchangers & air fin coolers. Leaks were observed in the LMDEA air fin coolers outlet line weld joints HAZ area after 06 years of service. Leaks were noticed in the form of cracks at HAZ area of welds in the forged components (Like elbows, flanges, expanders). Multiple leakages have been noticed in the weld HAZ area of the outlet lines of LMDEA air fin coolers over the period of last 02 years.

A failure investigation study was conducted to find out the root cause of the failure. The study employed visual examination, Wet fluorescent magnet particle inspection (WFMPI), Scanning Electron Beam Microscopy and X-ray Diffraction Spectroscopy (EDS) to do the metallographic and fractographic analysis of the leaked components. EDS analysis on deposits reveals the presence of sulfur and water borne contamination. The crack surface is intergranular in nature. Microstructural examination revealed the cracks are intergranular, branching in nature and filled with scale initiating from pitting corrosion at inner edge. Microhardness values in the weld/HAZ are relatively higher as compared to the parent metal. All this evidence indicates the cracking is due to amine stress corrosion cracking (ASCC).

Title: Corrosion Failures in Power Sector Components.

Author: Dr. Vilas Gunjal, Dr. Nitin Shingne, Electrical Research and Development Association.

Abstract:

The demand for electricity has been substantially increasing in India. In order to meet the consumer requirements, generation plants and utilities strive to operate at higher load and efficiency. This leads to operation of power plant discontinuously or otherwise operated cyclically. The fluctuations in operation and harsh operating condition are the major reason for the failure of components at power generation plants and at transmission and distribution lines which pose major

concern in meeting the demands.

The corrosion of power sector components is one of the causes for failure of component which lead to frequent shutdown, repair and replacement cost to power plants and utilities. The present paper discusses the major corrosion failures observed in power generation plant as well as transmission lines. The role of various factors such as temperature, operating pressure, cyclic stress, water chemistry, deposits, impurities and raw materials responsible for specific corrosion failures are presented. The overview on corrosion failure mechanisms, possible reasons, susceptible components and preventive remedies are discussed along with few case studies performed in the past, in order to help power plants and utilities to take preventive actions to avoid the failures.

Title: Condition Assessment and Performance Monitoring of Solar PV Module.

Author: Mr. Macwan Robert Advin, Mr. Anil Khopkar, Electrical Research & Development Association.

Abstract:

Due to continuous increase in energy demand & exhaust of fossil fuel, demand of solar power plant and its installation of roof top module, is increasing significantly as clean, abundant & green source of energy. The ROI calculation for solar systems often assumes 20-25 years of power production which is based on the concept of gradual power loss due to aging of panels. These calculations don't consider system deterioration caused by lightning storms, panel cell overheating and other failures. However, Significant Power loss occurs due to these failures.

The core idea of this paper is to give the data/information on presence & identification of various faults responsible for power loss in solar modules & its effect on power output. Condition monitoring of solar panels will be checked by using IR thermal scanning, Ultraviolet Fluorescence Inspection - UVF and Electroluminescence Inspection - EL to find out various faults which can be remain unseen during visual examination & I-V characteristics curve to ensure optimal solar power output in Performance Monitoring. An analysis of data will be done to diagnose the faults and its effect on efficiency of solar module. In Extreme conditions may lead to fire and possibility of heavy damage of solar power plant. Therefore, through IR thermal scanning, Ultraviolet Fluorescence Inspection - UVF, Electroluminescence Inspection - EL & I-V Curve techniques, we can control the power generation losses, increase reliability and availability of power and asset management of Solar PV power plant.

Title: Optimizing Maintenance Strategies with RCM: A Data-Driven Approach to Cost-Effectiveness.

Author: Mr. Prashant Kumar Sahu, Mr. Abhishak Saini, Mr. Murilo Silva, Mr. Soumya Chakraborty & Mr. Vaibhav

Jadhav, Oceaneering International Services Limited.

Abstract:

This paper demonstrates how the Reliability-Centered Maintenance (RCM) approach can guide decision-makers in evaluating the cost-effectiveness of different maintenance strategies for rotating machinery in subsea application. By utilizing RCM, businesses can make informed decisions on Preventive Maintenance (PM), Predictive Maintenance (PdM), and Corrective Maintenance (CM), weighing these strategies based on factors such as reliability, failure rates, duty cycles, and the costs of proactive versus reactive replacement.

When properly applied, RCM helps decision-makers understand that cost-effectiveness depends heavily on the specific context of the equipment and its operational environment. Preventive Maintenance is most effective when there is a clear wear-out pattern, making it suitable for equipment with predictable failure modes. In contrast, Predictive Maintenance allows for condition-based interventions, which can be more effective for equipment with less obvious wear-out phases but requires higher upfront costs for monitoring systems.

The study leverages life-data analysis and Monte Carlo simulation to model failure patterns and estimate the costs of different maintenance strategies. Real-world uncertainties such as operational demands, environmental conditions, and variable failure modes are incorporated into the analysis. Run-to-failure strategies are also examined for systems where the impact of unplanned downtime is tolerable.

Contrary to the common assumption that Predictive Maintenance always delivers superior results, the findings indicate that a combination of maintenance strategies tailored to the equipment's reliability profile often leads to more cost-effective outcomes. When failures have minimal impact, a run-to-failure approach may be more cost-effective by avoiding the costs of implementing PdM. For critical systems or those with clear wear-out patterns, however, Predictive or Preventive Maintenance may offer better control over unplanned downtime and reliability.

By applying RCM principles and using a data-driven methodology, this paper highlights how decision-makers can optimize maintenance strategies, reduce downtime, and manage lifecycle costs effectively. RCM provides the critical insights needed to select the right strategy for each operational scenario, balancing the costs of proactive interventions with the potential impact of reactive failures.

Title: Managing Corrosion Under Insulation by Thermal Insulative Coating Systems.

Author: Mr. Praveen Subrahmanian, Mr. Ramaprasad Baral, Mr. Anand K. P., BPCL - Kochi Refinery.

Abstract:

Corrosion Under Insulation (CUI) is any type of corrosion that occurs due to presence of moisture on the external surface of an insulated equipment. Since CUI occurs beneath insulation and is not readily visible during external inspection, the onset of corrosion cannot be easily identified, and in extreme cases, severe corrosion with consequential loss of system integrity can occur.

Thermal Insulating Coating (TIC) has come up as an effective method to prevent CUI. TICs are found to be useful in replacing the insulation itself especially in areas where the equipment has been operating in CUI range, such as storage tanks, hot air ducts etc, and also in equipment insulated for safety of the operating personal. Field trial was carried out for a selected equipment and the temperature before and after the application of the insulating coating was monitored and the results are explained in this paper. The trial involved in stripping full insulation of the vessel, shot blasting, and painting with TIC as per the TIC Manufacturers specification. After painting, vessel was commissioned and an external surface temperature of 75°C was obtained with operating temperature of 171°C.

Title: Stress Corrosion Cracking Case in Piping of EBMS Service.

Author: Mr. Ramdhari Maddheshiya, Mr. Girish Kumar, Mr. Vikash Sharma, IOCL, Mathura Refinery.

Abstract:

This case study investigates a leakage incident in the Tee portion of an inlet line to a naphtha service tank, which occurred at the 6 o'clock position. The line, previously in EBMS service from October 2015 to October 2023, was operating under naphtha service conditions with a temperature of 33°C and a pressure of 1.5 kg/cm² at the time of failure. Subsequent analysis revealed that the cracked Tee exhibited through-thickness cracking and general corrosion with greyish deposits on the internal surface. Literature review indicated that ethanol stress corrosion cracking (SCC) could be exacerbated by increased moisture, sulphur, sulphate, and chloride concentrations, leading to intergranular cracking.

Visual inspection and microstructural examination identified brittle crack propagation and typical corrosion failure characteristics, with no evidence of mechanical overload. Hardness testing showed a slight increase above the acceptable limit (204–208 BHN), and EDAX analysis confirmed the presence of corrosive elements such as sulphur, chlorine, and potassium. Optical microscopy and fractographic studies further supported the diagnosis of intergranular cracking and corrosion-assisted brittle fracture.

This investigation concludes that the Tee failure was due to ethanol SCC, highlighting the impact of corrosive agents and operational changes on material integrity in ethanol service.

Title: Designing for Sustainable Operation Excellence and Asset Integrity.

Author: Mr. Jyothikumar Chandran, IRISS.

Abstract:

In industrial operations, asset failure is inevitable but can be strategically mitigated to enhance operational efficiency and reduce costs. Reliability-Centered Design (RCD) and proactive maintenance are critical, focusing on precision and discipline throughout the asset lifecycle—from design and installation to operation and maintenance.

This presentation addresses key challenges such as startup-induced defects, poor operational practices, and inefficiencies in time-based maintenance strategies, which often reset the infant mortality clock. By incorporating predictive technologies like infrared thermography, airborne ultrasound, and partial discharge testing, organizations can detect early warning signals, prevent failures, and extend asset lifespans. Global studies reveal that up to 68% of defects are attributed to random failures, highlighting the necessity of data-driven strategies.

Achieving operational excellence requires the adoption of a Condition-Based Maintenance (CBM) model, which reduces unplanned downtime, enhances safety, and optimizes energy efficiency. For example, rectifying loose electrical connections can decrease energy losses by 20%, generating significant cost savings across industries. Cutting-edge tools like maintenance inspection windows and gold cup thermometers further streamline inspection processes without compromising safety or efficiency.

This presentation advocates for an Operations-Driven Sustainability and Reliability (ODSR) approach, emphasizing continuous surveillance and risk-based methodologies. By implementing these strategies, organizations can transition from traditional reactive maintenance to sustainable, cost-effective practices that ensure superior reliability and operational success.

Title: Process Hazard Analysis (PHA) & Risk Control Measures for Safe Operation of Compressor Transporting Natural Gas through Cross Country Pipelines.

Author: Mr. S. L. Chakravorty, Former ED - IOCL, Former Director - OISD.

Abstract:

Gas compressors are the heart of Natural Gas transportation over long distances through cross-country pipelines, and centrifugal compressors are

the preferred choice for this application. In petroleum refining operations also, especially for secondary processing units, recycle gas centrifugal compressors are used to circulate hydrogen (H₂)-rich gas through catalysts/conversion reactors to produce finished products.

Safe operation of compressors using natural gas is essential due to potential hazards & risks from high to very high-pressure operations with the flammable gas.

Process Hazard analysis (PHA):

It is a tool for structured identification of hazards related to design & operation of facilities with the objective to proactively identify hazards & to recommend appropriate prevention and/or mitigation measures. PHA analysis should be performed for any facility to identify, evaluate, and reduce the likelihood of abnormal events & its consequence. PHAs for compressor operation, especially for startup & shutdown activities, are needed to answer basic process safety questions: What can go wrong? What safeguards are needed? Are the provided safeguards working? Also, relevant questions must also be answered, such as what are the effects on the environment?

Commonly used techniques to aid in hazard identification & qualitative analysis include: What-If. HAZOP), LOPA, FMEA, FTA, Bowtie etc.

What if? analysis.

To answer the above-mentioned questions, the "What if?" methodology for a fixed-speed centrifugal compressor (motor- or gas turbine-driven) is considered here in this paper. When conducting a what-if analysis, it is essential to address the most important process safety information i.e., the settle out pressure (SOP) of the gas compressor and its importance to ensure operational integrity. While evaluating hazards using 'What if analysis' w.r.t compressor start-up & shut down operations, following risk control measures for the compressor safety were revealed from the challenges on what can go wrong?

1. Use of suction throttle valve at compressor inlet along with anti-surge control in case of low uptake at consumer point or at downstream.
2. Minimum design pressure at compressor suction system including KOP to be considered at 1.05 times settle pressure (SOP) in line with API standard
3. Provide ESD at compressor suction & discharge lines with blowdown facility.
4. Blow down facility at the suction is essential to enable restart of the compressor after the Settle out condition (SOP).

The effect due to perforce depressurisation to atmosphere during every restart of the compressor from the settle out condition would mean the methane (GHG) emission to atmosphere. The paper suggested to capture such emission using auxiliary compressor

and use the same in the gas turbine fuel system of the running compressor or inject to suction of running compressor. Alternatively review the compressor system with OEM for pressurised start up along with checking of the driver's capability. This will save the precious energy in addition to reduction in GHG emission.

PHA technique while identifying hazard & risks reveals the very important findings for the safety of the compressor and its reliability.

Title: Failure Analysis of Membrane Tubes for Waste Heat Recovery (WHR) Boiler in Sulphuric Acid Plant (SAP).

Author: Mr. Santosh Kumar Pradhan, Indian Farmers Fertilizer Cooperative Limited.

Abstract:

Failure analysis is an investigation process of collecting and analysing data to determine the root/primary cause(s) leading to failure with the aim of developing corrective action(s) by modifying design, manufacturing, operating & maintenance procedures which can prevent recurrence.

Its objective is to study membrane tube degradation in waste heat recovery (WHR) boilers used in Sulphuric Acid Plants (SAP). This involves analysing causes, effects, and mitigation options. The paper investigates membrane tube failures and proposes solutions.

To achieve its goal, the research uses theoretical analysis, experimental investigations, and case studies. This study's analysis and answers are based on waste heat recovery, boiler technology, and membrane tube deterioration literature and theories.

The study examines the causes and effects of membrane tube deterioration in waste heat recovery (WHR) boilers used in steam-assisted production (SAP) systems. This includes reviewing literature, collecting data, conducting experiments, and analysing case studies. The study collects and analyses data using qualitative and quantitative methods.

The study found that heat stress, corrosion, erosion, and mechanical wear induce membrane tube failure in WHR boilers. It also emphasizes how these failures affect operations, maintenance costs, and plant performance. The paper also suggests ways to reduce membrane tube degradation and improve WHR boiler reliability.

The study suggests proactive maintenance and monitoring to prevent membrane tube failures in waste heat recovery (WHR) boilers. These discoveries are discussed in relation to SAP operators, maintenance staff, and petrochemical stakeholders. The study also evaluates membrane tube degradation's effects on

energy efficiency, sustainability, and economic viability.

This research sheds light on membrane tube deterioration in SAPs, improving waste heat recovery and boiler technology. This document offers concrete ways to improve WHR boiler performance and reliability, enhancing plant efficiency and sustainability.

Key principles: To prevent membrane tube failures in waste heat recovery (WHR) boilers, the research emphasizes proactive approaches, regular monitoring, and cutting-edge technology. Researchers, industry professionals, and regulatory organizations must work together to solve waste heat recovery problems and ensure SAP operations' sustainability.

Failure Analysis Methodology: Visual Inspection, Dimensional Measurement, Dye Penetrant Testing, Ultrasonic Thickness Measurement, Optical Magnification, Hardness Measurement, Scale Thickness Measurement, EDS Analysis of Corrosion Deposits & Scale, Fractographic Investigation by Scanning Electron Microscope, Temperature Measurement, Macrostructural & Microstructural Examination, Metallographic Examination by Scanning Electron Microscope & Optical Microscope, Spectro Chemical Analysis, Examination of Tensile Properties, Flattening Test.

Title: Deep Experience of FFS Level-3 and RLA/RLE of Refinery Systems.

Author: Mr. Shivakumar G. Hadagali, ProSIM R&D.

Abstract:

Asset integrity management is crucial for ensuring the safe, reliable, and efficient operation of industrial assets, especially in high-risk sectors such as oil and gas, power generation, and manufacturing. Effective risk management is essential for identifying, assessing, and mitigating risks throughout an asset's lifecycle. In this presentation, we discuss how we integrate Fitness for Service (FFS) level-3 assessments by numerical method / Finite Element Analysis, Remaining Life Assessment (RLA), Remaining Life Extension (RLE), and design analysis and optimization to provide a comprehensive approach to asset integrity. Our FFS assessments help evaluate whether assets, even with degradation such as corrosion or cracks, can continue to operate safely, guiding decisions regarding repairs, replacements, or continued service. Also, the numerical method is used to determine the structural integrity and design optimisation. Through RLA, we determine the remaining useful life of components, enabling proactive maintenance planning and optimal resource allocation. Our RLE strategies focus on extending the operational life of assets through targeted repairs, upgrades, or modifications based on RLA findings, effectively delaying failure and reducing downtime. Additionally, our design analysis and optimization ensure that assets are engineered to meet operational

demands, improving performance and minimizing the risk of failure.

We (ProSIM) specialize in solving the complex challenges associated with FFS, RLA, RLE, and design optimization. Through our advanced engineering solutions and expertise, we help organizations optimize asset performance, extend service life, and minimize the likelihood of catastrophic failures. By providing data-driven insights, we empower asset managers to make informed decisions that improve operational efficiency, reduce maintenance costs, and ensure compliance with safety and regulatory standards.

Title: Reliability improvements in CCR Unit, Visakh Refinery.

Author: Mr. S Kirubakaran, Rajwade Manish Kumar, HPCL - Visakh Refinery.

Abstract:

Reliability improvement within complex Refining Operation is a cornerstone of sustainable and efficient process management. The Continuous Catalytic Reforming (CCR) unit in the MS Block is a critical process unit in producing high-octane gasoline. However, recurring issues in the heater convection section, reactor reduction zone, and cyclemax air injection line necessitated reliability enhancements. This presentation outlines the strategic reliability measures undertaken to mitigate these challenges and ensured seamless operations.

During TA inspection of the CCR Heater Convection Section, cracking and detachment of 13 Intermediate Tube Sheets (ITS) were observed, attributed to vulnerabilities in the suspended-type design. To address this, a comprehensive redesign was undertaken, replacing the suspended-type with a robust bottom-support design, reducing the number of ITS to six, and changing the metallurgy from 50Cr/50Ni to 25Cr/35Ni to better suit current firing conditions. Additionally, peep-hole doors were added to enable online condition monitoring, significantly enhancing preventive maintenance capabilities.

In the CCR Reduction Zone, gasket failures on the bonnet flange posed persistent reliability issues. The existing SS 321 spiral-wound gaskets with graphite filler were replaced with Kamprofile gaskets incorporating Thermiculite filler, supported by enhanced torque tightening and the addition of weather shields. Since the implementation, no flange leaks have been reported, demonstrating the efficacy of this targeted intervention.

In the CCR Cyclemax Upper Air Injection Line experienced persistent leaks due to sulphuric acid dew point corrosion and stagnation during white burn mode. The metallurgy change proposed from SS 316H to Inconel 600, as nickel-based alloy offering superior

resistance to sulphuric acid dew point corrosion, chloride-induced corrosion, oxidation, and stress under stagnant and high- moisture conditions.

These measures underline the importance of tailored engineering interventions in addressing frequent reliability issues. By integrating advanced metallurgical upgrades, design optimization, and enhanced monitoring mechanisms, the MS Block CCR unit has achieved a marked improvement in operational reliability. This case study serves as a testament to the role of targeted solutions in ensuring the longevity and efficiency of critical Refinery assets.

Title: Reliability improvements in Hydrocracker unit, Visakh Refinery.

Author: Mr. S Kirubakaran, P. Deepak, HPCL - Visakh Refinery.

Abstract:

Full Conversion Hydrocracker Unit (FCHCU) commissioned under Visakh Refinery Modernization Project (VRMP) in Oct, 2023, is a very complex and critical unit where feed VGO from CDUs is directly processed to final products viz., Diesel, Light & Heavy Naphtha, LPG & Kerosene conforming to Euro VI norms. Due to this inherent capability of the unit, continuous and uninterrupted operation is of paramount importance. However, frequent leak of charge pump warm-up line, pin hole leak on diesel pump around pump line has affected reliability of the unit. This document is intended to outline the improvement measures implemented to enhance the reliability of the unit.

1" Pump warm-up line elbow leak due to erosion: Observed frequent leak from outer arc of 90Deg elbow located at close proximity to flow orifice plate on 1" warm-up line of charge pumps. Line is of SA106GrB material. Upon investigation, the root cause for leak was found to be flow induced erosion due to absence of minimum downstream straight length of pipe which is required for flow stabilization after passing through the orifice plate.

The flow orifice was relocated to further upstream location so as to maintain straight pipe length for flow stabilization and no leak was observed since last 7 months of the line service.

8" diesel pump around pump line leak due to MIC: Observed recurrence of leak at 6 O' clock position on 8" diesel service line from diesel pump around pump discharge to heavy fractionator column leading to unit shutdown. Line is of SS304 material. Upon investigation it was observed that fresh water was used instead of DM water for hydrotest and also absence of low point drain in the entire loop which could have led to incomplete draining of hydrotest water and possible growth of microorganisms. Based on observations the root cause for leak is ascertained to MIC.

Provision of low point drain and use of DM water followed by complete draining and drying using Nitrogen to prevent water stagnation and possible growth of microorganisms was suggested for averting MIC type corrosion. The above measures have improved the reliability of the unit thus averting unplanned shutdowns.

Title: Remaining Useful Life Prediction of Water Pipeline Using Machine Learning Algorithm.

Author: Mr. Moinak Banerjee, Solinas Integrity.

Abstract:

The pipeline infrastructure is one of the key assets for a country. Pipelines are critical for transporting resources like water, oil, and gas and many more substances which are a necessary commodity for daily end to end needs. Over time, these systems are affected depending on physical, mechanical, environmental, and operational parameters. Physical parameters include pipe age, pipe diameter, manufacturing, pipe wall thickness and corrosion depth. Mechanical parameters include bursting tensile strength and modulus of rupture. Operational factors include internal pressure and factor of safety. Environment factors such as soil pH, soil aeration index, soil resistivity, these parameters will result in failure or collapse of the pipeline, which would lead to environmental disasters, economic losses, and would affect the day to day life of people.

A solution with a hefty price tag could be crafted out but would be the most basic method of intervention by replacing the whole infrastructure of the pipeline which does take up an enormous amount of manpower and financial loss, which always would not be the most economical solution. To overcome this problem, we have proposed a multiple regression model for predicting the remaining useful life (RUL) of the cast iron/ ductile iron water pipeline. The proposed model works in two stages: stage-I is statistical analysis and stage-II is operational analysis. Statistical analysis model is a multiple regression model that will take the parameters like corrosion depth in pipeline, age of the pipeline, material and type of the pipeline, soil type, diameter of the pipeline and depth of the pipeline for RUL calculation. In stage-II, visual inspection analysis has been further added to enhance the accuracy of statistical models by providing information extracted from the robot such as encrustation, ferrule, failure, blockage etc. The dataset contains the eight statistical and four operational parameters. 80% of the dataset is used for training the model and the rest 20% is used for validation of the model. The model is tested on a daily basis and the results are correlated with the actual situation of the pipeline.

Title: Reliability Enhancement and Carbon Footprint Reduction Through Lubrication Program Development.

Author: Mr. K. N. V. Subrahmanyam, VAS Tribology Solutions.

Abstract:

Reliability enhancement and carbon footprint reduction are two critical objectives for modern industrial operations, particularly in sectors reliant on machinery and equipment. Lubrication management plays a pivotal role in achieving these goals by optimizing the performance and longevity of mechanical systems. Effective lubrication practices, including the selection of appropriate lubricants, precise application, and regular maintenance, can significantly reduce wear and tear on components, thereby improving equipment reliability and minimizing unplanned downtime. Furthermore, optimized lubrication systems contribute to carbon footprint reduction by improving energy efficiency, lowering friction, and reducing the overall consumption of lubricants, which in turn diminishes waste and the need for frequent replacements. Additionally, the adoption of biodegradable and environmentally friendly lubricants can further reduce the environmental impact. This paper explores various lubrication management strategies, such as condition-based monitoring, lubricant recycling, and advanced lubrication technologies, to enhance reliability while promoting sustainability. By integrating these practices, industries can not only improve operational efficiency but also contribute to broader environmental goals, making lubrication management a critical component of sustainable industrial operations.

Title: Robotic Inspections of Storage Tanks, Pressure Vessels, Boilers, and Underwater Assets using PetroBot Robots – Field Experiences.

Author: Mr. Sahab Gurjar, PetroBot Technologies.

Abstract:

Aboveground storage tanks (ASTs), pressure vessels, underground tanks, boilers and underwater assets are very critical assets. Assuring the reliability & integrity of these assets are also very important considering the critical operations of the Oil & Gas / Chemical / petrochemical Industry / power industry. Conventional method of inspecting these assets is erection of scaffolding followed by conventional inspection by human which led to work at height hazards and increased safety risks. To minimise or eliminate above problems, these assets can be inspected by using online robotic tools which can climb over the shell roof or dish end of these assets and can carry out the external inspection of shell / roof / dish end plates.

This paper discusses about the robotic inspection methodology, prerequisite for aforesaid inspections, inspection execution and result / finding reporting etc. This paper will benefit the industry participant to get the

insights of use of tank inspection robot PetroBot ITIS Rover & MagRover to mitigate the corrosion failures and to monitor the corrosion damage before it leads to disaster incidents. This presentation will benefit the participant to get the insights of use of on-stream asset inspection robots ATEX approved PetroBot ITIS Rover / PetroBot MagRover and to inspect these assets without any shutdown and service life extension acceptable to regulatory authorities.

Title: Asset Integrity Optimization and Management: A Knowledge-Based and Digitalized Approach for Long-Term Sustainability.

Author: Mr. Paresh Haribhakti, TCR Advanced Engineering.

Abstract:

This presentation emphasizes the critical role of Asset Integrity Management (AIM) in driving reliability, safety, and operational excellence in the process industry. AIM encompasses the entire lifecycle of assets, requiring a collaborative approach that aligns top management strategies with on-field engineering execution. The evolution of AIM—from reactive, failure-driven methods to knowledge-based, digitally enabled proactive strategies—has transformed industrial operations and risk mitigation paradigms.

Key methodologies such as Risk-Based Inspection (RBI), Fitness-for-Service (FFS), Reliability-Centred Maintenance (RCM), Integrity Operating Windows (IOWs), Corrosion Control Documents (CCDs), and advanced analytics are highlighted as essential tools for preserving and enhancing asset integrity.

These frameworks enable systematic identification and management of critical damage mechanisms, including corrosion under insulation (CUI), temper embrittlement, hydrogen-induced damages, liquid metal embrittlement, small-bore piping failures, localized corrosion due to process impurities, design deficiencies, metallurgical degradation, and welding anomalies.

The presentation also explores the implementation of the AiOM® (Asset Integrity Optimization and Management) tool, showcasing its ability to address complex damage mechanisms through a knowledge-driven, team-based approach. The expertise of metallurgical professionals, particularly in failure analysis and FFS assessments, is presented as an essential factor in ensuring the success of AIM programs.

By integrating expert knowledge, digitalization, and a proactive risk-based approach, industries can systematically minimize vulnerabilities and prevent catastrophic failures. Impartial, third-party facilitation of AIM programs, such as AiOM®, provides a solid foundation for achieving long-term sustainability, safety, and operational profitability.

This presentation illustrates how the adoption of a knowledge-based, digitalized AIM framework, driven by metallurgical insights and state-of-the-art technologies, enables industries to enhance operational resilience while meeting the demands of a competitive and safety-focused environment.

Title: Integrity Assessment of Steam Generation System.

Author: Mr. Macwan Robert Advin, Mr. Anil Khopkar, Electrical Research & Development Association.

Abstract:

Limitation of fossil fuel & Climate change issue has made disruption in the energy scenario and all sectors are facing the challenges for accommodating new normalcy. In a new scenario of fluctuation in demand, Steam Generators of industries and power plants are frequently becoming on and off and partial load operation has become regular practice. This affects the life and performance of Steam Generator and its auxiliaries. Therefore, plant life extension is a major concern to survive in the current scenario of uncertainty.

Many of the existing power plants have aged to the point where they are operating inefficiently at a derated capacity and with poor reliability records.

This paper talks about the solution of this problem through Integrity Assessment and will be helpful to obtain safe, reliable and efficient operation of steam generators and their auxiliaries. Performance Assessment, Residual Life Assessment and Condition Assessment can accurately define as Integrity Assessment & gives the condition of existing plant components, determines the remaining life of the components and recommends justifiable repairs, replacement, refurbishment etc. as described below;

- As a part of Performance Assessment, two case studies have been discussed which gives some highlights on a situation arising from different reasons of Steam Generator loss and how we can minimize these losses to effectively operate Steam Generator.
- Systematic approach towards Residual Life Assessment of Steam Generator is also discussed with various defects found during inspection.
- Vibration Severity Analysis is discussed as a part of Condition Monitoring of Steam Generator's auxiliary and Case studies related to Vibration Severity Analysis has been discussed.

All these activities together can be call as Plant Life Extension (PLE) program and will be discussed in detail with case studies. The paper will show an organized program to investigate, evaluate, and plan for prolonged utilization of existing steam generation systems for safe and efficient long-life operation. Proper utilization of

various methods of life assessment and performance assessment can result a good, healthy and reliable operation of Steam Generator and auxiliaries.

Title: Enhancing Risk Assessment, Reliability Management, and Risk-Based Inspection (RBI) in Refinery Static Equipment through Linear Programming Optimization.

Author: Mr. Naveen Kr. Kisalay, IOCL - Barauni Refinery.

Abstract:

In refinery operations, static equipment plays a crucial role in ensuring process continuity, safety, and efficiency. Traditional methods of risk assessment and reliability management often rely on qualitative or semi-quantitative techniques, which, while effective, may not fully leverage the capabilities of modern computational tools. This paper explores the application of linear programming (LP) to enhance the Risk-Based Inspection (RBI) framework for static equipment in refineries. By integrating LP optimization, the study aims to improve inspection schedules, resource allocation, and risk mitigation strategies while maintaining compliance with safety standards and operational reliability.

Title: Failure Investigation of Elbows of common line from MT shift convertor to PSV of HMU-II unit.

Author: Mr. Girish Panchal, Ms. Neema Pandey, Mr. Brajesh Kumar, Nayara Energy

Abstract:

NAYARA ENERGY is a new-age downstream & petrochemicals company of international scale in Vadinar, Gujarat. It owns India's second-largest single-site, state-of-the-art refinery, and one of the most modern and complex refineries in the country

Two elbows of common line from MT shift convertor to PSV of Hydrogen Manufacturing II Unit failed after 7.2 years of service. The failure was observed as leakage from elbow to pipe weld joint during operator's field round. These elbows, of MOC ASTM A 234 Grade WPB, have leaked at bottom side 5-6 o'clock. Design Temperature was 240°C, and pressure 27kg/cm². The dimensions of elbows were 88.9 mm OD and thickness 5.49 mm. Process medium handled was H₂- 70-72%, CO- 18-20 %, CO₂- 2-4%, CH₄- 4.5-5%, N₂- 2-3%, steam & condensate.

To find out the reasons for premature failure of elbows, these elbows were sent for destructive and non-destructive testing, based on which, further analysis and investigation was carried out to establish the root cause of failure. This paper presents suitable recommendations in the form of remedial measures to avoid recurrence of such failures in future.

Title: CorrosionWISE: Advancing Corrosion Prediction in Upstream Piping Systems through Machine Learning.

Author: Mr. Mehran Izadkhah, TWI Services Sdn. Bhd.

Abstract:

Corrosion poses a substantial challenge to the integrity and safety of piping systems across industries such as oil and gas, chemical, and power generation. Traditional evaluation methods, relying on manual examination and subjective assessments, are time-consuming, error-prone, and provide limited proactive insights. However, recent advancements in machine learning (ML) and artificial intelligence (AI) offer promising opportunities to enhance the accuracy and effectiveness of corrosion assessment. In this article, we present a ML model called CorrosionWISE developed by TWI, specifically tailored to predict corrosion rates in upstream facilities, including offshore platforms.

CorrosionWISE developed using TWI's comprehensive dataset of corrosion measurements. The dataset comprised over 35,000 corrosion measurement logs (CMLs), each containing a combination of numerical and categorical features. To tackle the prediction task, we explored two ML techniques: regression and classification. Through a meticulous optimization process using the grid search method, we identified the most suitable hyperparameters for achieving the highest possible accuracy. This involved selecting 12 key features from the dataset, considering factors such as data variability, correlation with the target variable, and elimination of duplicate or inconsistent data points.

The developed ML model demonstrated an overall accuracy of 78% in predicting corrosion rates of piping systems. However, it is important to acknowledge the limitations stemming from the imbalanced nature of the dataset and the scarcity of cases with higher target values. Despite these limitations, our independent ML model represents a significant step forward in predicting corrosion rates using existing datasets. Furthermore, the insights gained from the technical analysis highlighted the need for continued improvements, such as incorporating additional datasets and applying advanced techniques to address the identified challenges.

Title: New challenges for the Advanced Fitness for Service related to decarbonization goals.

Author: Mr. Luigi Francesco Di Vito, Mr. Francesco Iob, Mr. Andrea Fonzo, RINA Inc.

Abstract:

The paper focuses on the application of fracture mechanics-based structural integrity assessment, commonly known as Engineering Critical Assessment (ECA) and Fitness-For-Service (FFS), in the context of decarbonization goals. The need to update and improve the understanding of material damage phenomena to

meet new challenges is highlighted.

The work presented includes FFS evaluations carried out at RINA on two industrial components:

- a butane storage sphere with local thinned areas in the bottom
- an acid cooler component with local blistered areas.

Due to the complexity of the analysis, both components required a Level 3 assessment in compliance with API 579-1/ASME, utilizing an Elastic-Plastic Stress Analysis Method assisted by Finite Elements Modelling.

The paper emphasizes the importance of advanced tools for finite element analysis and material characterization to ensure the safety of components under conditions where traditional approaches might fail. It also discusses the need for accurate numerical models that reproduce the actual geometry and behaviour of damaged parts, considering the influence of the working environment on material stress-strain response.

Additionally, the paper addresses the assessment of crack-like flawed structures using fracture mechanics concepts and the necessity of proper material characterization in the operating environment. It highlights the adverse effects of hydrogen embrittlement on material properties, such as ductility, toughness and fatigue performance, and the importance of quantifying the reduction of material properties in a pressurized hydrogen gas environment.

Overall, the paper underscores the benefits for companies in the oil and gas sector from applying new test methods and developing improved in-service assessment procedures to ensure component operability without excessive conservatism.

Title: The Future of Asset Integrity and Reliability.

Author: Mr. Hemang Shah, Vegam Solutions.

Abstract:

Asset Integrity and Reliability Management (AIRM) is central to ensuring reliable, efficient, and safe operations in industries ranging from oil & gas and refineries to power plants and manufacturing. By integrating AI, Machine Learning (ML), and IoT, AIRM enables the transition from reactive to proactive maintenance strategies, significantly reducing downtime and enhancing operational excellence. Predictive maintenance leverages historical data to forecast equipment failures, while real-time monitoring through IoT platforms provides continuous visibility into asset performance, helping organizations address critical questions about failure causes and recurring patterns before issues escalate.

Hemang, VP of IIoT Products at Vegam Solutions, highlights how these data-driven insights optimize

maintenance schedules, reduce spare part inventories, and mitigate unplanned breakdowns—imperatives given the staggering annual losses of over \$600 billion due to frequent downtimes in manufacturing alone. AIRM further extends to applications such as corrosion detection in pipelines, biomass buildup management in machinery, and the lifecycle optimization of aging equipment.

Vegam Solutions tackles these challenges through scalable Condition Monitoring Systems (CMS) and Predictive Maintenance platform that integrate seamlessly with existing systems. These solutions provide real-time analytics and actionable insights, helping businesses drive cost savings, reduce energy

consumption, and maintain regulatory compliance. By adopting a proactive, technology-enabled approach to asset management, organizations can protect critical assets, ensure workplace safety, and achieve long-term sustainability.

As industries increasingly adopt these innovative strategies, the future of AIRM lies in harnessing AI-powered platforms, robust IoT frameworks, and predictive analytics to optimize performance across the entire asset lifecycle. Through actionable strategies and real-world examples, it becomes clear that embracing AIRM not only safeguards equipment but also fosters business resilience and competitiveness in a rapidly evolving market.



Why our members work with us



Trusted partner

We have over 500 Industrial Member companies already trusting us to provide them with expertise. A full list of Member companies is available on [our website](#).



Expertise and knowledge

All our staff are highly trained and respected experts in their fields. Alongside academic qualifications many of our staff associate with the Institute individually and uphold the standards of qualification required.



Cutting-edge technologies

Over the last 80 years we have brought technologies to the forefront of industry. From the invention of Friction Stir Welding to the acquisition of the UK's first dedicated EHLA system for research, we remain at the front of knowledge development in new fields.



Certified and accredited

We are certified against ISO9001 and ISO14001 in all our own work. We can work to and test against a huge range of ISO and ASTM standards, and our teams contribute to dozens of Standards Committees every year.



Collaboration and funding

We have an excellent track record for winning public funding bids, including Horizon and Innovate UK mechanisms among others. We have dedicated teams working on consortium building and project development, and have won more than £5M of projects in the past 5 years.



All your joining needs

Our knowledge base expands far beyond arc welding into full-service joining process management. We can support the full throughput of work under one roof; from design and adherence to standards, to modelling of the process, process monitoring, and non-destructive inspection of the final part.



Recognised brand

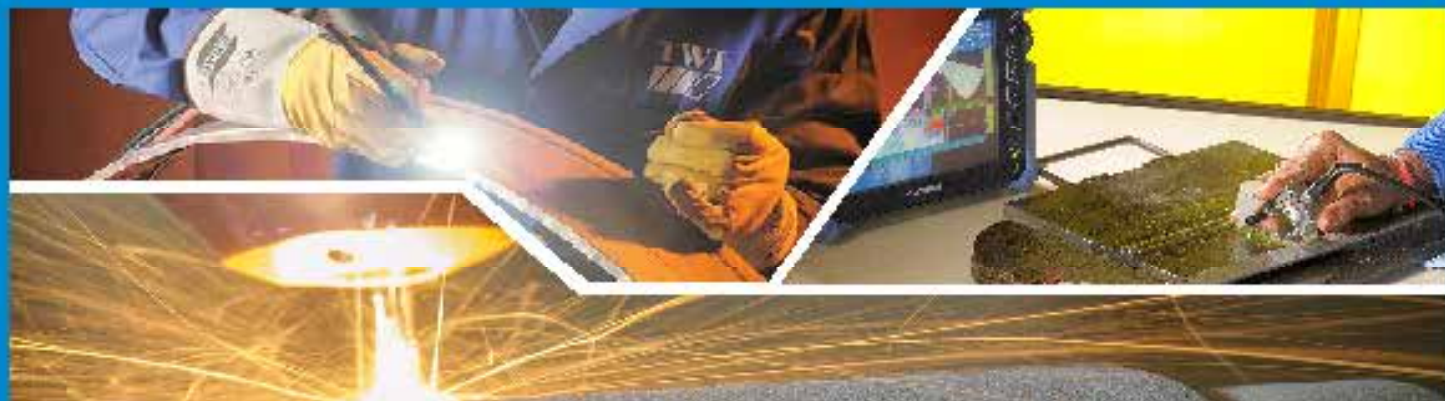
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We have a dedicated Membership team on hand to support you and ensure you get the most out of your membership without interrupting your technical discussions. Our central project management team can support large programs of work to keep strands on track, and our Library service will source information and documents for you as needed for your research.





About TWI India

TWI India Pvt. Ltd. is a subsidiary company of TWI Ltd. (TWI), a world-leading research and technology organization. TWI provides impartial technical support in Welding, Joining, Materials Science, Structural Integrity, NDT, Surfacing and Packaging. Services include Generic Research, Confidential R&D, Technical Information, Technology Transfer, Training, and Qualification.

As the world's largest training organisation in Welding, Welding Inspection and Non-Destructive Testing, each year over 20,000 participants in more than 60 countries benefit from our expertise. Our courses and examinations are designed to service all key industry sectors, including Oil and Gas, Aerospace, Construction, Power and Automotive, with all courses supported by internationally recognised certification.

In India, other than delivering Training and Examinations towards internationally recognized certification in Welding, Painting, Non-Destructive Testing and Plant Inspection, we offer Bespoke Training Solutions both for industrial member and non-member organizations.

Our Training Programmes

CSWIP Welding Inspection

- Visual Welding Inspector Level 1
- Welding Inspector Level 2
- Senior Welding Inspector Level 3
- Welding Quality Control Coordinator

BGAS-CSWIP Painting and Coatings Inspection

- Painting Inspector Grade 2
- Painting Inspector Grade 1
- Site Coating Inspector
- CSWIP Cathodic Protection

CSWIP Conventional NDT Level 1/2/3

- Liquid Penetrant Testing (PT)
- Magnetic Particle Testing (MT)
- Ultrasonic Testing (UT)
- Radiographic Interpretation (RI)
- Eddy Current Testing (ECT)
- Visual Testing (VT)

CSWIP Advanced NDT Level 1/2/3

- Phased Array Ultrasonic Testing (PAUT)
- Time of Flight Diffraction (ToFD)
- Automated Ultrasonic Testing (AUT)

CSWIP Plant Inspection

- Plant Inspector e-Learning Course

Other Courses

- Welding Qualification standard ASME Sec IX for Shop Engineers
- Essentials of ASME Section VIII Division 1
- Essentials of Indian Boiler Regulations
- Welder Training & Qualification
- Plastics Welder Training and Qualification
- Fitness for Service (FFS)
- Risk Based Inspection (RBI)



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REDUCE SIGNIFICANT
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AI Based Industrial Asset Reliability Platform

- How can I prevent unexpected machine breakdowns?
- Why do maintenance costs keep exceeding budgets?
- What are the root causes of equipment failures?
- How do I ensure maintenance doesn't disrupt production schedules?

Vegam

- ✓ Real-time Asset Monitoring
- ✓ AI-Powered Fault Detection
- ✓ Predictive Maintenance Scheduling
- ✓ Quick Installation and Cost Effective



SCAN ME

80%
Reduction in
Downtime

20%
Lower
Maintenance Costs

120%
ROI in
3 Months