YEAR 3. NUMBER 4. DECEMBER 2024

INSPENET Brief

BECHT 60 Years

of Empowering Success Through Expertise and Partnership.

SPECIAL EDITION

BECHT 60 YEARS OF EXCELLENCE 1964 · 2024

WWW. INSPENET.COM


Unifying industry leaders
in the energy sector.
INSPENET
www.inspenet.com

With More than 34 Years of Experience.

INSPENET BRIEF

With more than 34 years of experience, I've learned that the barriers to change and innovation are often simpler than we imagine. People don't typically resist change; what they face are poorly designed processes that don't allow them to adapt properly. But when we build change with empathy and curiosity, we can create effective processes that not only ease the transition but also inspire genuine commitment.

The reality is that people want change, but they fear loss. In many organizations within the energy and industrial sectors, there are stories of loss that leave a mark: loss of resources, stability, and sometimes, identity. Our duty is to clearly define the problem, inspire a vision of a better future, and chart a solid path to get there. This way, change stops being a threat and becomes an exciting opportunity that everyone shares.

COVID-19, beyond being a significant challenge, presented itself as an opportunity for integration and evolution. As the creator of Inspenet, I realized it was time to act, to generate a proposal that would address emerging needs and, to some extent, alleviate the fears many of us felt about the future at that time. It was a call to action, to innovate in the way we connect, share knowledge, and collaborate.

For this change to be lasting and effective, careful planning is key. We need a clear vision, adequate resources, the necessary skills, and concrete action plans to move toward the future. But this is not just an administrative task: we must roll up our sleeves and work hand in hand with our teams. My experience has taught me that the real challenge lies not in the change itself, but in developing the management and facilitation skills needed to lead in the face of complexity. That is Inspenet's mission: to empower professionals and companies in the energy and industrial sectors by providing knowledge and tools to optimize asset management, operational integrity, and efficiency.

To lead systemic change, we need a broad vision. Every time I visit an organization, I ask, "Where do you think employees take their problems?" and "From what height are we seeing these challenges?" Because we must remember that putting out fires is not a change management strategy; true transformation happens when we anticipate and guide every step, understanding both current challenges and future opportunities.

Connectivity is key in this mission. At Inspenet, we firmly believe in the power of knowledge as a driver of change. Our vision is to be the leading digital platform that provides high-value technical and educational content, keeping professionals updated on the latest trends and technologies. By connecting with our global, regional, and local communities, we build social capital and foster engagement, resulting in change that resonates at all levels.

Along this journey, Inspenet has shown that together we can make a difference. When we collaborate, share our successes and failures, and face the challenges at the heart of the energy and industrial sectors, we all win: leaders, professionals, and organizations. It has been an honor to be part of this effort through Inspenet and to have this platform that allows us to showcase and build all that we share with you today as we celebrate our first 3 years of existence...

We are here not only to imagine change but to lead it and to project collective visions and achievements. Because when we unite, align our vision, and work from an elevated perspective, change stops being a mere goal and becomes a shared legacy—a legacy that impacts not just our present but the future of the generations to come.

Ing. Francesco G. Solari.

Content INSPENET BRIEF

Become a fan of our Facebook page: **https://www.facebook.com/inspenetnetwork**

Follow us on Youtube at **Inspenet**

Follow us on X at **@InspenetNetwork**

Follow us on **@Inspenet**

Send us your suggestions or comments to **contacto@inspenet.com**

More information on our website: **https://inspenet.com/**

Inspenet Magazine is published by INSPENET LLC, 433 N Loop W, FWY, Houston, TX 77008.
Customer service: Telephone +1-834-6773638 (Monday through Friday, from 8 a.m. to 4 p.m. / Houston time) Email: Mktcomercial@inspenet.com

INSPENET
BUSINESS DIRECTORY

CONNECT WITH INDUSTRY LEADERS IN THE ENERGY SECTOR

Success hinges on quick decisions, strategic connections, and prominent visibility.

Inspenet invites you to join our exclusive **Business Directory,** where the most prominent companies in the energy sector connect and grow.

• Benefits:

1. **Global Visibility:** Showcase your brand on a global scale.
2. **Strategic Connections:** Access a community of industry professionals, with 25.1% being decision-makers, as well as a group of influential companies.
3. **Growth and Development:** Propel your success with unique collaboration opportunities.

Don’t miss the chance to be part of a vibrant and expanding community.

At INSPENET, we create opportunities, position your leadership, and maximize your impact in the energy sector. Join this exclusive group of professionals and companies leading the industry.

Visit **www.inspenet.com**

BECHT 60 YEARS OF EXCELLENCE 1964 · 2024

1. Mr. Becht, as Becht celebrates its 60th anniversary in the energy sector this year, what groundbreaking initiatives does the company have planned to maintain its leadership position amidst evolving global energy trends?

With a wave of retirements and diminishing new graduate interest in the energy sector, we are focused on creating tools that allow people to reach core competency faster so they are better equipped to solve industry challenges. Some examples of our tools in development are dynamic filtering engineering standards, a knowledge sharing and outreach platform, and advanced models for damage mechanisms like HTHA and high temperature crude corrosivity. While people remain the core of innovation, equipping them with these types of tools will let them focus on the most important activities.

2. With sustainability becoming a focal point in the energy industry, how does Becht plan to enhance its environmental stewardship while continuing to innovate?

As a consulting company, our Scope 1 impacts (internal) are minimal, but we reduce them by promoting a work from anywhere environment, limiting commuting and office usage, and by leveraging virtual meetings whenever possible to limit travel. Our biggest lever to benefit the environment is helping our clients avoid and mitigate leaks and emissions and reduce their Scope 1, 2, and 3 emissions. We are well positioned to do this by helping innovate new technologies and transferring knowledge from existing technologies that are applicable to low carbon fuels and energy optimization efforts.

3. Given recent geopolitical shifts impacting global energy markets, how is Becht strategizing to mitigate risks and ensure stable operations across its international footprint?

We built a diverse base of client connections and access to local talent by opening offices across 5 continents, which helps balance any regional perturbations. We also remain agile, ready to pivot to new market demands. For instance, clients recently needed help evaluating new crude slates due to existing crude slates becoming unacceptable from a geopolitical or economic perspective. Finally, we see regions specializing in different approaches or technologies on a macro level. By gathering talent from these different locations we can support a wide variety of technologies and projects.

4. Considering Becht's longstanding reputation for technological innovation, could you highlight upcoming advancements or projects that will reinforce the company's competitive edge in the next decade?

The next big project will be fully integrating the different knowledge bases we have (engineering standards, process technology practices, integrity standards, BechtCONNECT, etc.). We have been exploring ways to train AI models on these knowledge bases so that initial insights can be gleaned quickly on a wide range of questions or issues. People will still be invaluable for driving a complete solution, but their effectiveness and speed can be increased with a properly trained model.

5. As Becht navigates the complexities of regulatory landscapes worldwide, how does the company intend to foster stronger relationships with governments and regulatory bodies to facilitate its growth?

Building shared understanding and mutual trust is a critical step in progressing fair relationships with regulatory bodies. Participation is also important. We hold over 150 positions in codes and standards, which allows us have a voice in advancing regulations that benefit safety, reliability, and sustainability while not being unrealistically harsh economically.

BECHT

As Becht commemorates its 60th anniversary as a pivotal player in the global energy sector, it is a momentous year to reflect on its legacy and look forward.

With a steadfast reputation for innovation and a commitment to excellence, the company stands poised to address emerging challenges and capitalize on opportunities in a dynamic and competitive environment.

In an exclusive interview with INSPENET, we spoke with Charles Becht V, president of Becht, to explore the company's strategic plans, its focus on sustainability, and its vision for the coming years.

6. Looking ahead, what are the key milestones or targets Becht aims to achieve by its 75th anniversary, and how does the company plan to celebrate and reflect on its legacy of excellence in the energy sector?

Growing our footprint from 400 client facilities to over 1,000 facilities would be a very rewarding accomplishment. Building relationships and connections with people around the world gives us the most job satisfaction. Growing the number of connections is the best testament of success.

7. In the current global energy transition context, how is Becht contributing to the development of sustainable energy solutions, and what role does innovation play in this strategy?

"One of the paradoxes of creativity [is] that in order to think originally, we must familiarize ourselves with the ideas of others." George Kneller

We have been involved in many sustainable energy and low carbon fuel projects. Unfortunately, all too often we see a desire to start from scratch and do everything new, rather than building on the lessons of the past. There are significant transferrable technologies from our industry that can ensure safer and more reliable sustainable energy projects if we remain open to those past lessons. At Becht we feel our greatest strength in this emerging market is to bring forward these lessons.

8. As a leader in the energy sector for six decades, how does Becht plan to adapt and capitalize on emerging opportunities in an increasingly diverse and dynamic global energy landscape?

The more things change, the more they stay the same. People have been and will always be our greatest strength. Finding ways to crowdsource ideas and innovations from all employees rather than the few in leadership ensures we are prepared to jump on emerging opportunities. This requires transparency with all employees, and an environment where failure is not punished but rather learned from. Reinforcing this culture will best position us for an uncertain future.

BECHT

BECHT
60
YEARS
OF EXCELLENCE
1964 · 2024

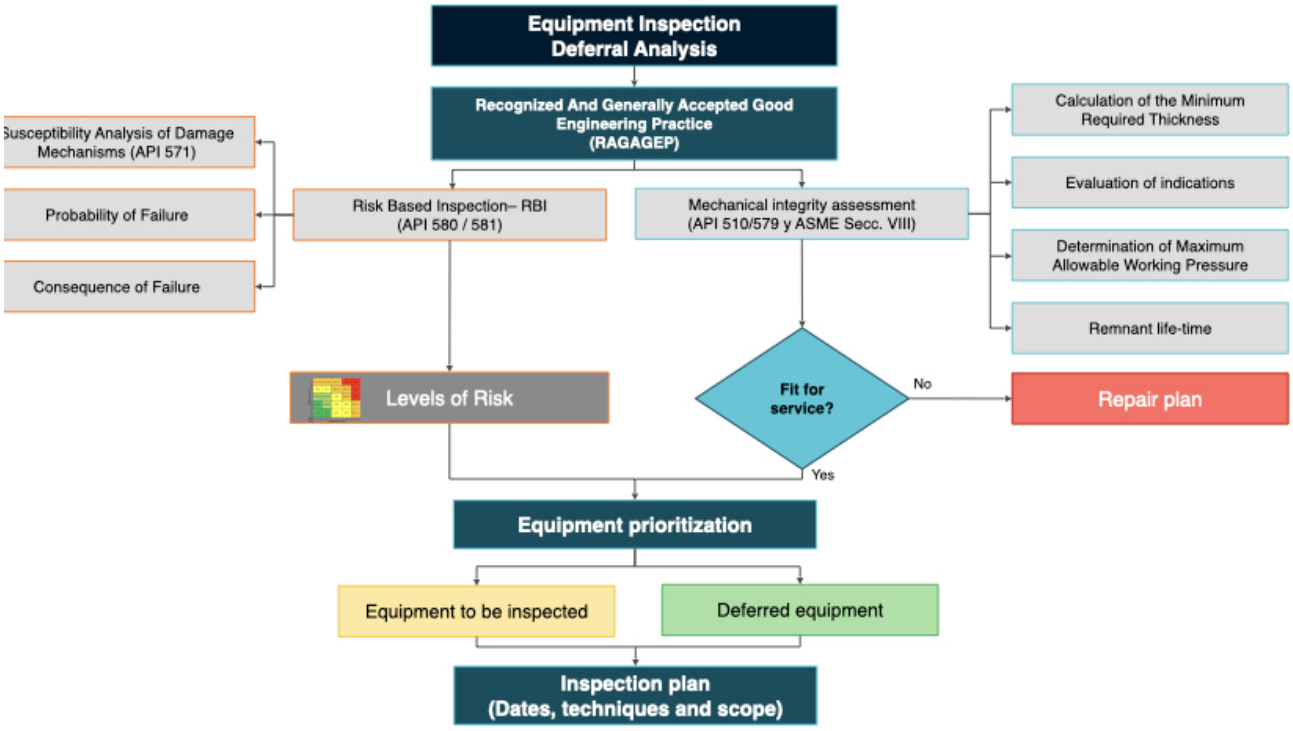
BECHT

RBI and FFS as Decision-Making Tools for Deferring Equipment Inspection

PENSPEN

The nature of hydrocarbon production, storage and refining processes involves risks, which must be known in order to focus maintenance resources on those components that present the highest risk; implementing in a timely manner measures that minimize the occurrence of an undesired event and its consequences, increasing the reliability of the facilities.

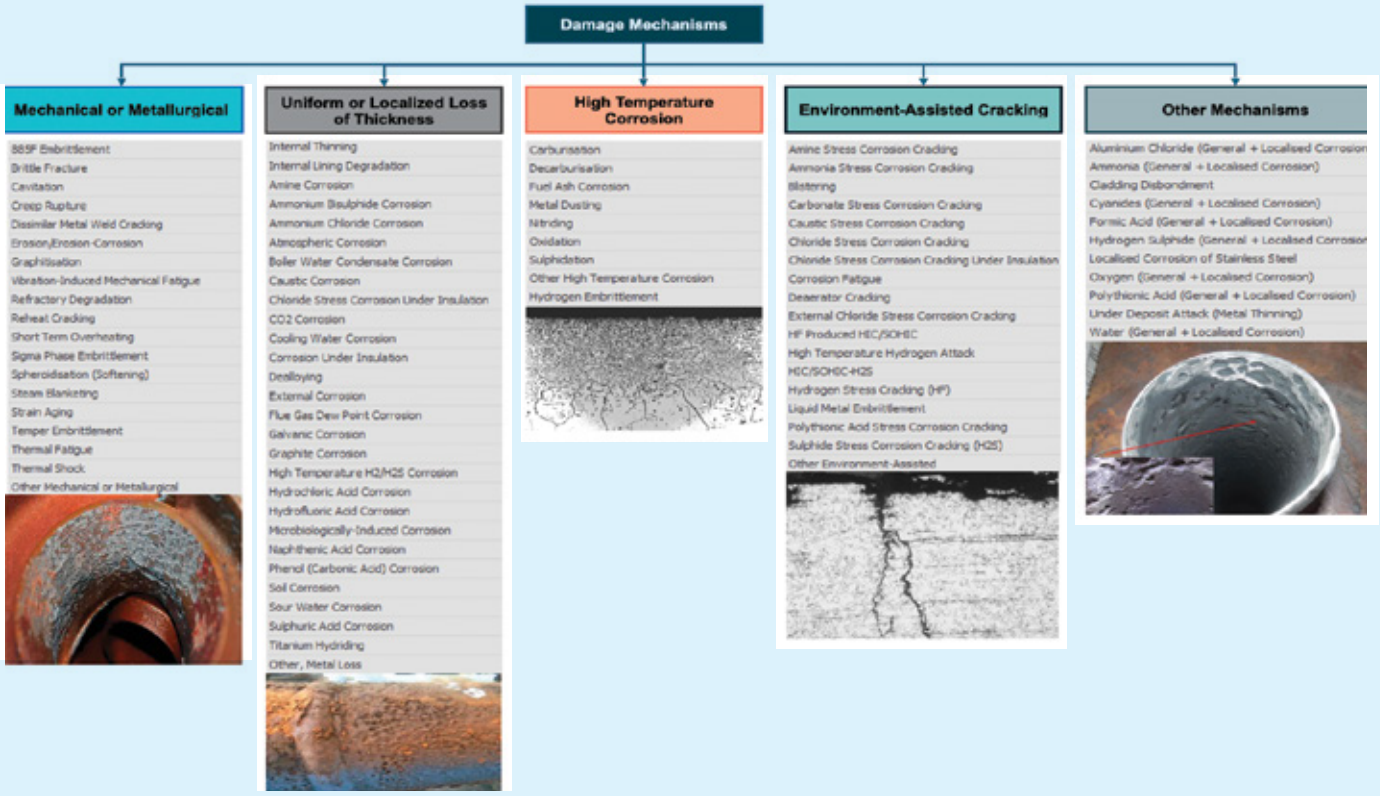
For the maintenance area, this means a constant search for methodologies that allow increasing the reliability, availability and useful life of the equipment that make up a facility, taking into consideration the reduction of costs associated with the failure of the equipment and its components (repairs, replacements, production losses, among others).
Therefore, Penspen proposes a quantitative approach, based on the established Recognized and Generally Accepted Good Engineering Practices (RAGAGEP), which includes the activities indicated in the following diagram:



Analysis of susceptibility to damage mechanisms

The identification of damage mechanisms is carried out by considering the characteristics of the equipment and its operating conditions, using API 571 as a reference. This standard describes the most likely damage that occurs in equipment (pipelines, pressure vessels, and tanks) in the refining industry, affected materials, critical factors, appearance or morphology of damage, prevention/mitigation, inspection, monitoring, and related mechanisms.

The knowledge of the damage mechanisms affecting the equipment allows us to select effective inspection methods to detect and characterize the damage.

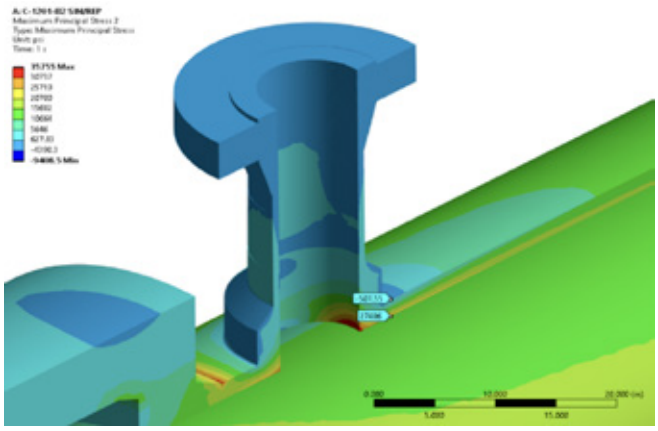


It is worth mentioning that Penspen has software that allows for the calculation of the quantitative failure probability for the identified damage mechanisms.

Mechanical Integrity Assessment – Fitness for Service (FFS)

The Mechanical Integrity analysis is conducted based on the applicable national and international standards according to the type of equipment to be verified (ASME Section VIII Div. 1, API 510, API 572, API 579, API 577, API 953, BS 7910, and API 1176). In some cases, it is necessary to develop a level III assessment using finite element software.

The fitness for service assessment includes the following activities:



- Analysis of the historical and current information of the equipment (year and construction code, design pressure and temperature, operating pressure and temperature history, construction material, nominal thicknesses, service, heat treatment, etc.).
- Determination of the Maximum Allowable Working Pressure (MAWP) and the minimum required thicknesses for each equipment component.
- Estimation of wear rate and remnant life-time.
- Evaluation of the reported discontinuities (correctly dimensioned) during the inspections carried out on the equipment.
- If necessary, repair alternatives for each anomaly are provided (repair, rehabilitation, replacement).
- Establishment of the maximum inspection interval in accordance with the evaluation results, applicable standards, and current national legislation.

In conclusion, the mechanical integrity assessment allows for determining the fitness for service of the equipment based on its current condition, ensuring integrity and reliability until the next inspection period.

Risk Based Inspection (RBI)

On the other hand, the Risk-Based Inspection (RBI) methodology is based on the API 580, API 581, DNV-RP-G101, and ASME PPC-3 standards. It involves the quantitative determination of the estimated failure probabilities for each damage mechanism, considering the effectiveness of prevention and/or control methods, as well as the quantitative estimation of failure consequences. The goal is to determine the quantitative risk level, derived from the combination of failure probability and the estimated consequence.

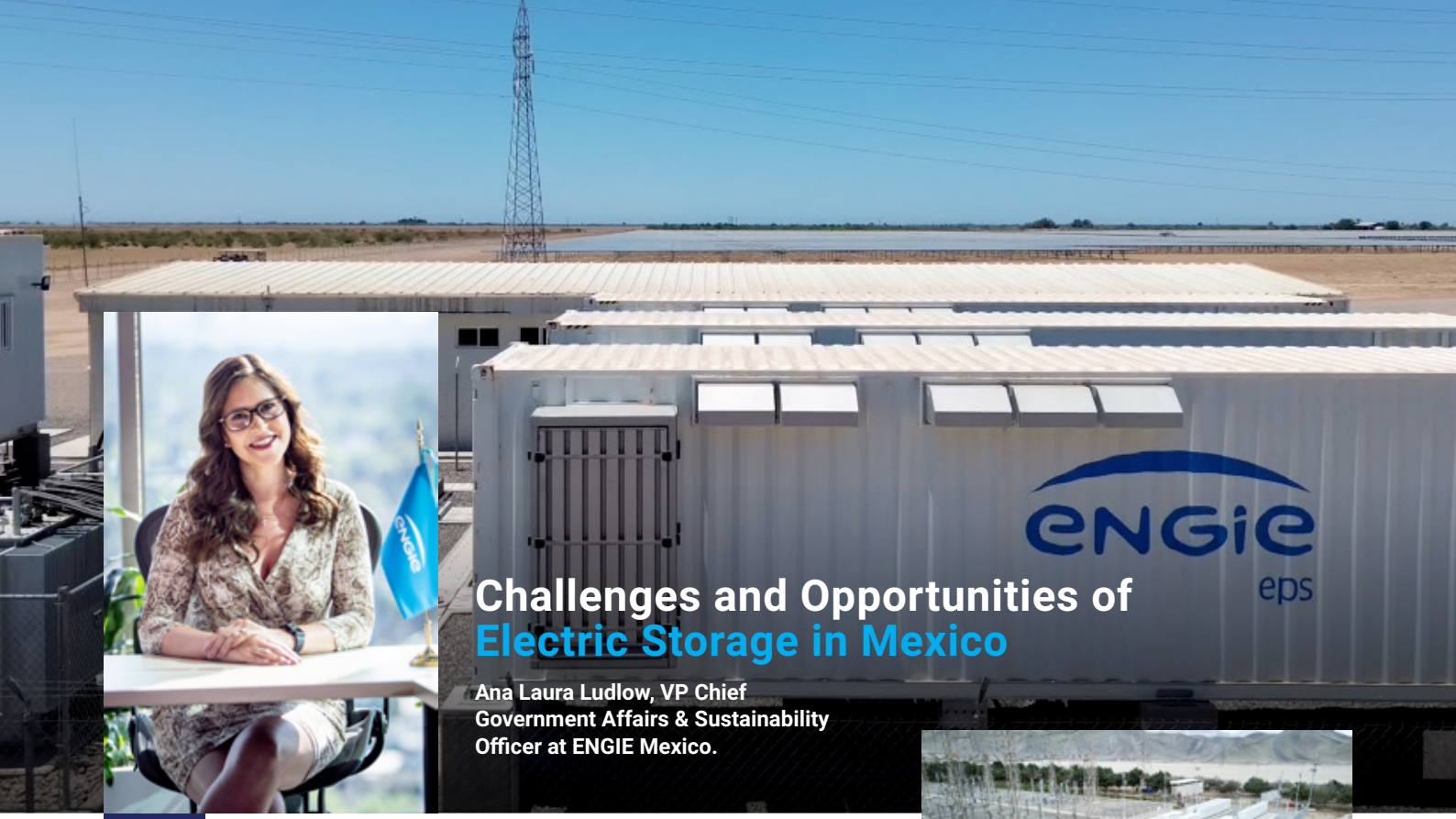
During the application of the RBI methodology, the following stages are followed:

- Review, classification of information, and creation of the database with all relevant equipment information: design and construction, operational context, and inspection and maintenance history.
- Determination of the failure probability for the identified damage mechanisms that may be present in each component, along with the cause behind them. The damage identified during in-service inspection may result from a pre-existing condition (i.e., before entering service) or service-induced damage.
- Determination of the consequences to classify the equipment based on the impact that the type of failure caused by the identified mechanisms may have.
- Determination of the level risk using the API 581 matrix (5 x 5) or one specified by the Client, considering the failure probability and estimated consequences, based on the failure mode according to the identified damage mechanism.
- Determination of optimal inspection plan frequencies. Once the level risk is defined, the inspection plan with frequencies is established (to optimize resources), with focused inspection activities (what, how, when, and where to inspect).
- Risk mitigation actions. If necessary, and to prevent, detect, or minimize the consequences of undesired events, actions are recommended to keep the risk at acceptable levels for the organization.

In conclusion, RBI allows maintenance activities to be prioritized based on the level of risk, optimizing resources by focusing inspections on critical equipment or areas.

Strategic decision making

Based on the results of the combination of the FFS assessment and the RBI analysis, the operator can make strategic decisions about deferring the inspection, with the certainty that there is adequate maintenance management based on the level of risk and the condition of the mechanical integrity of the equipment, which would contribute to the effective implementation of a process safety system.



Challenges and Opportunities of Electric Storage in Mexico

Ana Laura Ludlow, VP Chief Government Affairs & Sustainability Officer at ENGIE Mexico.

Electric energy storage has become a crucial component for the transition to more sustainable, reliable, and efficient energy systems. In Mexico, this concept has gained significance with the recent approval of the General Administrative Provisions for the Integration of Electric Energy Storage Systems into the National Electric System (SEN) by the Energy Regulatory Commission (CRE). This regulatory framework establishes the conditions and modalities under which energy storage systems (ESS) can be integrated into the SEN, thus providing a clear framework for the development of this technology in the country.

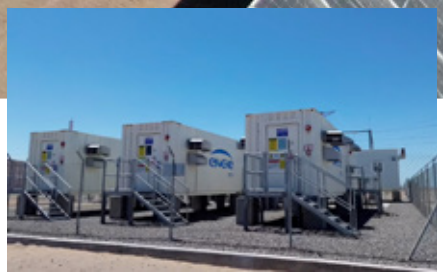
Potential of Electric Storage in Mexico

Thanks to the country's geographical conditions, Mexico has significant potential for solar and wind energy, making it an ideal candidate for implementing energy storage systems that help manage the intermittency of these sources. The integration of energy storage systems will contribute to improving the efficiency and reliability of the National Electric System, allowing for greater penetration of renewable energies. The Indicative Program for the Installation and Retirement of Power Plants (PIIRCE), included in the 2022-2036 National Electric System Development Program (PRODESEN), projects that approximately 4,505 MW of energy storage systems could be installed during this period. This reflects a significant commitment to strengthening the energy infrastructure in Mexico, aimed at improving the stability and efficiency of the national electric system, where battery storage technology will play a crucial role in accelerating the transition to a more sustainable energy future.

Energy Storage Landscape in Latin America

Compared to other Latin American countries, Mexico is in a favorable position due to its abundance of solar and wind resources. However, countries like Chile and Peru have also made significant progress in implementing energy storage systems. For example, Chile has made an important step towards decarbonization with the commercial operation of BESS Coya, the largest battery energy storage park in Latin America to date. This battery storage system has an installed capacity of 139 MW/638 MWh and allows for the storage of energy generated by the Coya Solar Plant. Additionally, ENGIE Chile has announced the construction of two additional projects: BESS Tamaya 68 MW/418 MWh and BESS Capricornio 48 MW/264 MWh, demonstrating the country's commitment to the energy transition.

In Peru, ENGIE Energía Perú presented the Battery Energy Storage System -CHILCA BESS-, which has an installed capacity of 26.5 MW, making it the largest of its kind in the country. This system is located at the ChilcaUno Thermoelectric Plant and provides the mandatory Primary Frequency Regulation (RPF)



service required by the electric system. In Mexico, the private sector has been working on consolidating proposals and observations regarding energy storage regulation with various authorities, seeking to include suggestions for adapting the regulation of BESS to the current regulatory framework and specific proposals to shorten implementation timelines.

Storage and Transmission of Energy: Two Fundamental Elements Working Together for a Just Energy Transition

Electric transmission infrastructure plays a fundamental role in the transition to a more sustainable and equitable energy matrix. Without a robust and expanded transmission network, the potential of renewable energies cannot be fully realized, as it is essential for transporting energy generated in remote locations—such as wind and solar farms— to urban consumption centers where it is needed, mitigating intermittency. An efficient transmission network allows for the effective integration of storage technologies, which are crucial for managing the intermittency of renewable energies. Thus, the development of transmission infrastructure becomes an indispensable pillar to ensure that the energy transition is not only technically and economically viable but also equitable and accessible for all. This is why we say that without transmission, there is no transition, and it is time to work in synergy with all stakeholders in the energy sector to ensure that the implementation of this type of technology is efficient. From policymakers and regulators to infrastructure developers and

technology providers, each actor plays an essential role in creating an efficient network accessible to all.

In summary, electric energy storage in Mexico and other Latin American countries is in a phase of growth and development. Implementing energy storage systems is essential to improve the efficiency and reliability of electric systems, allowing for greater penetration of renewable energies.

“Mitigating Safety Concerns Related to Materials Testing in Hydrogen Environments”

ULLER, Leonardo; HERRMANN, Jammes and DENZINE, Allen - CORTEST Inc.

Evaluating materials in hydrogen environments is critical for several reasons, primarily linked to the safe and efficient use of hydrogen as an energy carrier and feedstock.

As the world increasingly shifts towards sustainable energy sources, hydrogen is becoming a key player in several applications. It is used in fuel cells, hydrogen storage systems, and as a reducing agent in industrial processes. Its diverse applications span various sectors, including energy, automotive, and aerospace.

Hydrogen, due to its small atomic size and high diffusivity, poses a significant problem for the structural integrity and performance of materials. Therefore, constant evaluations of materials in environments with high hydrogen concentrations are necessary to identify and mitigate corrosion damage associated with hydrogen embrittlement.

Research on hydrogen corrosion mechanisms is important to understand the interactions between hydrogen and materials, promoting the development of more effective prevention methods. A systematic approach will not only improve material design but also assist in establishing guidelines and standards that promote best practices in the deployment of hydrogen-related technologies.

The selection of equipment is influenced by the specific properties and conditions in which the materials will be tested. Various types of laboratory equipment and testing methods can be adapted for use in hydrogen environments. Here’s an overview of some key equipment and techniques:

1. High-Pressure and Temperature Hydrogen equipment: Pressure Vessels, Reactor Systems, and Autoclaves for exposing materials to hydrogen under controlled temperature and pressure conditions.

2. Mechanical Testing Equipment
Tensile Testing Machines evaluate materials' mechanical properties; Fatigue Testing Equipment assesses how materials behave under cyclic loading in hydrogen; and Impact Testing Machines analyze materials' ductility and toughness

3. Corrosion Testing Equipment
Electrochemical Cells, for studying the corrosion behavior of materials in hydrogen and/or acidic environments.

4. Hydrogen Embrittlement Testing Equipment
Hydrogen Charge/Discharge Systems can be used to test the effect of hydrogen on the mechanical properties of materials, and Slow Strain Rate Testing (SSRT) Equipment can study hydrogen embrittlement by subjecting materials to slow strain rates in a hydrogen environment.

CORTEST’s Hydrogen Test System (“The Enclosure”)
The development, production, and delivery of the system took approximately three years. However, the project now available can be customized to meet the specific needs of clients. It was created to help evaluate materials under conditions relevant to hydrogen exposure and its related effects.

The system provides an extensive framework for conducting mechanical and electrochemical testing of materials in controlled hydrogen environments. By simulating operational conditions, this equipment enables researchers and engineers to assess the resilience of different alloys and composites, offering insights into their long-term performance and reliability.

These systems provide a choice between two testing methods, described as follows:

1) A static autoclave system for testing at elevated temperatures and pressures. Constant displacement specimens are utilized for this testing, and the system adheres to ASTM E1681.

2) A load frame system with an autoclave is used for high-temperature and pressure fatigue tests and tensile tests. The system follows ASTM E647, G142, or G129 standards.

A special enclosure was developed to house the testing systems to ensure safety. This enclosure has safety devices like hydrogen monitoring, hydrogen flame detection, and leak detection based on pressure. Additionally, the enclosure has ventilation systems to ensure the laboratory environment is safe. An external control panel can disable power to all non-classified electrical equipment, vent the test gas, and increase ventilation if a leak or flame is detected to control and manage the safety systems. The enclosure also has a pressure booster system and an automated pneumatic valve panel, allowing remote pressurizing of the vessel. Leak testing and cyclic purging are essential safety procedures to prevent hydrogen and oxygen from mixing; these steps should be taken before introducing hydrogen to the test system and after conducting a test.

The autoclave used for testing Compact Tension (CT) specimens is static and comes with a glove box and air purification system. This helps to create an inert environment for long-duration static constant displacement testing, which can be carried out near ambient temperature. The autoclave is designed to withstand working pressures up to 30 MPa (4,350 psi) and temperatures up to 300 °C (572 °F). The load frame comes with a load capacity of up to 50 kN and can be used for various tests such as fatigue, slow strain rate, static constant load, rising load, and programmable load tests. Additionally, the load frame has a system for crack initiation testing and accurate crack-growth measurement using the DCPD technique.

Utilizing such advanced laboratory equipment is vital not only for academic research but also for industrial applications, where the safety and efficiency of hydrogen-utilizing systems are paramount. Through systematic evaluation and characterization of materials exposed to hydrogen, Cortest's equipment is a critical tool in the ongoing efforts to enhance material performance and safety standards in hydrogen-related domains.

CORTEST

These newly developed Cortest, Inc. systems allow gaseous Hydrogen Studies to be safely conducted in an ordinary laboratory environment without the need for a classified area.

Our systems are fully equipped with ATEX certified ventilation fans, gas sensors, IR fire detection, as well as automated valves that allow the user to control the flow of test gases from outside the safety enclosure. With integrated redundancies and multiple fail safes, the systems can be safely used to conduct both static and mechanical studies at high pressure and high temperature.

SERVICES AVAILABLE

- Technical Support
- On-Site
- Installation &
- Start-Up
- Maintenance
- Application
- Support
- Hardware
- Support
- Warranty

Want More Info?
Contact Us!
Cortest, Inc.
38322 Apollo Parkway
Willoughby, OHIO 44094
T +1 (440) 942-1235
leo@cortest.com
www.cortest.com

HYDROGEN TEST SYSTEMS

NEW DESIGN!
Now you can SAFELY test materials in the presence of Hydrogen!

FEATURES

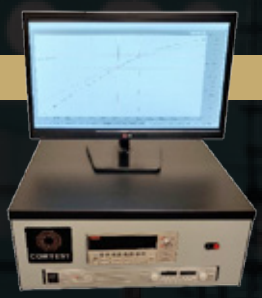
- Pressures Up to 55 MPa (7.975 PSI).
- Temperatures Up to 300°C (572°F).
- Safety System equipped with Intrinsically Sate, Explosion Proot Sensors.
- Gas Sensors, Pressure Transducers, Flow Switches, and Flame Detectors provide safety and early hazard detection.
- Explosion Proof Ventilation Fan with Speeds up to 1.200 CFM to extract hazardous gases.

Designed to work with CORTEST equipment including Autoclave Systems, Load Frames, and DCPD Test Systems

APPLICATIONS & CONTROLS

TYPICAL APPLICATIONS

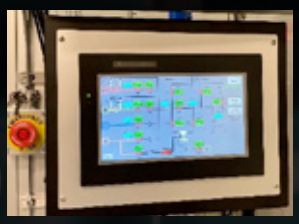
- ASTM Standards E1681, E1820, E647, G129, G142
- Slow Strain Rate Testing - NACE TM 0198
- Constant Load Testing - NACE TM 0177
- Corrosion Fatigue Testing
- High Pressure, High Temperature (HPHT)
- Stress Corrosion Cracking (SCC)
- Electrochemical Studies
- DCPD Testing — ASTM E647
- New Product Development lesting



CONTROLS

PLC Enclosure System

- Valve Panel Control
- Fan Control
- Pressure Loss Detection
- Gas, Flame, and Flow Sensing Emergency Shutdown
- Alarm System



PC Controlled Data Acquisition System DCPD Capabilities (30A/20V Power Supply

LabVIEW Based Software Tests

- Slow Strain Rate Test
- Constant Load Test
- Fatigue Test
- Creep Test

On Innovation and the Future with Dr David Alleyne

CEO at Guided Ultrasonic Ltd.

Guided Ultrasonics Limited (GUL) has been at the forefront of the Non-Destructive Testing (NDT) industry for 25 years, delivering cutting-edge solutions and shaping the field with groundbreaking technology. In this exclusive interview, Inspenet speaks with Dr David Alleyne, CEO and co-founder of GUL, to discuss the company's journey, its approach to innovation, and its vision for the future of the industry.

Inspenet (I): GUL has been an industry leader for 25 years. What are some of the key milestones that have shaped the company's trajectory?

Dr David Alleyne (DA): I believe what has shaped us the most is the response we've received from the industry—the enthusiasm of our clients and the dedication of the people who have worked with us. It's been about the feeling we're truly contributing to solving challenges faced by the industry. That sense of contribution over time has motivated and encouraged us to do more and continually improve.

I: Some companies in the NDT sector have been around for a century. How do you envision the next 75 years for GUL?

DA: I'm old enough to know I won't see the next 75 years, but I hope to witness a significant part of that future. Innovation is central to any company's longevity. For us, it's about creating solutions for today's problems, making those solutions more efficient, and being ready for challenges that haven't emerged yet. We aim to innovate in response to the upcoming working methods, helping our clients become more efficient, profitable, and successful. Through their success, our success follows.

I: The energy sector is undergoing major changes. How is GUL adapting to provide the solutions required by the sector?

DA: The energy sector is evolving significantly, from the fundamentals of what energy is to how it's distributed and managed. One of the approaches we are focusing on is Monitoring, which is shaping our industry. We're focusing more on asset monitoring. Instead of reacting to problems like damage and corrosion, we help the industry anticipate them. By providing insights such as, "This is how it's happening, this is the rate at which it happens," we offer the information needed to predict issues and enable a more controlled and efficient management of assets. That's where we see our key role. While we continue to develop and manufacture inspection equipment, we are increasingly delivering monitoring equipment and—more importantly—global monitoring solutions that integrate technologies like artificial intelligence, machine learning, and automation.

I: We also want to ask you about managing a company in this sector. Tell us about specific challenges the company has faced and how they've been overcome.

DA: We face many challenges, and they are part of the joy of running a company. For us, improving communication—internally and with clients—has been a key challenge. How do we overcome it? Through technology. The pandemic taught us how to use technology for remote meetings and engagement, and we've applied those lessons to improve communication with colleagues and the industry. We understand that the measure of our success isn't just what we sell, but how quickly we innovate in technology. It's also about listening to our clients to gain insight on how to implement technology effectively and understand our clients' needs to shape our next steps. It all comes down to communication.

I: What specific goals do you have for the next five years? And in the longer term, 8 to 10 years? What would you like to see happen?

DA: I would like to see the expansion of the exciting new market for what I call real-time large-area monitoring. This Monitoring covers areas like corrosion under insulation (CUI), midstream jetty lines, buried and above-ground pipes, and in-process pipes. The area of automation for Monitoring is very exciting. We're achieving 10 times greater efficiency and sensitivity, and we are obtaining real-time information on when corrosion or other types of damage start, their rate of growth, and their causes. It's truly exciting to lead this new frontier in technology, much like when we introduced guided wave screening for pipes 25 years ago.

I: What new NDT solutions do you have planned for the future? How will they improve safety and efficiency in the industry

DA: We're concentrating on artificial intelligence and machine learning. These technologies are already integrated into current inspection products like the QSR and are being expanded for use with the Wavemaker. This is about helping inspectors do more within the time they have. Data can be reviewed by both people and automated machine learning systems. Connectivity is also a focus, enabling data to be instantly reviewed by a Level 2 or Level 3 inspector from a remote location or to be automatically analyzed. It all revolves around digitization and communication to achieve a continuous flow of data and information.

I: David, one last question: Do you have a message for your employees, partners, and clients?

DA: Thank you for your support. Thank you for trusting us. We value that trust. Our success is backed by people passionate about our technology. We specialize in guided waves and have world experts in this area. Over the past 30 years, we've been the innovators for this technology, introducing new technologies like Wavemaker screening, gPIMS monitoring, and QSR scanning. Your support has allowed GUL to reach this milestone of 25 years, and you can be absolutely confident that we're driven to improve and offer even better technology for the next 25 years, ensuring our reliability and commitment remain unmatched.

GUIDED ULTRASONICS LTD

25 YEARS 1999-2024

I: Dr David Alleyne from Guided Ultrasonics Limited, thank you very much for this special interview.

DA: Many thanks to Inspenet for making this possible, for fantastic communication, for engagement with our industry, and for spreading the work of those of us who truly want to push and be ambitious to take our industry to new levels.

With a steadfast focus on innovation, GUL continues to lead the NDT sector, pushing boundaries and preparing for a promising future.

INSPENET

is the platform that connects leaders in the energy sector, fosters knowledge sharing, and creates global opportunities.

www.inspenet.com

ILTA 2025

CONFERENCE & TRADE SHOW

ILTA 2025 is the largest event focused exclusively on the business and technology of liquid terminals.

SAVE THE DATE!

June 9-11, 2025 | Houston, TX

www.ilta.org

API Valve Standard Updated to Address Hydrogen Gas Service

By Anchal Liddar
Senior Vice President of Global Industry Services

American Petroleum Institute

As the energy landscape continues to evolve, hydrogen is becoming increasingly significant in our energy mix. But the transition is not simply plug-and-play; indeed, hydrogen gas service presents unique challenges that require updated infrastructure and standards. Recognizing this, API has taken proactive steps with the publication of Addendum 2 to API 6D, 25th Edition: Specification for Valves. This update introduces new requirements designed to enhance the safety and performance of valves used in hydrogen gas applications.

The inclusion of Annex M (the Addendum language) in API 6D demonstrates our industry's commitment to innovation and safety. As hydrogen's role grows, it's imperative that we provide infrastructure capable of safely and reliably handling this alternative fuel. The updates to API 6D ensure that valve design, materials and testing protocols are equipped to meet the unique demands of hydrogen environments.

Some of the key enhancements in this update include rigorous design validation tests, such as high-pressure gas and fugitive emission assessments to assess valve performance, along with material specifications that ensure durability in hydrogen service. Additionally, the standard introduces enhanced non-destructive examination protocols to assess valve integrity over time and additional testing protocols to verify valve reliability. Collectively, these and other updates allow for reliable and safe API 6D-compliant valves for hydrogen applications.

This updated standard is also immediately eligible for the API Monogram Program, allowing licensed manufacturers to apply the API Monogram mark to products that meet the new requirements. This mark is a testament to the quality and reliability of these products, reassuring users that they conform to our rigorous specifications and standards.

The update to API 6D advances our mission to protect workers, communities and the environment while advancing the integrity and reliability of critical pipeline infrastructure. To learn more, visit the API webstore.

Anchal Liddar is Senior Vice President of API's Global Industry Services (GIS) division, which is responsible for standards setting, certification, training, publications and safety programs for industry operations. Previously she spent nine years at The Boeing Company, serving various roles in supply chain, finance, and program management. Anchal holds a Bachelor of Science from the University of California – Irvine and an M.B.A. and a Master of Science in Information Systems & Technology from Claremont Graduate University.

ADVANCING SAFETY AND SUSTAINABILITY THROUGH API STANDARDS FOR 100 YEARS

Since 1924, API has published more than 800 standards, guidelines, and other documents that enhance safety, efficiency and environmentally responsible industry practices.

Safeguarding the Future: The Role of Corrosion Control in the Evolving Energy Sector

By Alan Thomas, CEO of the Association for Materials Protection and Performance (AMPP)

As the energy sector undergoes a significant transformation, it faces new challenges and opportunities across all segments—from oil and gas to renewable energy. Maintaining the integrity, safety, and sustainability of energy infrastructure is more critical than ever. The Association for Materials Protection and Performance (AMPP) is at the forefront, providing the standards, certifications, and resources to address these evolving needs.

Challenges in the Energy Sector

The sector faces growing challenges in maintaining asset integrity, particularly with aging infrastructure and the increasing demands of harsh environments. Existing oil and gas transportation systems now need retrofitting to transport new fuels like CO2 and hydrogen, which can introduce new corrosion risks. These developments require updated design and inspection criteria to effectively manage the highly corrosive products now moving through these systems.

Offshore wind farms, hydrogen pipelines, and carbon capture projects also present challenges that require innovative corrosion protection strategies. For example, methods developed for offshore oil rigs can be adapted to protect offshore wind farms, while oil well corrosion control can inform CO2 injection projects. AMPP's initiatives in carbon capture, utilization, and storage (CCUS) and alternative fuel transport are crucial in guiding this transition.

Opportunities for Innovation

While challenges are significant, the shift to new energy sources creates vast opportunities for innovation, with advances in corrosion protection directly contributing to the success of renewable energy projects. Preservation strategies used in civil structures, for example, can be adapted for use in solar farms and geothermal plants.

Recent research by AMPP members, including Dr. Gerald Frankel and Dr. Mariano Iannuzzi, estimates that by 2030, between 4.1% and 9.1% of global CO2 emissions could result from producing steel to replace materials lost to corrosion. This highlights the need for sustainable infrastructure design. The life cycle assessment of clean energy projects must consider the performance and reliability of materials to minimize environmental impact. Corrosion control is critical to reducing costs and carbon footprints in large industrial projects.

AMPP's Role in Shaping the Future

AMPP is committed to addressing these challenges with industry professionals. Our Standards Committee SC 26 focuses on carbon capture, alternative fuels, and energy storage technologies like hydrogen and biofuels. AMPP's Guide 21532, published in 2023, covers materials selection and corrosion control for CO2 transport and injection. It has quickly become one of AMPP's most popular standards, drawing attention from both industry and regulators. The committee is now planning a series of documents addressing laboratory testing, failure modes, and materials selection for CO2 injection wells and transport. They are also working on similar guidelines for hydrogen transport and corrosion testing for hydrogen. Experts from over 30 countries participate in SC 26, reflecting the global efforts driving the energy transition. Latin America is well-represented, with Dr. Leonardo Uller in Rio de Janeiro leading one of AMPP's hydrogen projects. Dr. Uller should be a familiar name to INSPENET readers.

Beyond technical standards, AMPP is also focused on workforce development, ensuring that engineers, inspectors, and technicians have the latest knowledge to manage corrosion and protect infrastructure. Our certification programs and continuous education initiatives ensure professionals have the latest knowledge and techniques.

Looking Forward

As the energy sector reaches this critical juncture, AMPP will continue leading the way, providing the technical guidance needed to ensure safer, more sustainable, and efficient energy operations. Through our comprehensive standards, cutting-edge research, and commitment to workforce development, AMPP remains dedicated to supporting the industry in delivering cleaner, safer, and more reliable energy solutions. **Learn more at www.ampp.org**.

UNLOCK YOUR POTENTIAL WITH AMPP

Explore cutting-edge technologies at AMPP Annual Conference + Expo.

ace.ampp.org

AMPP®
ANNUAL CONFERENCE + EXPO
APRIL 6-10, 2025 | NASHVILLE, TENNESSEE

Join thousands of professionals at the largest global conference dedicated to materials protection and performance.

- Explore hands-on workshops
- Connect with peers at social events and technical symposia
- Protect energy assets and advance your career

Upstream, Midstream, Downstream & New Energy

From asset integrity to cathodic protection, AMPP's peer-reviewed technical symposia will keep you up to date on:

- Facilities integrity and process safety
- Corrosion inhibitors specific to the Oil and Gas industry
- Case studies and monitoring techniques in oil, gas, water, and chemical systems
- Corrosion resistant alloy development and applications
- Environmentally assisted cracking (EAC) research and reviews
- Pipeline integrity and oil refining damage mechanisms, failure analysis, and more
- Biofuel and biomass refining
- Carbon capture, transportation, utilization and storage (CCTUS)

Are you ready for the future of energy?
Register today!

BactiQuant: Leading the Way in Bacterial Detection with Mobile and Online Monitoring

BactiQuant

BactiQuant technology is revolutionizing microbial detection across industries where water quality is crucial. Its unique combination of mobile and online meters allows for flexible and efficient monitoring, providing real-time, actionable insights into bacterial contamination. The mobile meter is ideal for spot sampling in the field, while the online meter continuously monitors water systems, delivering 24/7 data.

This versatility makes BactiQuant highly valuable in industries such as oil and gas, pharmaceuticals, environmental management, and municipal water systems.

Mobile and Online Monitoring for Comprehensive Solutions

BactiQuant's mobile and online meters offer a dual solution tailored to industry-specific needs. The mobile meter is portable and easy to use, making it perfect for on-the-go spot sampling in locations like offshore platforms, pipelines, or remote processing sites. It delivers immediate results, helping operators make quick, informed decisions about bacterial contamination risks.

For continuous oversight, the online meter provides automated, real-time data for critical infrastructure. This solution is invaluable for industries that require around-the-clock monitoring to prevent issues such as microbiologically influenced corrosion (MIC) and other microbial threats. The online meter allows operators to detect bacterial activity trends early and implement timely, preventive actions.

The combination of mobile and online systems ensures industries have the flexibility and control to maintain the highest water quality standards, whether they need spot checks or continuous monitoring.

Trusted by Industry Leaders in Oil and Gas

In the oil and gas sector, where MIC can cause severe corrosion and damage to assets like pipelines and offshore platforms, BactiQuant has become a trusted solution. Major oil and gas companies, including SLB (Schlumberger), rely on BactiQuants technology to quantify and track bacterial content in near real-time.

By using the mobile meter for spot sampling and the online meter for continuous monitoring, oil & gas companies can detect and address microbial threats before they escalate. This proactive approach not only optimizes biocide treatments but also extends the lifespan of assets, reduces downtime, and lowers operational costs—all while minimizing the environmental footprint through more efficient chemical use.

Exceptional Aftersales Service and Expert Support

What sets BactiQuant apart is not just its innovative technology but also its commitment to excellent aftersales service. BactiQuant's professional team works closely with clients to ensure their needs are met, consistently finding the best solutions tailored to each unique situation. Whether it's adjusting the system for specific operational demands or providing ongoing support, BactiQuant's team is known for delivering top-tier customer service.

This dedication to aftersales care ensures that clients get the most out of their systems, with expert guidance always available to fine-tune the technology for optimal results.

Global Collaborations and Distribution Partners

Bactiquant's global reach is supported by strong partnerships. In the United States, Brown Corrosion Services is the official distributor, combining BactiQuant technology with their expertise in corrosion management. In Malaysia, Indonesia, and Brunei, Mach3 Engineering serves as BactiQuant's key partner, bringing its mobile and online solutions to the region's with oil & gas companies

Through these collaborations, BactiQuant continues to expand its impact, helping industries worldwide monitor bacterial risks more efficiently.

A Sustainable Approach

BactiQuant's technology not only ensures accurate bacterial detection but also promotes sustainability by reducing chemical use. With precise data from mobile and online meters, industries can apply treatments more efficiently, minimizing waste and environmental impact—an increasingly important focus in today's industrial landscape.

Transpetro's Sustainability Commitments: Decarbonization, Clean Energy, and Water Management

Transpetro is committed to advancing the energy transition and is making significant strides in its decarbonization efforts. The company consistently invests in innovative solutions and technologies to reduce emissions across its ships and terminals, embrace clean energy, and enhance water management, all while integrating sustainability into its core strategy.

In 2023, Transpetro achieved an 8.3% reduction in greenhouse gas emissions compared to the previous year. Additionally, fuel consumption across its fleet decreased, saving over 8,000 tons of bunker fuel, a key marine fuel source.

In the shipping sector, Transpetro has implemented various energy-efficiency technologies, including hydrodynamic appendages for hulls, propellers, and rudders. These advancements, combined with monitoring software for speed control, have boosted maritime efficiency. Another contributing factor is the use of specialized paints to prevent hull fouling, which reduces drag and lowers fuel consumption.

Looking ahead, Transpetro's new fleet will be equipped with technologies that meet the International Maritime Organization (IMO) emission standards. These vessels will feature more efficient equipment and offer the flexibility for future adaptations to alternative fuels, such as ethanol. With these innovations, the new ships are expected to cut greenhouse gas emissions by up to 30% compared to the current fleet. When powered by ethanol, their operations will be fully decarbonized.

Clean Energy and Water Management

Since April 2023, Transpetro has been operating the Petrobras System's first fully solar-powered facility, a photovoltaic solar power plant at the Guarulhos Terminal in São Paulo. This plant will prevent the emission of over 240 tons of CO_2 annually. Further advancing its commitment to clean energy, the company is developing a second solar plant at the Belém Terminal in northern Brazil, set to become operational in the first half of 2025. Additionally, plans are underway for another solar facility at the Coari Terminal, also located in northern Brazil, further expanding its renewable energy portfolio.

In tandem with its clean energy initiatives, Transpetro has made significant strides in water management, particularly through water reuse and recycling programs. Over the past five years, these efforts have led to a 10% reduction in fresh water consumption, a saving equivalent to supplying approximately 2,160 people for an entire year.

Through these sustainability initiatives, Transpetro continues to assert itself as a leader in Brazil's energy transition. Its strategy, rooted in environmental responsibility and a commitment to societal demands, underscores the company's pivotal role in building a cleaner, more sustainable future.

Phd Israel Hurtado
Founder & President Mexican Hydrogen, Storage & Sustainable Mobility Association (AMH2)

Mexico, Leader In Clean Hydrogen: Opportunities and Challenges for a Sustainable Energy Transition

Mexico is positioned as a leader in the production of clean hydrogen, thanks to its geographical location, renewable resources and competitive advantages. The clean hydrogen industry is key to the country's energy transition and decarbonization.

Mexico has a strategic geographic position, abundant renewable resources and a consolidated manufacturing infrastructure. The United States-Mexico-Canada Agreement (USMCA), and its membership in the sunbelt make it an attractive destination for investment.

Although the industry faces challenges such as lack of infrastructure, the Mexican government and industry must work together to create a National Hydrogen Strategy, update technical standards and promote clean hydrogen projects.

There are currently 17 hydrogen projects in different stages of development that will have a significant impact on the energy transition, replacing fossil fuels and reducing carbon emissions.

International cooperation is essential for technology transfer and financial support, as well as the creation of the Mexican Hydrogen Center by the Mexican Hydrogen Association, which will train professionals in the sector.

The industry requires tax incentives and subsidies to be internationally competitive. The creation of auctions for clean hydrogen production and commercialization projects can boost the industry's development.

The Mexican Hydrogen Association has positive expectations with the new administration and the growth of the industry, with investments estimated at 20 billion dollars.

Mexico is in a singular position to lead the production of clean hydrogen and drive the energy transition. Cooperation between government, industry and civil society is essential to overcome the challenges and take advantage of the opportunities of this growing industry.

Gastech

Climatetech & AI | Hydrogen

EXHIBITION & CONFERENCE
FIERA MILANO | MILAN | 9-12 SEPTEMBER 2025

Transforming energy through vision, innovation, and action

The world's largest event for natural gas, LNG, hydrogen, climate technologies, AI and low carbon solutions.

BOOK A STAND
Find out about the benefits of exhibiting

50,000	1,000	1,000	7,000	150
Attendees	Exhibitors	Speakers	Delegates	Countries represented

gastechevent.com @gastechevent #Gastech

Organised by: dmg::events

IOCS Srl: Innovation, Quality, and Sustainability for the Oil & Gas Industry

Since its foundation in 2017, IOCS Srl has established itself as a global leader in the design, supply, and customization of advanced equipment and solutions for offshore and onshore operations in the oil and gas industry. Headquartered in Italy, the company has earned the trust of industry giants such as ENI, Galp Energy, and Ceylon Petroleum thanks to its commitment to quality, sustainability, and tailoring solutions to meet each client's specific needs.

Excellence in Products and Services

IOCS Srl offers a wide range of products, including hoses, subsea valves, mooring systems, and buoys, all designed under strict international standards such as ISO, API, and UNI EN. These solutions are built to operate in the most demanding environments, enabling the company to position itself as a strategic partner in over 20 countries.

Customization is a cornerstone of IOCS Srl's strategy. Their process begins with field visits to identify clients' specific needs, followed by detailed analysis to develop proposals that optimize operations. This approach ensures that each solution is safe, efficient, and environmentally friendly.

Key Success Stories

Technological Innovation at the SPM in Civitavecchia

A critical technical issue at the SPM in Civitavecchia tested IOCS Srl's ability to solve complex challenges. A failure in a tension cell compromised the safety of mooring operations. In response, the company implemented an advanced solution: a high-precision cell connected to a remote monitoring system. This not only restored operational capacity in record time but also enhanced the safety and sustainability of the system.

Supplying 16" Subsea Valves for Ceylon Petroleum

Another standout project was the supply of 16-inch subsea valves with complete accessories to Ceylon Petroleum. The timely delivery and optimal conditions met all technical requirements, strengthening the commercial relationship with the client and highlighting IOCS Srl's commitment to excellence and attention to detail.

Environmental Responsibility and Future Outlook

IOCS Srl prioritizes not only product quality but also environmental sustainability at every stage of its operations. From design to implementation, the company's solutions meet the highest standards for safety and environmental respect.
Looking ahead, IOCS Srl plans to launch an e-commerce platform in 2025 under its new subsidiary, IOCS-e Srl. This initiative will enable B2B and B2C customers to access a wide inventory of standard products, simplifying the procurement process and strengthening the company's global presence.

Innovation and Trust in the Energy Industry

With over a decade of experience, IOCS Srl continues to lead the way in providing innovative solutions for the oil and gas industry. Its focus on innovation, sustainability, and customization has set a benchmark for excellence in the sector, establishing it as a trusted and visionary company in the global energy landscape.

For more information about their products and services, visit www.iocs-srl.com or their upcoming e-commerce platform at www.iocs-e.com.

IOCS SRL IS YOUR RELIABLE SUPPLIER FOR LOADING AND UNLOADING SYSTEM OF VESSELS.

THE BEST AID TO IMPROVE YOUR ACTIVITIES

CONSTRUCTION
Collaborations with EPC for the construction of stations and re-works

MANUFACTURING
We study the best solutions for excellent end products

INSTALLATION
Quick and easy on site assembly of all components

ASSISTANCE
Necessary assistance on site during the commissioning

The IOCS is well organized to provide its Customers the best assistance for the solution of any kind of problem that may arise. In particular, our activities are focused on these services:

- Computerized simulation
- Business relations
- Management of offer requests
- On Field Inspection
- Incident investigation
- Hoses Maintenance Program
- Hoses Repair

www.iocs-srl.com

Exclusive Interview with Dr. Óscar Mendoza: "Natural Gas is Key in the Energy Transition"

The CEO of INSPENET, Engineer Francesco Solari, had the pleasure of interviewing Dr. Óscar Mendoza, who currently serves as the Director of Gas Mexico & Central America at Gasoductos y Estaciones del Norte. A distinguished expert in energy project management, Dr. Mendoza boasts a solid track record of over 15 years in the natural gas sector in Mexico and Central America. During the interview for our INSPENET BRIEF edition, Dr. Mendoza shared his insights on the challenges, opportunities, and innovations facing the natural gas industry in a world progressing toward energy sustainability.

The Importance of Natural Gas in the Energy Transition

INSPENET BRIEF: Dr. Mendoza, how do you see the current landscape of the energy sector and the role natural gas plays in it?

Dr. Óscar Mendoza: Natural gas has a very active role in the energy transition, especially in Mexico. This resource will remain a central component for many more years as it serves as a bridge between traditional energy sources and renewables.

Its lower environmental impact compared to coal or oil makes it a clean and viable alternative. Globally, the transition to more sustainable energy sources presents significant opportunities for technological innovation and the development of new solutions.

Regulatory and Technical Challenges in the Gas Industry

IB: What are the main challenges facing natural gas transportation in Mexico?

OM: Rather than technical challenges, the issues are primarily regulatory and social. In Mexico, difficulties related to land access rights and negotiations with community leaders complicate the construction of new pipelines. In some cases, these delays significantly increase project costs. It is crucial to find a balance between community rights and the country's energy needs.

Technological Innovations in Pipelines and Stations

IB: What technological innovations are being implemented at Gasoductos y Estaciones del Norte to optimize the natural gas supply?

OM: We have developed decompression stations that allow compressed gas to reach areas where pipelines cannot. This model is especially beneficial for industries, providing a more economical and sustainable energy source. Additionally, we are innovating with methane and green hydrogen blends, contributing to decarbonization and progress toward cleaner energy sources.

Expansion and Public-Private Collaboration

IB: How are you expanding your reach, and what role does collaboration between the public and private sectors play?

OM: We serve diverse markets, from residential to industrial, and have built over 1 million linear meters of pipelines in Mexico. Public-private collaboration has been key to covering areas the government could not develop. This partnership has ensured a reliable and accessible natural gas supply across the country.

The Future of Natural Gas and Its Role in Global Energy Reconfiguration

IB: Looking ahead to 2050, how do you envision the role of natural gas in the global energy scenario?

OM: While natural gas will remain relevant, its role will gradually diminish as renewable sources like biogas and green hydrogen develop. We are already working on biodigesters that capture biogas from organic waste and solutions to blend methane with green hydrogen. However, this transition will be slow due to the investments required to scale these technologies.

A Message to the Energy Community

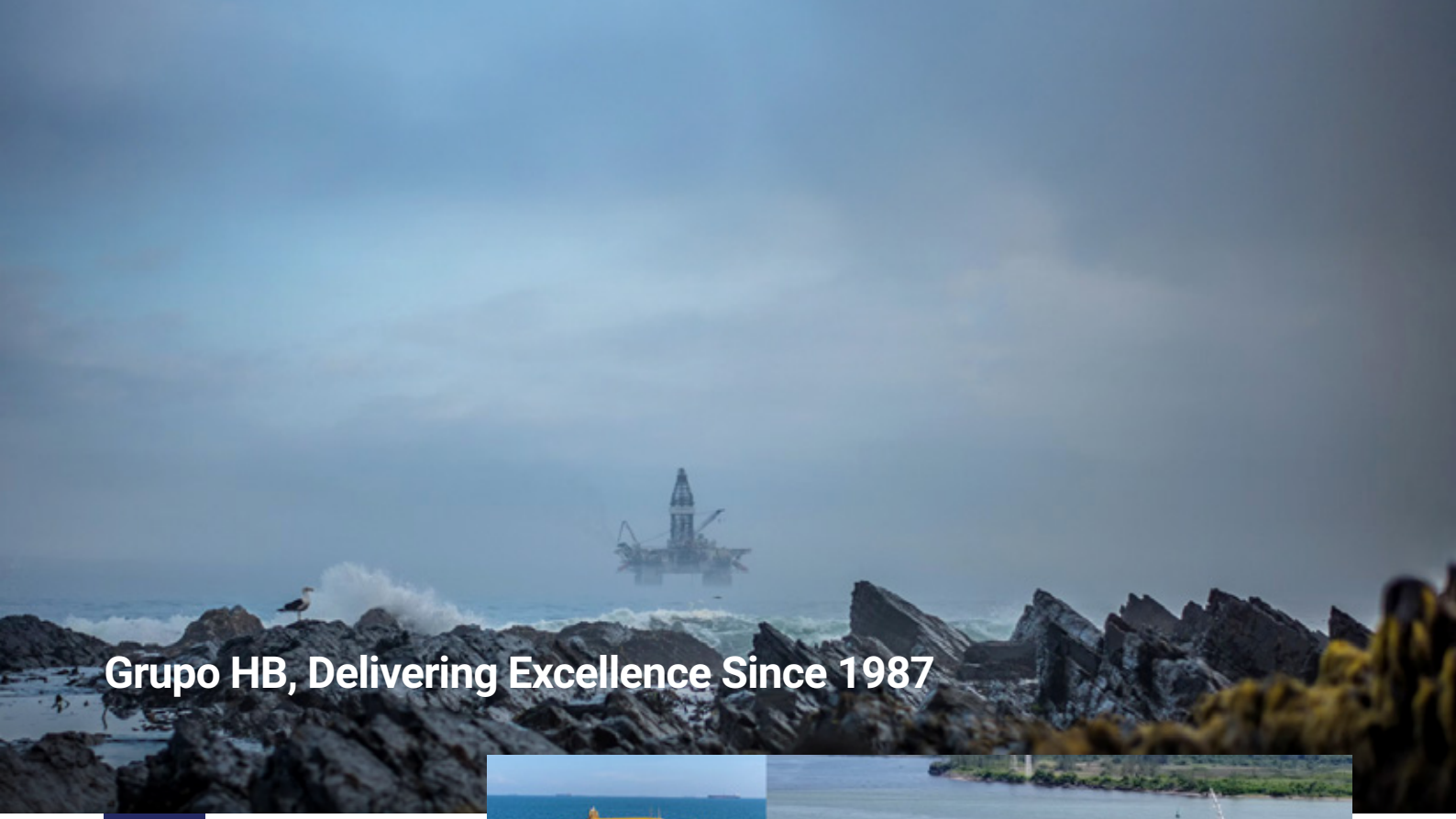
IB: Finally, what message would you like to share with our readers?

OM: It is crucial that we all become aware of the importance of changing our mindset and energy consumption habits. The energy transition requires collective efforts to reduce our dependence on fossil fuels and move toward a more sustainable future. We have the opportunity to transform our relationship with energy and build a better world for future generations.

IB: We deeply thank Dr. Óscar Mendoza for sharing his time and expertise with us. His vision and leadership in the energy sector are an inspiration for those working toward a more sustainable future.

OM: Thank you for the invitation. I am always willing to collaborate and contribute to initiatives that promote knowledge and energy development.

IB: The knowledge of leaders like Dr. Óscar Mendoza inspires us to turn energy challenges into opportunities for growth and sustainability. See you in the next edition!



Grupo HB, Delivering Excellence Since 1987

Grupo HB is a Mexican company that began operations in 1987, integrating a group of professionals committed to the values of honesty, loyalty and professionalism, which to this day serve as the foundations of the group´s growth and expansion

Starting as a civil works construction company, over the years, the groups has consolidated itself as a company specialized in maritime construction, in areas such as a construction of docks, maritime terminals, breakwaters, dredging and beach protection and recovery.

On this path over the years, we have consolidated an area of specialized services in maritime facilities, such as CALM-type monobuoys, multi-buoy terminals and specialized docks for loading and unloading oil products in storage terminals.

These services include the loading/unloading operation of the tanker, from its arrival, maintaining control during the operation, and ending with the launch of the vessel.

In addition to these services, at Grupo HB we integrate routine, preventive and corrective maintenance services in order to guarantee the correct operation of the loading and unloading systems. The elements of the system include hoses, chains, buoys, monobuoys, PLEM, pipes, loading arms, unloading racks for tank trucks, and all other elements that make up the system.

An important specialty of the company is to realize an (overhaul) of the Monobuoy, a procedure that consists of taking it out to dry dock, to execute a major repair of all the components that make it up, this in order to guarantee the correct operation of the same, and in a comprehensive manner, extend the useful life of the buoy.

Our experience of having executed more than 15 monobuoy overhauls, including the entire unloading system, makes us leaders in the market and a strategic partner for our clients.

All services performed are attached to the highest quality standards of the industry with certified personnel and equipment, following manufacturers' recommendations, international industry recommendations and always aligned with the particular regulations of the government agencies of each country.

The industry today faces a strong commitment to the environment and that is why we are convinced that the correct maintenance of the facilities guarantees that the operations are carried out safely, avoiding accidents that threaten the environment, human life and our clients investment.

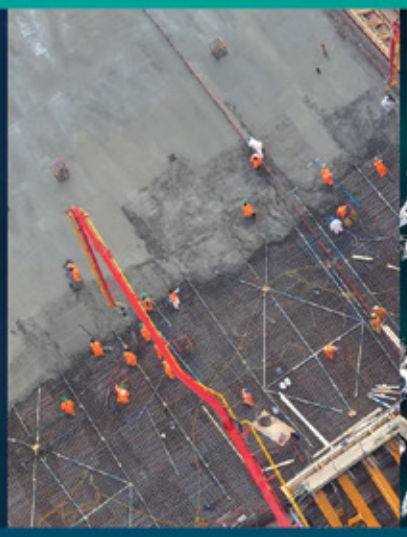
Continuing with Grupo HB's growth plans, and partnering with strategic allies, the company has undertaken growth towards South America, to attend the needs related with our expertise. Today we have a presence in Lima, Peru, being our starting point to serve the region.

Contact information:
www.grupohb.com
fabiola.picazo@grupohb.com
Corporate offices in Mexico City
Operational offices in Lima, Perú

grupo

Delivering excellence since 1987 services






WE PROVIDE TO THE INDUSTRY

- Construction of Maritime Infrastructure
- Monobuoys: Operation and Maintenance
- Civil and Electromechanical
- Works Tourist Marinas

www.grupohb.com

Optimizing Marine Terminal Utilization: A Data-Driven Approach

MIS

Optimizing marine terminal utilization in the constantly evolving maritime industry is crucial for increasing efficiency and decreasing costs. The key objectives are to minimize alongside time and associated delay costs while ensuring that the ship/shore interface fits within the risk tolerance level. Utilizing accurate and comprehensive data collection, terminal operators can make well-informed decisions that drive operational excellence.

Efficiently managing alongside events is one of the critical challenges in marine terminal operations, as delays can result in significant financial losses and operational inefficiencies. A streamlined approach focuses on minimizing dockside idle time. By centralizing data collection, terminal operators can gain a comprehensive view of their operations, allowing them to identify bottlenecks and implement targeted improvements.

Accurate data collection forms the cornerstone of this methodology. By capturing detailed information on vessel movements, cargo handling, and terminal activities, a comprehensive dataset is created. This dataset is the foundation for well-informed decision-making. It enables terminal operators to visualize, anticipate, and proactively address potential issues, thus significantly reducing the risk of delays and associated costs.

Furthermore, a single information-sharing platform facilitates seamless communication and collaboration between terminals and vessels, enhancing transparency and fostering cooperation. This improves operational efficiency, builds trust, and strengthens relationships within the maritime community.

Terminal Operators must confirm that the ship/shore interface fits within the risk tolerance level well before vessel arrival. Analyzing historical data and real-time information can predict potential compatibility issues, providing actionable insights to terminal operators. This proactive approach ensures that all operations are executed within safe parameters, minimizing the risk of accidents and disruptions.
The benefits of a data-driven approach are evident in the significant efficiency gains achieved by terminals. Some terminals have reported substantial annual savings through delay reduction, demonstrating the value of leveraging data to optimize terminal operations and inspiring optimism for potential cost savings and efficiency gains in other operations.

In conclusion, optimizing marine terminal utilization requires a comprehensive and data-driven approach. By collecting accurate and detailed information, terminal operators can make informed decisions that enhance efficiency, reduce costs, and ensure safety. This commitment to innovation in the maritime industry, as demonstrated by the adoption of a data-driven approach, helps achieve operational excellence and inspires a forward-thinking mindset.

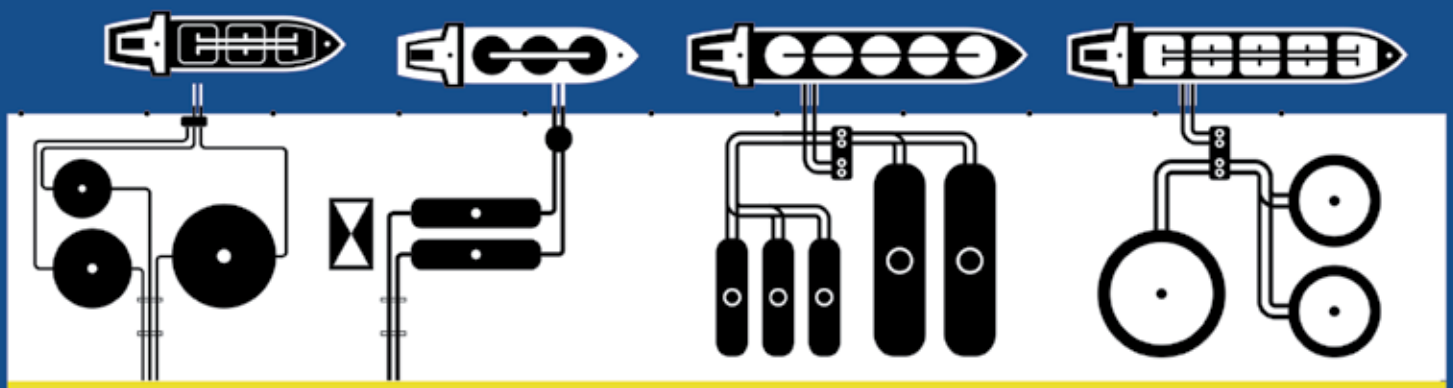
Learn more about how we are supporting our terminal operations customers with their data-driven approach and join in the conversation by visiting: **https://bit.ly/3ZyEQOZ**

MIS

Costly delays?
Vessel compatibility issues?
Disjointed communication?

It's time to fix the inefficiencies holding your terminal back.

Discover the benefits of a digitalized, data-driven approach to terminal management.



Trusted by leading integrated energy manufacturing and logistics companies

www.mismarine.com/MTO Request a Demo

Naturgy has Initiated an Innovative Project within The Natural Gas Distribution Network in Mexico.

The company is focused on reducing the environmental impact of its downstream operations. In a groundbreaking move, Naturgy has successfully relocated 382 meters of infrastructure in the Valley of Mexico, employing a ZERO emissions strategy and adhering to stringent safety protocols to safeguard users, the environment, and its assets. The execution of this ambitious project required not only the application of advanced technology prevalent throughout Latin America but also the implementation of comprehensive logistical and safety measures, particularly in the intricate urban landscape of Mexico City. The area encompasses a diverse range of services that needed to be preserved to prevent any damage or disruption. In certain sections, excavation depths reached up to five meters for installation purposes, presenting the additional challenge of maintaining uninterrupted service, which is essential for the industries, businesses, and residential customers in the vicinity of this operation.

Alejandro Peón, the General Director of Naturgy Mexico, contemplates the pressing necessity at hand: "**A fundamental aspect of Naturgy is its innovative spirit, which is deeply embedded in the Group's DNA. Over the course of its 180-year history, the Company has continually reinvented itself. At this critical juncture marked by the climate emergency, we are providing tangible solutions through the advancement of our infrastructure and the implementation of new technologies in our assets, exemplified by the Cross Compression project or RECAP.**"

The Project and Its Complexity

Modifying any segment of a route within the distribution network is arguably one of the most challenging tasks that an energy company can encounter, particularly when considering the aforementioned complexities: its location in an industrial area of Mexico City, the necessity to maintain supply continuity, adherence to international safety standards, and environmental protection, all of which made the undertaking quite difficult. After several months of planning, Naturgy addressed this requirement by employing, for the first time in the Latin American countries where the Group operates, a technique known as "RECAP." This method facilitates the installation of a new pipeline segment that allows for the diversion of a portion of the gas pipeline, thereby minimizing the release of natural gas into the atmosphere. The new segment connects two points while isolating the section of the pipeline that will remain inactive. Francisco Ripoll, Operations Director of Naturgy in Mexico, elaborates: "**When this occurs, gas remains contained in the section of the pipeline that is taken out of service. In such projects, the common practice is to 'vent' this gas into the atmosphere. This procedure ensures that the decommissioned pipeline is rendered harmless**

and, consequently, safe. Unfortunately, this practice results in methane emissions into the atmosphere. At Naturgy, in alignment with our environmental commitments, we designed this project utilizing RECAP technology."

This technology enables the natural gas extracted from the pipeline to be decommissioned to be compressed to at least 1 kilogram or bar above the pressure of the operational segment, allowing it to be reinjected into the new pipeline route. With the successful implementation of this project, Naturgy prevented the release of just over 1 ton of methane and 30 tCO2e. Jaqueline Luna, Operations Manager at Naturgy, states: **"This has been a truly unique project for several reasons. First and foremost, we had to ensure complete safety in the area during the diversion of a 24-inch diameter pipeline while maintaining uninterrupted supply to homes, businesses, and industries throughout the transition, working only at night over approximately 400 linear meters, all without releasing any methane particles during its execution."**

Naturgy sets a new standard for execution in such projects within the natural gas distribution industry in Mexico, particularly in areas with high population and industrial density. This project demonstrates that the practice of venting natural gas can be avoided while ensuring safety for both communities and the environment, preventing atmospheric damage and supply interruptions. "**Throughout the project, we maintained ongoing coordination and dialogue with neighbors, authorities, and all participants. We appreciate the trust placed in us, as we are committed not only to the quality of service we provide but also to the outcome of this work. Today, this important segment of the gas pipeline has been successfully relocated,**" explains Carlos Capponeto, Distribution System Manager at Naturgy in Mexico.

Alejandro Peón emphasizes the significance of such operations: **"Ensuring that our activities are conducted to the highest standards serves a greater purpose, which is to support Mexico's energy transition through the utilization of natural gas. We firmly believe that natural gas is a central component of this transition. Therefore, we are committed to enabling more industries, businesses, and households to benefit from this resource, as it not only reduces their CO2 emissions but also provides a safe and highly affordable energy source."** It is important to note that the climate change chapter of the National Aeronautics and Space Administration (NASA) reports that the concentration of CO2 in the atmosphere has increased by 50% since the Industrial Revolution (1750), driven by human activity. In light of the urgent need to reduce CO2 emissions, every effort in the downstream sector of the energy industry is crucial.

Spanish Association of Non-Destructive Testing

The Spanish Association of Non-Destructive Testing was established on September 27, 1988, as a successor to the Non-Destructive Testing Committee of the AEC.

On December 23, 1997, CERTIAEND (the Certification Body of AEND) was accredited by the National Accreditation Body (ENAC) for the certification of personnel in Non-Destructive Testing (NDT).

OBJECTIVES

•Promote and facilitate the implementation of techniques for the management of NDT in public and private industries.
•Promote professional improvement and lifelong learning of its members in the field of NDT.
•Encourage research in various NDT methods.
•Certify NDT personnel through its certification body, CERTIAEND.
•Collaborate in the development of standards and specifications related to its specialty with appropriate national and international organizations.
•Cooperate with Public Administration and other public or private entities in promoting NDT and communicating their challenges.

VISION

We promote professional improvement and lifelong learning in the field of Non-Destructive Testing, as well as the certification of NDT personnel through the CERTIAEND certification body.

MISSION

We aim to continue being leaders in providing NDT education at all levels and for all types of public and private entities, contributing to the continuous improvement of personnel performing Non-Destructive Testing.

ORGANIZATION

GENERAL ASSEMBLY
•Members of AEND
•The highest authority of AEND
•Its decisions are binding for all members
GOVERNING BOARD
•Executive body of AEND by delegation and representation of the General Assembly
MANAGEMENT COMMISSION
•To make the Governing Board operational, there is a Management Commission elected by it and ratified by the General Assembly.

ACTIVITIES

•Training
•Certification
•Dissemination
•Conferences and congresses
•International projects

TRAINING

-Training programs comply with UNE EN ISO 9712 and UNE CEN ISO/TR 25107.
-Training department professionals are Level 3 .
-Certified, with extensive experience in NDT.
-Course modalities: In-person, semi-presential, and in-company.
-Approved training programs:

Method	Program ID	Description
Level 1	Introduction to NDT	END
	EDDY CURRENT TESTING LEVEL 1	P-EF-004-ET-001-2
	ACOUSTIC EMISSION LEVEL 1	P-EF-004-AT-001-2
	LIQUID PENETRANT TESTING LEVEL 1	P-EF-004-PT-001-2
	MAGNETIC PARTICLE TESTING LEVEL 1	P-EF-004-MT-001-2
	INDUSTRIAL RADIOGRAPHY LEVEL 1	P-EF-004-RT-001-2
	ULTRASONIC TESTING LEVEL 1	P-EF-004-UT-001-2
	ULTRASONIC THICKNESS MEASUREMENT LEVEL 1	P-EF-004-UT-001B-2
	ULTRASONIC SPOT WELD TESTING LEVEL 1	P-EF-004-UT-001G-2
Level 2	COMMON KNOWLEDGE (DISTANCE) LEVEL 2	D-EF-004-CC-002-2
	EDDY CURRENT TESTING LEVEL 2	P-EF-004-ET-002-2
	LEAK TESTING GAS TRACER METHOD LEVEL 2 (DIRECT)	P-EF-004-LT-G-012-2
	LEAK TESTING LEVEL 2 (DIRECT)	P-EF-004-LT-012-2
	VISUAL INSPECTION LEVEL 2 (DIRECT)	P-EF-004-VT-012-2
	VISUAL INSPECTION LEVEL 2 (DIRECT, ASYNCHRONOUS, SEMIPRESENTIAL)	S-EF-004-VT-002-2
	RADIOGRAPHIC INTERPRETATION LEVEL 2	P-EF-004-RT-002D-2
	LIQUID PENETRANT TESTING LEVEL 2 ASYNCHRONOUS DIRECT	S-EF-004-PT-012-2
	LIQUID PENETRANT TESTING LEVEL 2 DIRECT	P-EF-004-PT-012-2
	MAGNETIC PARTICLE TESTING LEVEL 2 DIRECT	P-EF-004-MT-012-2
	MAGNETIC PARTICLE TESTING LEVEL 2 SEMI-PRESENTIAL ASYNCHRONOUS DIRECT	S-EF-004-MT-012-2
	INDUSTRIAL RADIOGRAPHY LEVEL 2	P-EF-004-RT-002-2
	INFRARED THERMOGRAPHY LEVEL 2	P-EF-004-TT-002-2
	ULTRASONIC TESTING LEVEL 2	P-EF-004-UT-002-2
	ULTRASONIC TESTING LEVEL 2 DIRECT TO AUTOMATIC INSPECTION	P-EF-004-UT-002C-2
	ULTRASONIC TESTING LEVEL 2 THICKNESS MEASUREMENT DIRECT	P-EF-004-UT-012B-2
	ULTRASONIC TESTING LEVEL 2 FOR UNIVERSITY GRADUATES	P-EF-004-UT-002R-2
	ULTRASONIC TESTING LEVEL 2 SEMI-PRESENTIAL	S-EF-004-UT-002-2
	ULTRASONIC TESTING LEVEL 2 SPOT WELDING	P-EF-004-UT-002G-2
	ULTRASONIC TESTING LEVEL 2 TOFD	P-EF-004-UT-002H-2
	ULTRASONIC TESTING PHASED-ARRAY LEVEL 2	P-EF-004-UT-002I-2
Level 3	BASIC KNOWLEDGE LEVEL 3	P-EF-004-CB-003-2
	BASIC KNOWLEDGE LEVEL 3 REDUCED	P-EF-004-CB-003R-2
	EDDY CURRENT TESTING LEVEL 3	P-EF-004-ET-003-2
	EDDY CURRENT TESTING LEVEL 3 REDUCED	P-EF-004-ET-003R-2
	VISUAL INSPECTION LEVEL 3	P-EF-004-VT-003-2
	VISUAL INSPECTION LEVEL 3 ONLINE	P-EF-004-VT-003-2
	VISUAL INSPECTION LEVEL 3 REDUCED	P-EF-004-VT-003R-2
	LIQUID PENETRANT TESTING LEVEL 3	P-EF-004-PT-003-2
	LIQUID PENETRANT TESTING LEVEL 3 ONLINE	P-EF-004-PT-003-2
	LIQUID PENETRANT TESTING LEVEL 3 REDUCED	P-EF-004-PT-003R-2
	MAGNETIC PARTICLE TESTING LEVEL 3	P-EF-004-MT-003-2
	MAGNETIC PARTICLE TESTING LEVEL 3 REDUCED	P-EF-004-MT-003R-2
	INDUSTRIAL RADIOGRAPHY LEVEL 3	P-EF-004-RT-003-2
	INDUSTRIAL RADIOGRAPHY LEVEL 3 REDUCED	P-EF-004-RT-003R-2
	ULTRASONIC TESTING LEVEL 3	P-EF-004-UT-003-2
	ULTRASONIC TESTING LEVEL 3 REDUCED	P-EF-004-UT-003R-2

CERTIAEND

•Offers certification for individuals performing non-destructive testing in accordance with the requirements established by the UNE EN ISO 9712:2023 standard.

•Complies with the requirements outlined in the ISO/IEC 17024 standard.

•Accredited by the National Accreditation Body (ENAC).

•Operates as a third-party system.

•Signatory of the EFNDT mutual recognition agreement. The certification issued is recognized by national associations within the European Union.

•Signatory of the ICNDT (International Committee for Non-Destructive Testing) mutual recognition agreement.

•<Notified body to demonstrate compliance with the European Directive on pressure vessels regarding the certification of NDT personnel.

Detecting Chloride Stress Corrosion Cracking in Stainless Steel

Written by Eddyfi Technologies exclusively for INSPENET

Eddyfi Technologies
Beyond current

Understanding Chloride Stress Corrosion Cracking

Chloride stress corrosion cracking (ClSCC) is a serious form of corrosion that compromises stainless steel's structural integrity, potentially leading to catastrophic failures. This occurs when stainless steel is exposed to chloride-rich environments such as seawater, de-icing salts, or industrial chemicals. These conditions can initiate corrosive reactions that evolve into cracks over time.

ClSCC begins with chloride ions accumulating on the surface of stainless steel. Initially, these ions may not cause significant damage. However, they create pits and crevices that, under high temperatures (above 60°C) and mechanical stress, develop into stress corrosion cracks. Industries like oil and gas face heightened risks, making early detection and management critical for infrastructure safety and longevity.

The Role of Environmental Factors in ClSCC

Environmental factors significantly influence ClSCC initiation and progression. Chlorides in marine or industrial environments penetrate the protective oxide film on stainless steel, causing localized breakdown and corrosion. Elevated temperatures accelerate these reactions, making environments above 60°C particularly hazardous.

Mechanical stresses, whether residual from manufacturing or applied during use, further exacerbate ClSCC. Once the protective oxide layer is compromised, these stresses contribute to crack initiation and propagation. Controlling environmental conditions is thus essential to prevent ClSCC in stainless steel.}

Penetrant Testing: Advantages and Limitations

Penetrant testing (PT) is a common technique for identifying surface-level ClSCC. The method involves applying dye to the surface, which seeps into cracks or defects, making them visible upon inspection. PT is valued for its sensitivity to small surface discontinuities and its applicability across various materials.

However, PT has limitations. It can only detect surface-breaking defects, requires extensive pre-cleaning, and is time-consuming. The process involves multiple steps, including post-cleaning, and poses environmental concerns due to the chemicals used. Moreover, PT cannot measure defect depth or detect flaws on the far side of a pipe wall, reducing its effectiveness in certain applications.

Benefits of Eddy Current Array Testing

Eddy current array (ECA) testing offers significant advantages over PT. Using multiplexed coil arrays, ECA inspects larger areas in a single scan with high speed and accuracy. It detects both surface and far-side defects, making it an invaluable tool for industries prioritizing safety and efficiency.

ECA provides wider coverage and encoded inspection data, enabling accurate defect positioning and depth sizing. It is environmentally friendly, requiring no dyes or chemicals. These features make ECA ideal for environments where access to both sides of a pipe wall is restricted.

Comparative Analysis: PT vs. ECA

ECA surpasses PT in detecting ClSCC, particularly for far-side defects. While PT is effective for surface-level discontinuities, its limitations make it less suitable for comprehensive inspections in complex environments. ECA's ability to cover larger areas

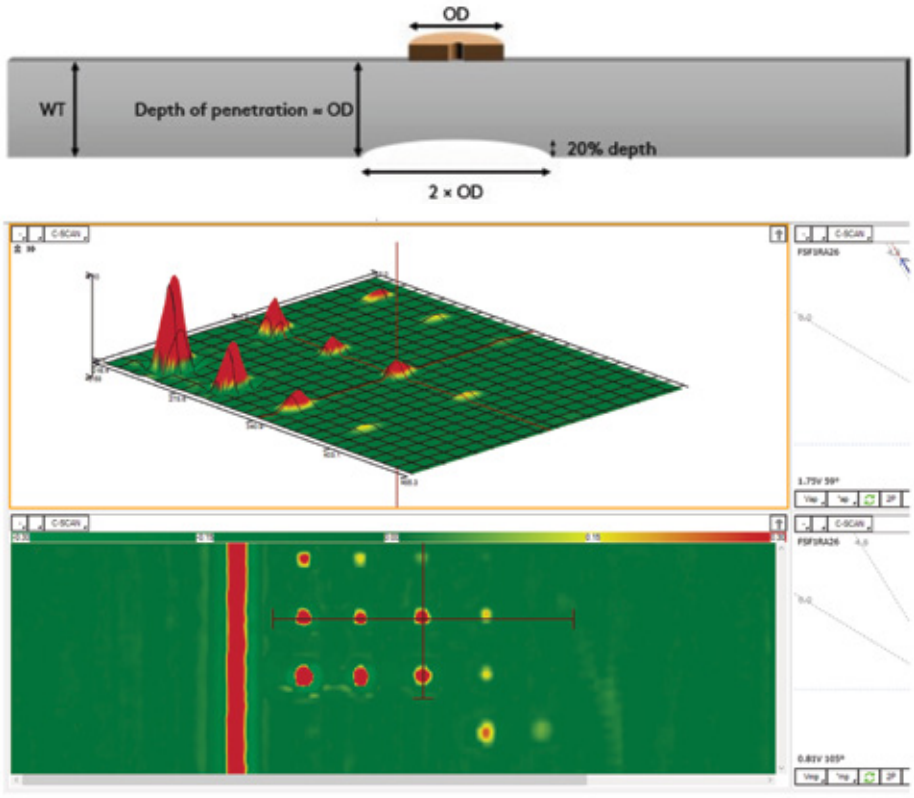
quickly, provide recorded data, and offer greater precision makes it a superior choice, particularly for critical industries like oil and gas.

Though ECA systems require higher initial investments, their long-term benefits in safety, efficiency, and accuracy outweigh the costs. As technology advances, ECA is expected to become the standard for ClSCC detection.

Future Trends in Detection Technologies

The future of ClSCC detection lies in advanced technologies prioritizing precision, efficiency, and sustainability. Innovations in non-destructive testing methods, particularly ECA, are setting new standards for reliability.

The integration of artificial intelligence and machine learning promises further advancements, enabling rapid data analysis and the identification of subtle anomalies. These technologies will play a pivotal role in safeguarding industries reliant on stainless steel, ensuring infrastructure safety and durability.



Reference: https://blog.eddyfi.com/en/dont-crack-under-pressure-how-eddy-current-array-helps-spot-chloride-stress-corrosion-cracking-in-stainless-steel-pipes

Speed. PoD. Efficiency.

SPYNE

Unleash the power of Spyne™—now equipped with a gyroscopic circumferential encoder for unmatched precision and speed. Designed to revolutionize surface inspection, Spyne detects stress corrosion cracking, subsurface defects, and pitting in high-pressure gas pipes, vessels, tanks, and more. With scan speeds up to 1200mm/s and 200mm of coverage in a single pass, Spyne maximizes productivity while delivering reliable, repeatable results. Say goodbye to labor-intensive penetrant testing and magnetic particle inspection methods—Spyne requires minimal surface preparation, handles high temperatures, and is ready to perform right out of the box. Get faster, more efficient inspections with Spyne.

eddyfi.com/spyne

Eddyfi Technologies
Beyond current

BOOST YOUR CAREER WITH INSPENET ACADEMY

Educational Excellence: Access premium training programs in the industrial sector.
Innovative Learning: Go beyond traditional classrooms with up-to-date, relevant content.
Specialized Certification: Designed for visionary leaders and professionals.
Incredible Opportunities: Programs that enhance your professional and academic success.
Quality and Relevance: Committed to accessible, high-quality education.

All courses are offered in Spanish.

Take the leap towards success with INSPENET E-Learning

Visit us at
www.academia.inspenet.com

Slom: Latin American Society of Maritime Oil Terminal Operators and Single Buoys in the Energy Transition

In the current context of the energy transition, the Latin American Society of Maritime Oil Terminal Operators and Single Buoys (SLOM) plays a fundamental role as a catalyst for change toward more sustainable practices. Its influence spans both oil tank yards and maritime facilities, two key components of the energy infrastructure in Latin America. This strategic role involves adopting innovative energy technologies, optimizing operations, promoting cleaner fuels such as liquefied natural gas (LNG) and hydrogen, digitalizing operations, and training personnel to manage these new infrastructures effectively and safely.

In general, SLOM helps its members adapt to this transition through the implementation of sustainable strategies, innovation management, and the creation of regional collaborations. These efforts aim to ensure that the region's maritime and logistics industry achieves a successful energy transition, aligned with global sustainability goals.

Transformation of Oil Tank Yards

Oil tank yards, traditionally designed for storing fossil fuels like crude oil and its derivatives, are evolving to meet the demands of the energy transition. In this context, SLOM plays a crucial role in guiding this transformation. One of its main focuses is the diversification of stored fuels. Tank yards are being adapted to handle renewable fuels such as biofuels, LNG, and green hydrogen, representing a significant shift in energy storage infrastructure.

Additionally, SLOM leads initiatives to promote research and adoption of more advanced energy storage technologies. These include the use of large-scale storage batteries to store renewable energy generated from sources like solar and wind. Such solutions enable tank yards to integrate more efficiently into renewable energy grids, thus contributing to the decarbonization of the sector.

Another key aspect of this transformation is the implementation of carbon capture and storage (CCS) technologies in terminals that store oil and its derivatives. These technologies significantly reduce CO_2 emissions associated with storage operations, aligning with global emission reduction goals. In this context, SLOM can facilitate the adoption of these solutions by providing its members with the knowledge and tools needed to implement CCS systems. Digitalization and automation are also critical aspects of this transition. During various events and forums, the SLOM leadership has emphasized the importance of these technologies as key tools for improving operational efficiency and reducing environmental impact. Smart inventory management and remote monitoring systems help optimize operations, reduce emissions, and ensure greater safety in tank yards.

SLOM
Sociedad Latinoamericana de Operadores de Terminales Marítimo Petroleros y Monoboyas

Modernization of Maritime Facilities and Single Buoys
Maritime facilities and single buoys are essential components of the energy supply chain, as they facilitate the transportation of energy products across oceans. Within the framework of the energy transition, these infrastructures must be modernized to handle cleaner and more sustainable fuels. SLOM plays a central role in supporting the operators of these facilities to adapt to new market demands.

One of the most relevant initiatives is the adaptation of single buoys for the transport and storage of alternative fuels such as LNG and hydrogen. These adaptations require not only changes in physical infrastructure but also the implementation of new safety standards and staff training for operational management.
Moreover, SLOM is promoting electric charging infrastructure at ports. This includes the design of charging stations for vessels operating on electric or hybrid energy, which can significantly reduce local emissions at ports and facilitate the transition to cleaner maritime transport. These initiatives are fundamental for advancing toward a more sustainable energy system that is less reliant on fossil fuels.

SLOM as a Catalyst for the Energy Transition
SLOM positions itself as a key catalyst in the region's energy transition. Its role includes fostering collaboration among terminal operators, governments, and technology companies. These strategic alliances are essential for knowledge exchange and the adoption of best practices in the industry. Additionally, SLOM promotes technology transfer, supporting operators in implementing cleaner and more efficient solutions such as renewable energies, carbon capture, energy storage, and automation.

Another critical aspect of SLOM's role is the development of innovative financing models. This includes facilitating access to green funds and other fiscal incentives that allow operators to make the necessary investments to adapt to the demands of the energy transition. By promoting these financing opportunities, SLOM helps the industry adopt new technologies and sustainable fuels more effectively.

SLOM as a Regional Focal Point
As a focal point in Latin America, SLOM has the capacity to centralize energy transition efforts in the region. This includes defining regional standards and regulations that promote sustainability in the maritime industry. These standards ensure that operators meet clear goals for emission reductions and energy efficiency, aligning with international climate commitments.

SLOM also organizes events, seminars, and discussion platforms that enable operators and other stakeholders to share their experiences and learn about implementing new technologies. This collaborative approach fosters the exchange of best practices and the development of solutions tailored to the region's specific needs.

Additionally, SLOM leads the creation of innovation and collaboration networks. These networks involve universities, research centers, and key players in the technology industry, driving research and development of advanced solutions for the maritime and energy industries. Training and talent development are also priorities for SLOM, which works to ensure that industry professionals are prepared to handle the new technologies and processes associated with the energy transition.

Finally, SLOM is developing environmental certification programs that recognize the efforts of operators implementing sustainable practices. These certifications not only promote the adoption of clean technologies but also provide visibility for best practices in the region, encouraging other operators to follow the same path.

Conclusion
In conclusion, SLOM plays a fundamental role in Latin America's energy transition. Acting as a catalyst and focal point, SLOM facilitates the adoption of innovative technologies, promotes sustainability, and fosters regional collaboration. Its leadership enables the region's maritime and logistics industry to position itself as a global benchmark for sustainability, significantly contributing to meeting international climate goals and ensuring a cleaner, more efficient energy future.

Equipcon Mexico Specializes in Liquid Penetrant and Magnetic Particle Inspection Methods

Equipcon Group, a trusted name in the NDT industry, headquartered in Indiana, USA, recently has expanded its reach with a growing division in Oaxaca, Mexico. For over 30 years, Equipcon has supplied the U.S. market with high-quality nondestructive testing (NDT) supplies, equipment, and systems. This success has led to the company's expansion into Mexico.

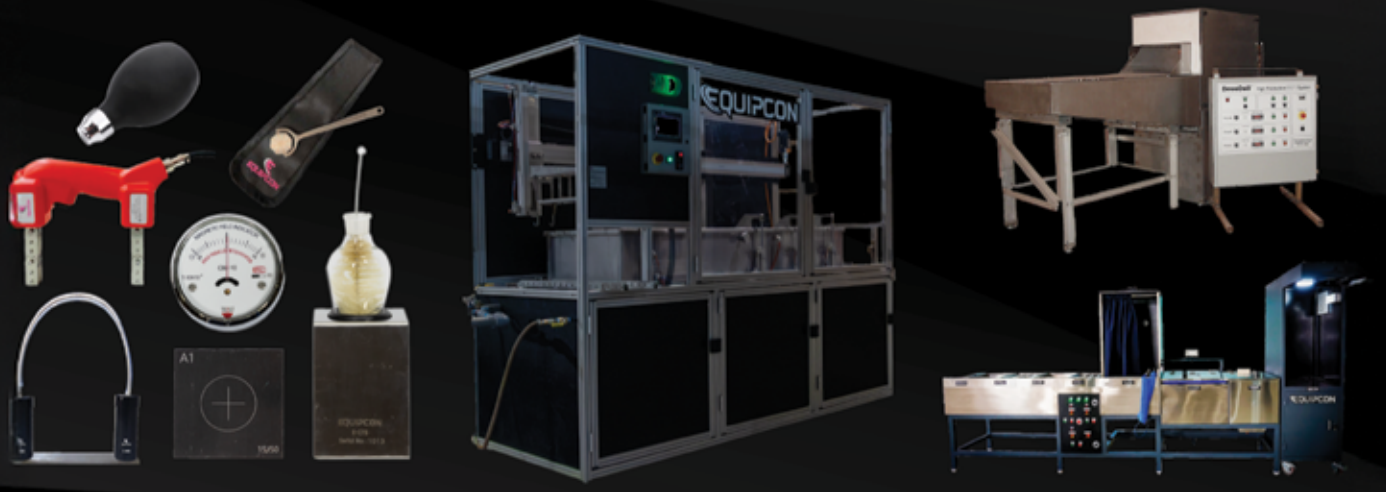
Luis Cruz, Manager of the Equipcon Mexico Division, has been working diligently to increase the brand's visibility in Latin American markets. With the rise of industries in the oil and gas, mining, and automotive component manufacturing sectors across these regions, this is a great time for expansion into these markets for the company.

Equipcon Mexico specializes in liquid penetrant and magnetic particle inspection methods while meeting the requirements of all of these various industries. Including Equipcon's own MPI and FPI automated systems, ultrasonic thickness gauges, sensors, couplants, and integrated UT systems are now readily available to address the needs of clients in these new markets.

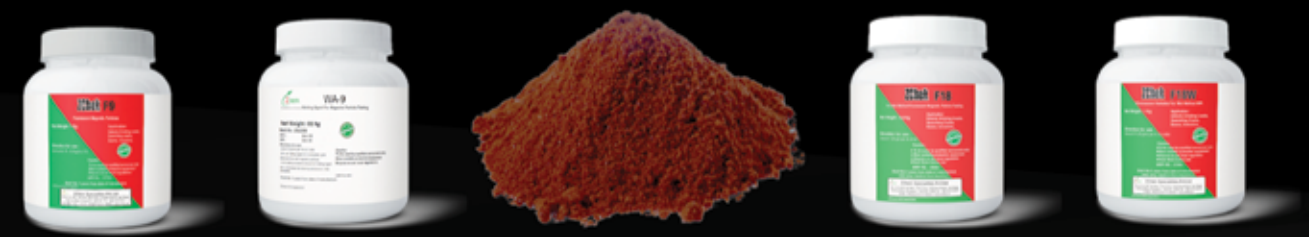
This expansion highlights Equipcon Group's commitment to delivering advanced, innovative NDT solutions to its customers. It aims to improve efficiency and accessibility, strengthening partnerships with businesses in the oil and gas, mining, and automotive component manufacturing sectors across Latin America. Equipcon Group is excited to build on its 30-year legacy of quality and innovation, anticipating continued growth and success in the years ahead throughout Latin America!

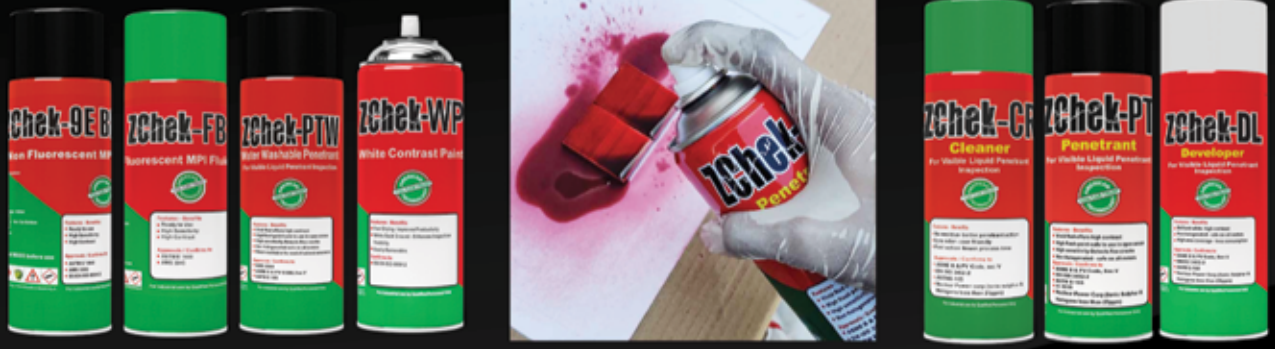
EQUIPCON

For all NDT needs, Equipcon Mexico has you covered



ZChem Materials Now Approved & QPL Listed!





Mexico Headquarters
Address: San Francisco Ixhuatan, Oaxaca, Mexico, 70175
Call: +52 (921) 298-5987

U.S. Headquarters
Address: 15322 Herriman Blvd. Noblesville, IN 46060
Call: +1 (317) 730-3354

www.equipcon.com

Importance of Implementing Modern Processes and Engineering in Sulfur Plants

VECTOR ENGINEERING
INTERNATIONAL, S.A. DE C.V

Globally, the current energy production revolves around six main industries: the oil and gas industry, the electric power industry, renewable energy, mining, nuclear, and bioenergy. Among these, the oil and gas industry remains the primary energy producer. One of the processes involved in the energy production chain of this industry includes sulfur plants, where advanced processes like the SuperClaus process significantly increase the conversion efficiency of sulfur dioxide (SO_2) into elemental sulfur, achieving conversion rates of over 99% compared to the conventional Claus process. This contributes to reducing SO_2 emissions and increases the operational profitability of sulfur plants, ensuring compliance with the strictest environmental regulations and minimizing the environmental impact of industrial operations. Modernization of these processes allows sulfur to be captured and utilized rather than released into the environment as a pollutant, adding economic value by transforming waste into a usable product.

InFor the optimal functioning of an industrial sulfur plant, it is essential to ensure its mechanical integrity under suitable and safe operating conditions for all personnel working there. Therefore, structural rehabilitation of the plant is necessary when equipment has reached its estimated operational lifespan. A critical stage during the rehabilitation of a sulfur plant is the pre-intervention engineering phase. This phase involves various activities, including process design through the Process Flow Diagram (PFD), Piping and Instrumentation Diagram (P&ID), process simulation, technical specifications, plant layout, process control systems, structural design, and design optimization. Completing the engineering phase comprehensively before starting the rehabilitation of a sulfur plant not only ensures technical and operational viability but also guarantees the safety of personnel and the environment, which are key factors for long-term operation.

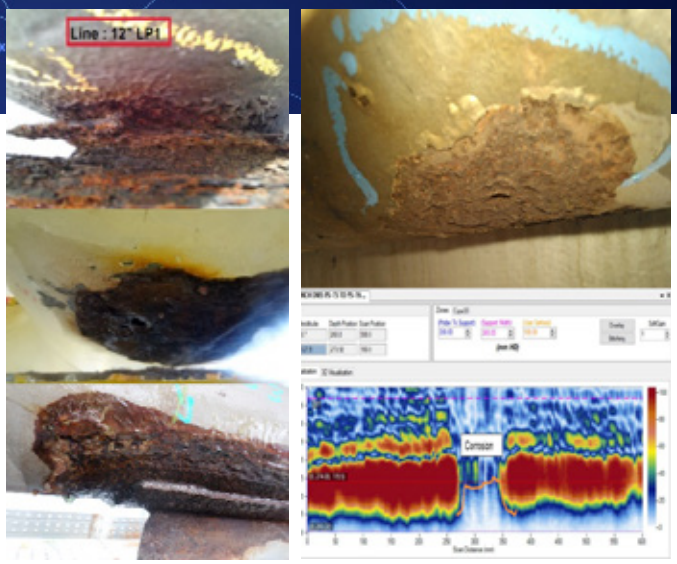
In a global context where efficiency and reducing environmental impact are increasingly crucial, sulfur plants not only ensure compliance with environmental regulations but also optimize resource use, making energy operations more sustainable and profitable.

At Vector Engineering International, one of our key pillars is balancing human development with respect for the environment, promoting a culture of responsibility that translates into productivity and efficiency.Engineering International has experience and highly qualified personnel in various disciplines such as design, mechanical integrity, risk analysis, non-destructive testing, metallurgy and welding, modeling and simulation, corrosion and failure mechanisms, functional safety, maintenance, and repair.


INSPENET TV
YOUR PORTAL TO ENERGY INNOVATION
Inspenet invites you to discover Inspenet TV, the center for technical and professional content in the energy sector.
Access exclusive interviews, documentaries, and detailed analyses that will keep you engaged and enhance your knowledge. With Inspenet TV, you'll always be up-to-date with the latest innovations and industry trends.
Join us and see how technology comes to life!
Visit now at www.inspenet.com

Ultrasonic Higher Order Mode Cluster (HOMC) Guided Waves – Helping Visualize Hidden Corrosion In Piping including Pipe Supports and Estimating the Lowest Remaining Thickness Accurately

K.S.Venkataraman
Director – Escon Dhvani International LLC
www.escon-dhvani.com



INDUSTRY PROBLEM:
Corrosion happening at the support regions of the pipes are severe. Supports can be of various types from simple resting supports, welded sacrificial pads to clamp supports.

Ultrasonic NDT plays a major role in the inspection of these supports. But to perform a conventional ultrasonic inspection in such inaccessible region (i.e. at support locations), the pipes have to be lifted out of the supports, which would be undesirable due to the risk of stressing a pipe that would have been already weakened by corrosion and will involve a complete shutdown.

Several NDE Techniques exist for such inspection but quantifying the wall loss in an accurate manner depends on the nature and extent of corrosion and success has been varied for different techniques

HOMC as a Total Solution
A new concept for the improved inspection of corrosion at the support region of pipelines using a short-range ultrasonic guided wave technique that uses a collection of Higher Order Modes Cluster, called here as HOMC* has been developed and verified at several field sites and round robin trials.

Ultrasonic Guided waves (circumferential or axial modes), once generated will be reflected or transmitted from corrosion and other features on the pipe.

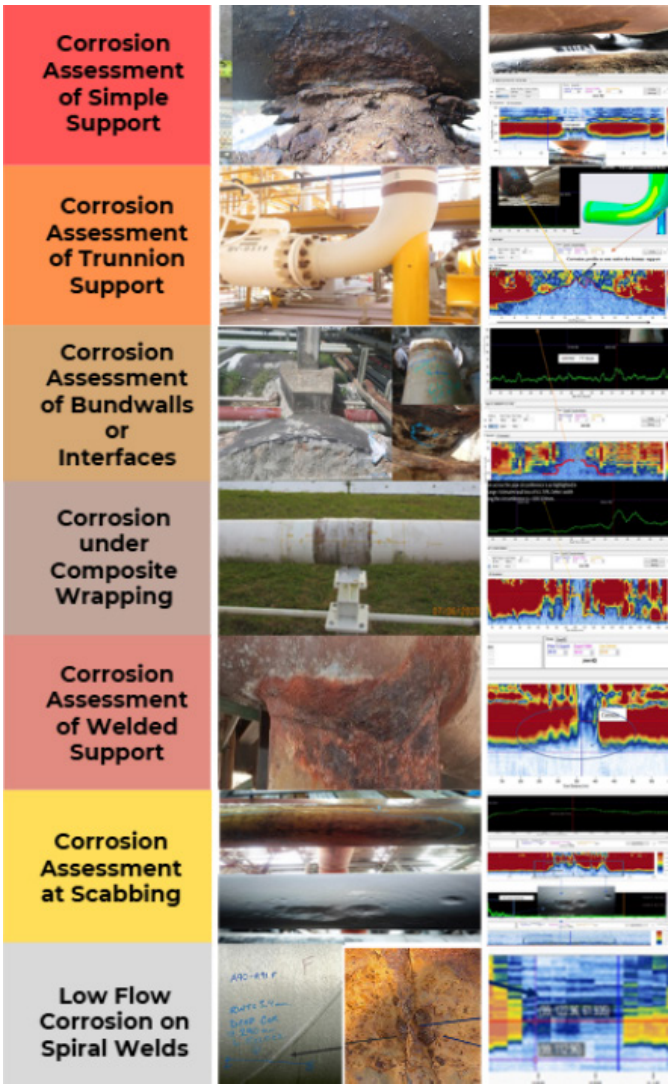
Inspection can be carried out from the accessible portion of the pipe. This could be done as an in-service inspection without emptying the pipe.

HOMC Guided waves are unaffected by the point of incidence of the probe.

Accurate Wall loss estimation independent of Signal amplitude and only a function of time delay together with cross-sectional depth profile mapping and with complete inspection coverage is achieved using two probes on transmit-receive mode with suitable scanning procedures and having sensitivity for both shallow and severe wall loss close to failure.

The performance of this technique across various trials for Pipe Supports has validated its reliability to test a wide range of Pipe Sizes from 2inch in diameter to a flat plate and of thickness 3-20mm and with a wall loss of 20-80% where the sizing accuracy is extremely accurate

Applications of the technique have expanded to Trunnions, Scabbing, Corrosion under wrapping, Riser Clamps, Welded Supports, Bund Wall Crossings, Low-Flow Corrosion in Pipes. Validate Results of estimated wall loss at field deployments have been very accurate.

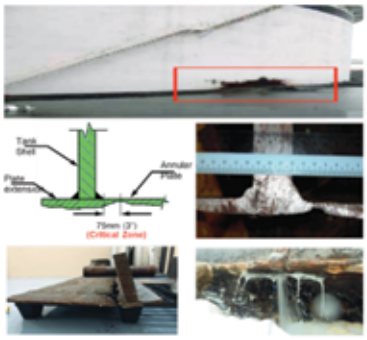


ESCON DHVANI
HIDDEN CORROSION INSPECTORS

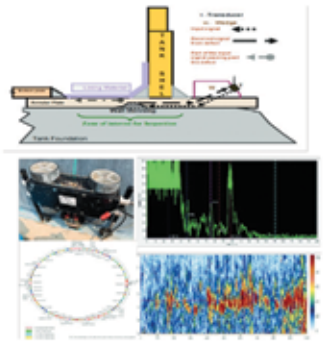
ESCON DHVANI INTERNATIONAL

ULTRASONIC HOMC GUIDED WAVES

Visualize the Invisible & Quantify the Damage in Above Ground Storage Tanks and Pipe Supports



Costly Failures in the Critical Zone of an Above Ground Storage Tank can be prevented with Accurate Detection and Sizing deploying HOMC TAPS Inspection while in service. Inspection is performed from the Chime Projection outside the tank

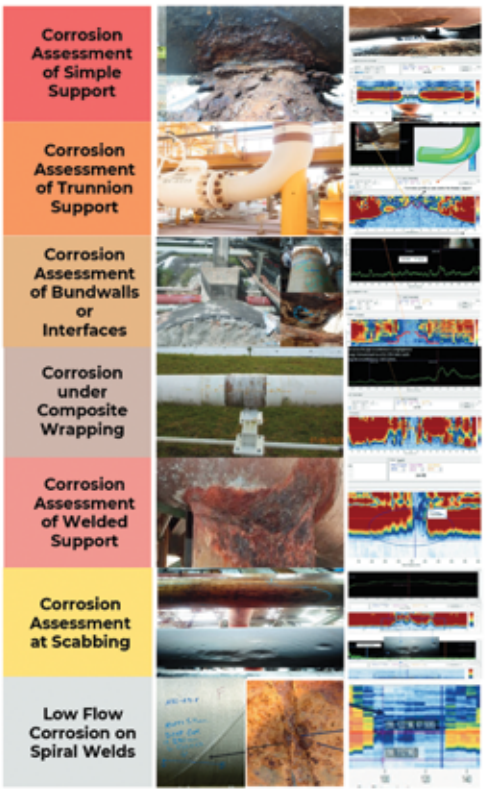


Pipe support corrosion failures have severe consequences and can occur without prior warning.

Ultrasonic HOMC guided waves (circumferential or axial modes), allow Inspection from the accessible portion of the pipe (in-service inspection) without emptying the pipe. HOMC guided waves are unaffected by the point of incidence of the probe.

A Signal Amplitude Independent - Time Delay based Wall Loss estimation and thus minimum remaining wall thickness in the pipe is estimated together with the cross-sectional depth profile mapping of the corroded area.

Pipe Sizes that can be inspected include 2" and above and Wall Thickness Range of Pipes include 3-20mm and Wall loss Depth measurement between 20 and 80% Wall loss.



www.escon-dhvani.com

On how a Bendable DR Detector can Expand, Enrich and Reinforce your Radiographic Imaging Capabilities.

CarestreamNDT

On Structured Innovation.

The pace for technological innovations on NDE is influenced not only by the industries where these innovations are deployed but also by how each organization aims to expand, enrich, and reinforce at its own pace its imaging capabilities. Industries such as oil and gas, nuclear, construction, foundry and castings, energy generation, aerospace, NDE services companies, transportation, automotive, military, and defense make ample use of a very diverse palette of imaging capabilities.

This richness not only contributes to assure the quality and safety of the associated assets but also provides essential information and knowledge to support substantially important decision-making processes at all hierarchical levels in the asset stakeholder's ecosystem.

Technological advancements in imaging sensors, IT & Telecommunications hardware, and their associated software create a positive syngenetic effect on the rest of the constituents of an organization's imaging ecosystem.

A recent article written in ASNT's journal Materials Evaluation by Fernandez and Singh on Structured Innovation provides interesting insights into how innovation can be nurtured and guided: **"Innovation in nondestructive evaluation (NDE) is an increasingly important contributor to the safety assurance of high-value assets and operationally critical systems.** It enables asset integrity for owner-operators and enhances their ability to adapt in a changing world. Novel and innovative ideas give rise to better ways of inspecting, as well as new solutions for reducing costs, generating valuable data, and improving long-term sustainability. **However, innovation is not just having a few bright ideas. It is about creating value and helping organizations continuously adapt and evolve."**

Brian S. White, Carestream NDT, Rochester, NY. USA, brian.white@carestream.com

WHY SHOULD YOU USE IT

PRODUCTIVITY	OPERATIONAL SAVINGS	HEALTH AND SAFETY	ENVIRONMENTAL IMPACT
• Faster time to image vs Film and CR • Instant Images (no processing time associated with film development or IPs Scanning) • Labor flexibility (Complete significantly more work in the same amount of time) • Reduce work burden associated with retakes	• Consumables (including films and chemicals or imaging plates) • Inventory carryings costs • Chemical wastes disposal costs • Film scanning and archiving • Isotope replacement costs	• Smaller exclusion zones are possible • Reduce radiographer's fatigue (associated with running films and imaging plates)	• Eliminate impacts associated with chemicals production, distribution and waste disposal. • Eliminate water consumption impact associated with film processing

Currently it is only available in the USA and Canada

DRIVING TANKS
A Proactive Approach to Manage Storage Tanks

BECHT 60 YEARS OF EXCELLENCE 1964 · 2024

Storage tanks play a key role in the energy and liquids commodities supply chain. Diversity of products, business logistics needs and regulatory frameworks all make storage tank management programs very complex. Visibility and severity of storage tank incidents generate public reactions that regulatory bodies, tank owner-operators and industry organizations try to address by imposing new mandates and standards.

The root cause of storage tank problems is commonly overlooked while the focus has been reactive to remain in compliance with standards and mandates from regulatory bodies.

The Becht **"Driving Tanks"** initiative is focused on proactively managing storage tank problems by consolidating a network of senior tank owner-operators who will pool their experience to positively influence standards improvements, risk reduction, operational optimization and increased profitability.
We will share lessons learned and analyze data trends to better define and prioritize general interest tank initiatives, research and feedback to industry organizations, committees and regulators.

We will share lessons learned and analyze data trends to better define and prioritize general-interest tank initiatives, research and feedback to industry organizations, committees and regulators.

We started the conversation with the "Driving Tanks" initiative kickoff meeting that occurred May 8th, 2024 in Houston. The meeting was facilitated by Becht with the participation of several tank owner-operators, and it helped narrow the focus to four topics:

1. **Floating Roof Reliability Centered Management**
2. **Bottom Repair Proactive Strategies**
3. **Repair Scope of Work - Review/Approval Workflow**
4. **Risk-Based Tank Integrity Program**

We also committed to creating the "Driving Tanks" Industry Forum, where our community of "tank drivers" will be sharing lessons learned and exchanging experiences in response to posted questions and topics for discussion.

This forum is now available on the INSPENET technical platform. We invite you to participate and share your experiences, lessons learned or concerns by visiting:

https://inspenet.com/en/foros-2/forum/tanks-and-terminals/

For more information on "Driving Tanks" contact Rafael Rengifo / rrengifo@becht.com

INSPENET

invites you to join the

Driving Tanks Forum

A collaborative space to exchange experiences and insights on Storage Tank Management.

Connect with multidisciplinary professionals dedicated to proactively managing tanks.

This forum will be moderated by the

“Tank Commander”

Rafael Rengifo

“Tank Whisperer”

Earl Crochet.

“CEO Inspenet”

Francesco Solari

Register now at Inspenet,
and start driving tanks today!

STORAGE

TERMINALS MAGAZINE

DEDICATED 100% TO THE GLOBAL TANK STORAGE INDUSTRY

RISE AND SHINE

it's media planning time

To receive the 2025 Media Pack for Storage Terminals Magazine please contact Greg Emmenis greg@storageterminalsmag.com or Tracey Sansom tracey@storageterminalsmag.com . Tel +44 7877 003195

STOCEXPO 20
CELEBRATING 20 YEARS

11&12 March 2025
Rotterdam Ahoy

The blueprint event for sustainable storage

Celebrating 20 years of industry excellence

3,574 attendees

80% of exhibitors would recommend StocExpo

92% of visitors will return in 2025

79% of exhibitors plan to return in 2025

91% of exhibitors feel exhibiting at StocExpo is crucial for this business

64% of visitors were at a managerial level or above

"It's my first time coming to StocExpo, and I'm happy with what I've experienced so far! The conference has been engaging, covering a wide range of topics that have kept me interested throughout!"

Jan Gelens, Safety Advisor, **Vopak**

stocexpo.com

REGISTER FOR FREE NOW!

by EASYFAIRS

INSPENET

www.inspenet.com

AMPP

MISTRAS

RAM 100 PIPELINE REPAIR SYSTEMS

ENGIE

CarestreamNDT

CORTEST

MIS

Brown Corrosion Services, Inc.

TOTALCOAT INDUSTRIAL

GUIDED ULTRASONICS LTD.

VECTOR ENGINEERING INTERNATIONAL, S.A. DE C.V

EQUIPCON

TECNO NDT

Testek GROUP

Eddyfi Technologies

VERSA INTEGRITY GROUP

The Tank Whisperer

VIRTUAL TANK SOLUTIONS

hocol

Honeywell

DIAPSA Diagnóstico y Asesoría Predictiva

STI SPFA

CFS CONSULTING & FIELD SERVICES

bluewater

TRUSTWELL ENERGY & EMISSIONS MANAGEMENT

iMC Integrity Management Co.

grupo

STOCEXPO 20 CELEBRATING 20 YEARS

I:M OFFSHORE AND MARINE ENGINEERS PVT. LTD.

Gastech

Naturgy

BactiQuant Grounded in science and know-how

AEND asociación española de ensayos no destructivos

THANK YOU TO OUR ESTEEMED PARTNERS IN THE BUSINESS DIRECTORY!

SLOM
Sociedad Latinoamericana de Operadores de Terminales Marítimo Petroleros y Monoboyas

ILTA

API American Petroleum Institute

BECHT
Good Better Becht

OCENSA 30 AÑOS
EN MOVIMIENTO

Mesa ETP
ENGINEERED TANK PRODUCTS

MARVAL

ANCAP

INSPEAICA
LATINAMERICAN SERVICES LLC

H2 México
ASOCIACIÓN MEXICANA DE HIDRÓGENO

NATURGAS
ASOCIACIÓN COLOMBIANA DE GAS NATURAL

IOCS Srl
Marine Hose & Ancillary Equipment for Oil & Gas industries

ASNT The American Society for Nondestructive Testing

STORAGE
TERMINALS MAGAZINE

ANCOR
Pipeline Integrity

GPA MIDSTREAM ASSOCIATION

LAMOR

PENSPEN

Buzca
Soluciones de Ingeniería

Puerto Bahía

4A Inspection
NDT Service Solution

SOFEC

AFRECOR
Somos Resiter

OCIMF

BR TRANSPETRO

EVIDENT

Naval & Industrial SOLUTIONS

ROSEN
empowered by technology

Greater Houston Port Bureau

RECUMAR
RECURSOS MARITIMOS S.A.S.

CHAMPIONX

SUBSEA
NDT & ENGINEERING

EDI
ESCON DHVANI
HIDDEN CORROSION INSPECTORS

Gen
sistemas de medición y control
Gasoductos y Estaciones del Norte

PROFESSIONAL PROFILES

Charles Becht IV

Dr. Charles (Chuck) Becht IV, PhD, PE, is CEO of Becht and a renowned expert in pressure vessels, piping, and elevated temperature design, with over 40 years of experience. A former ASME B31.3 Chairman, he has chaired five committees, authored two books, and holds seven patents. Dr. Becht has received multiple prestigious awards, including the ASME Pressure Vessel and Piping Medal and the B31 Forever Medal.

Charles Becht V

Charles (Chuck) Becht V, PE, President of Becht, is a mechanical and nuclear engineer specializing in FEA, thermo-hydraulics modeling, and fitness-for-service (FFS) assessments. With expertise in failure analysis and repair, he has developed models for NRC hydraulic issues, LOCA transients, and waterhammer events. Chuck holds a Master's in Nuclear Engineering from Georgia Tech and a Bachelor's in Mechanical Engineering from Bucknell University.

Anchal Liddar

Anchal Liddar is Senior Vice President of API's Global Industry Services (GIS) division, which is responsible for standards setting, certification, training, publications and safety programs for industry operations. Previously she spent nine years at The Boeing Company, serving various roles in supply chain, finance, and program management. Anchal holds a Bachelor of Science from the University of California – Irvine and an M.B.A. and a Master of Science in Information Systems & Technology from Claremont Graduate University.

Israel Hurtado

Israel Hurtado is a leading energy sector expert with over 20 years of experience. Founder of the Mexican Hydrogen, Storage and Sustainable Mobility Association, he has shaped renewable energy policies in Mexico. He's also an author, podcast host, and former Commissioner of the Energy Regulatory Commission. Recognized as one of Mexico's top 100 energy leaders, he's also a former legislator and legal advisor.

Briam S. White

Lab Manager with extensive experience in product design and quality within non-destructive testing. Expert in film, computed, and digital radiography with detector arrays. Active member of ASTM radiography standards committee, serving as secretary. Holds a Bachelor's in Imaging Science from the Rochester Institute of Technology. Certified Radiographer, Six Sigma Blackbelt, and skilled in X-ray physics, digital imaging, and system development. A recognized leader in the energy sector.

David Alleyne

Dr. David Alleyne, CEO and co-founder of Guided Ultrasonics Limited (GUL), has revolutionized guided wave inspection. With a Ph.D. from Imperial College London, his groundbreaking work has globally impacted industries like oil, gas, and energy. A leader in the NDT field, he's an active mentor to young professionals and was appointed CEO of ASNT in 2023, recognized for his technical and social contributions.

Earl J. Crochet, PE

Earl has worked in engineering, operations, management and other roles in pipelines and terminals. He has served on various API committees since 1994: SCAST, API 2350, and others. He has been a Certified API 653 Tank Inspector since 1993. He has a BSME and an MBA from LSU. He is a Registered Professional Engineer in 4 States. He holds 4 U. S. Patents.

Emilie Peloquin

Emilie Peloquin has over 15 years in the welding/NDT industry, holding a welding degree, certifications from CWB, and an Associate's in Non-Destructive Examination Technologies. She is the Executive Director of NDT Application Engineering at Evident, a leader in ultrasonic technologies. Active in the NDT community, Emilie serves on ASNT's Board of Directors, chairs ASME's FMC and ISI working groups, and hosts the Inspect Tech podcast.

KS Venkatarama

K S Venkataraman finished his master's degree in Non Destructive Testing from Brunel University and has worked in Europe before setting up the Advanced NDE services arm of the ESCON group of companies in South East Asia . The drive to innovate and develop cutting edge solutions in the field of NDE saw the birth of the Dhvani Research and subsequently Escon Dhvani International and Dhvani Aii. These were set up partnering the Centre for NDE Chennai and has an integrated facility that houses over 150. People developing solutions, R and D, HOMC technology development and Inspection Systems.

José Perdomo Rivadeneira

José Perdomo Rivadeneira is a seasoned maritime professional with 43 years of experience in port operations and international maritime transportation. He specializes in offshore oil terminal projects (Monobuoys, Ductile Alba docks, platforms). A consultant and trainer for the UN-IMO on maritime safety, he has worked with PDVSA and ConocoPhillips on major oil export projects. As CEO of IENPAC Consulting Services, he delivers technical seminars globally, focusing on mooring systems and port security.

Rafael Rengifo

Rafael Rengifo is Director of Midstream & Logistics at Becht, with over 30 years of experience in mechanical integrity and engineering. He leads multidisciplinary solutions for midstream companies. He has served as Director of Engineering, Tank and Facility Integrity Manager, and Global Leader for Tank and Marine Terminal Integrity. Rafael holds a degree in Materials Engineering, is API-653/510 certified, and holds key roles in various industry initiatives.

Oscar Mendoza

Oscar Mendoza Rebolledo is a recognized leader in the energy industry with an honorary doctorate and multiple diplomas in Energy Project Management. With over 25 years of experience, he has held key roles at companies like Schlumberger and Actaris Metering Systems. He is currently the Director of Gas Mexico and Central America at Gasoductos y Estaciones del Norte. He has been recognized as one of the 100 most influential leaders in the energy sector and has participated in key forums.

Joshua de Monbrun

Joshua de Monbrun, CEng, has over 20 years of NDT and Engineering experience. He holds multiple certifications, including ASNT NDT Level III and is a Chartered Engineer. With over 10 years at MISTRAS Group, he contributed to NDT training and innovation. A US Air Force veteran, he serves as Chair of ASNT's Underwater NDT Committee and is active in various industry organizations. He advocates for integrating new technologies in NDT.

Juan Lugo

Juan Lugo Marín is an Industrial Engineer with a Master's in Quality Management and a Doctorate in Administrative Sciences. With postdoctoral studies in Business and Futures Studies, he's been a leader in quality management since the '90s, implementing ISO-certified systems across oil, gas, manufacturing, and services. A management consultant since 2000, he's also a retired professor and published author on strategic management and quality improvement.

Leonardo Uller

Leonardo Uller, a seasoned chemist with a Ph.D. in Chemical Engineering, specializes in high-temperature corrosion. With over 50 years of experience, he's led research at France's Atomic Energy Commission and founded companies like CORRTEC and SURPLUS. Uller has advised global organizations such as the UN, developed anti-corrosion solutions for ethanol-powered vehicles, and is spearheading standards for hydrogen material testing. He's a recognized leader in materials protection and a Fellow of NACE.

Salah AlZahrani

Salah AlZahrani is a senior engineer with 17+ years at Saudi Aramco, specializing in inspection across mega projects like pipelines and refineries. He's an expert in NDT, particularly ultrasonic testing, and has led teams to tackle complex technical challenges. With strong management skills, Salah excels in meeting tight deadlines. A certified NDT Level III and AWS-CWI, he's also an experienced instructor and presenter in NDT methods.

Malvin Delgado

Malvin Delgado is a seasoned business leader with over 30 years in energy and manufacturing. As CEO of Trustwell Energy and GM of Fluid-7 Americas, he drives energy transition and sustainability through innovative solutions. With past roles at Siemens, GE, Shell, and PDVSA, he excels in P&L, market expansion, and team management. A multilingual strategic thinker, Malvin leads with vision, operational excellence, and a focus on results across global markets.

Mohammed A. Abufour

Mohammed Abufour is a seasoned NDT expert with over 40 years in the oil and energy industry. Holding an ASNT Level III certification in UT, MT, and VT, he's led teams, developed NDT techniques, and ensured compliance with industry standards. A lifetime ASNT member, he's served on the ASNT Board and currently directs the region covering the Middle East and South Asia. His innovative work has earned numerous awards, including the 2022 Charles N. Sherlock Award.

Yolanda De-Abreu

Yolanda De-Abreu is a Materials Engineering expert with a B.S. from Simon Bolivar University and a Ph.D. from the National Polytechnic Institute of Toulouse. With over 20 years in the energy sector, she's worked as a professor, consultant, and Corporate Scientist at ChampionX. Yolanda specializes in electrochemistry, failure analysis, and corrosion, contributing to innovations in hydrogen-compatible chemistry and pipeline sustainability. She also teaches at the University of Houston and University of Martinique.

Yolanda Villegas

Yolanda Villegas, Ph.D. in Humanities with a focus on Water and Energy, is an expert in international law, energy law, and corporate governance. She has authored four books, including "Energy 2050" on energy technologies and regulation. With over 18 years of experience, she's worked with top companies like GE, PEMEX, and HEINEKEN. Currently, she's the Global Legal Director at Envases Universales and CEO of OLEUM. She's recognized as one of Mexico's top energy leaders (2019-2023).

Ana Ludlow

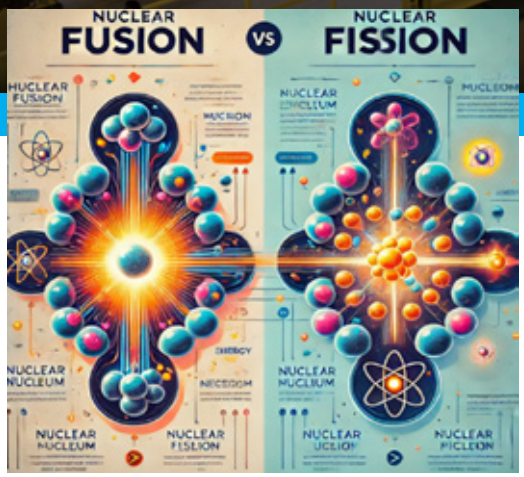
Ana Ludlow, with a master's in administration, has over 22 years of experience in the energy sector in Mexico and the U.S. She was General Manager of ENGIE's Los Ramones Sur gas pipeline, Mexico's second-largest. Currently, she is Vice President of Government Affairs and Sustainability at ENGIE Mexico and leads the National Energy Committee of the Cámara Nacional de la Transformación Industrial. Ana also mentors in IEEE's Women in Power program and writes for energy publications.

Bostjan Bezensek

Bostjan Bezensek is a renowned expert in structural integrity with over 15 years of experience in Engineering Critical Assessments (ECA), fracture mechanics, and fitness-for-service analysis. He currently works at Shell, assessing asset integrity against threats such as corrosion, fatigue, and fracture. He has contributed to international standards like ASME and BS 7910, published key research, and delivered lectures on structural integrity worldwide.

Nuclear Fusion: Recent Advances That Will Transform Global Energy

By: Eng. Antonio Zavarce.



Comparative Diagram of Nuclear Fusion vs Nuclear Fission

Nuclear fusion is a process in which light nuclei, such as hydrogen, combine to form heavier nuclei, releasing enormous amounts of energy, as seen in the Sun. Unlike traditional energy sources, fusion is emerging as a global trend toward clean and nearly limitless energy, as it emits no carbon dioxide and generates no long-term radioactive waste. Additionally, it is a self-sustaining process: once a self-sustained reaction is achieved, the system can produce continuous energy for extended periods as long as necessary conditions are maintained. With projects like ITER leading the advancements, nuclear fusion is positioned as a key solution to the global energy crisis. Its success could transform the global energy landscape, offering a sustainable, safe, and efficient energy source to meet future growing demand.

What is Nuclear Fusion?

Nuclear fusion occurs when two light nuclei, such as deuterium and tritium (isotopes of hydrogen), combine under extreme conditions of temperature and pressure to form a heavier nucleus, releasing large amounts of energy in the process. To achieve fusion, the conditions of the Sun must be recreated, reaching temperatures of millions of degrees.

In contrast, nuclear fission splits heavy nuclei, such as uranium, to release energy. Although fission also produces significant amounts of energy, it generates long-term radioactive waste and carries greater risks of accidents.

The primary advantages of fusion include its low environmental impact (no CO_2 emissions), the abundance of fuel (hydrogen), and limited radioactive waste. If this process can be mastered, nuclear fusion could provide virtually limitless and safe energy.

Recent Advances in Nuclear Fusion

In recent years, nuclear fusion technology has made significant progress. One of the most important milestones has been the development of tokamak reactors, which use magnetic confinement to control the hot plasma necessary for fusion. The ITER project in France is one of the most ambitious, aiming to demonstrate the feasibility of this type of large-scale energy.

Recently, fusion reactions have been sustained for longer periods at higher temperatures, bringing us closer to self-sustained fusion. Additionally, technologies such as inertial confinement reactors, which use high-powered lasers to trigger fusion, are being explored.

These advances have generated optimism within the scientific community, suggesting that fusion could become a commercial reality in the coming decades, potentially revolutionizing the global energy future.

The ITER Project: Key in the Race for Fusion

The ITER Project (International Thermonuclear Experimental Reactor) is one of the most ambitious experiments in the history of nuclear energy. Located in southern France, ITER's primary goal is to demonstrate the viability of nuclear fusion as a clean, safe, and nearly limitless energy source. Its design uses a tokamak reactor, which confines hot plasma with magnetic fields, recreating the conditions necessary for fusion, similar to the process occurring in the Sun.

ITER is being developed through international collaboration, with the participation of over 35 countries, including the European Union, the United States, China, India, Japan, Russia, and South Korea. This joint effort has led to critical advances, such as improved magnetic confinement and an increase in the duration of sustained fusion reactions.

With an estimated cost in the billions of dollars, ITER's success would mark a turning point in the history of energy, providing solid evidence that fusion can be a viable energy source for the future, reducing our reliance on fossil fuels.

Implications for the Energy Future

Nuclear fusion has the potential to completely transform the global energy landscape. By offering a nearly limitless, carbon-free energy source, it could accelerate the energy transition toward a clean energy model. Its ability to generate vast amounts of energy with minimal fuel, combined with the absence of long-term radioactive waste, would make fusion a sustainable alternative to meet the world's growing energy demand.

Conclusion

Nuclear fusion represents a unique promise to reshape the global energy matrix. With significant advances in projects like ITER, the foundation is being laid for fusion to become a sustainable and safe energy source. While technical and economic challenges remain, the progress so far is encouraging. If the proposed goals are achieved, we could witness the emergence of a clean, virtually limitless energy source that could revolutionize the way the world produces and consumes energy, ensuring a safer and more sustainable energy future.

The impact of Liquefied Natural Gas (LNG) on the Transformation of The Global Energy Sector

By: Eng. Mario Toyo

Today, Liquefied Natural Gas (LNG) is considered an important component in the transformation of the global energy sector. Energy companies, operators and industry professionals are using it to advance their decarbonization and diversification goals. The following highlights the main aspects that demonstrate the impact of this energy source.

Emission Reduction and Decarbonization

LNG has proven to be effective in reducing carbon dioxide (CO2) emissions and other pollutants compared to traditional fossil fuels, such as coal or oil. Its use in electricity generation and shipping has led to a significant decrease in greenhouse gas emissions. This alternative is positioned as an intermediate solution while renewable energies are unable to meet global energy demand.

Energy Matrix Diversification

Its ability to be transported by ship has allowed countries to diversify their energy sources, reducing dependence on more polluting fuels. In a volatile energy scenario, with geopolitical crises, LNG provides flexibility and security. Countries such as Japan and South Korea depend on LNG to guarantee their natural gas supply, especially in times of uncertainty.

Global Energy Security

During the war in Ukraine, its role has been key to Europe's decreasing dependence on Russian gas. Shipping capacity allows countries not dependent on pipelines to secure a steady supply. This flexibility has changed the global map of energy imports, providing stability in times of crisis.

Technological Innovation

Liquefaction and regasification technologies have improved its distribution, allowing more remote regions to access this energy source. Innovations such as floating terminals and smaller plants have expanded its use. In addition, carbon capture and storage (CCS) technologies are improving the environmental profile of LNG, making it more attractive to companies seeking to meet their sustainability goals.

Market Growth and Global Demand

LNG demand has grown rapidly in recent years, with Asia and Europe leading the way. In 2023, global demand reached 400 million tons, up 7% compared to 2022. Global consumption is projected to increase by 3.4% annually through 2030. Its use as a marine fuel has also grown due to stricter regulations on emissions.

Perspectives: Between Support and Criticism

Proponents of LNG see it as an essential solution for the energy transition, capable of meeting demand while reducing emissions. However, critics argue that it is still a fossil fuel, and that investments in LNG infrastructure could delay the adoption of renewables. For them, the transition to 100% clean sources should be accelerated.

Conclusion

Liquefied Natural Gas is playing a central role in the transformation of the global energy sector, offering a cleaner and more flexible alternative for countries and companies seeking to reduce emissions and secure their energy supply. However, its future as part of a long-term solution remains a matter of debate, as a complete transition to renewables is needed to meet global climate targets.

New Technologies in Offshore Exploration

By: Ing. Euclides Quiñonez

Emerging technologies are transforming the oil and gas energy sector, especially in exploration and production activities in offshore facilities. Artificial intelligence (AI), drones and robotic subsea vehicles have established themselves as essential tools that optimize operational efficiency, improve safety conditions, and enable cost reduction through accurate, real-time monitoring and automated interventions in highly complex and risky environments.

Artificial Intelligence: Data Optimization and Decision-Making
AI is being used to analyze large volumes of data in real time, enabling offshore platforms to optimize their operations and reduce risks. Using advanced algorithms, patterns, and potential equipment failures can be predicted, anticipating problems that could disrupt production or jeopardize operator safety. In addition, AI facilitates the interpretation of seismic and geological data, improving accuracy in the identification of hydrocarbon reserves. This predictive capability is highly important in an environment as dynamic and dangerous as offshore platforms.

Drones: Remote Monitoring and Supervision
Aerial drones are another technology that has gained relevance in offshore exploration and production. Equipped with high-resolution cameras and infrared sensors, these devices perform detailed inspections of structures and equipment without the need to expose personnel to risk. For example, drones can detect gas leaks, corrosion and structural damage quickly and accurately, providing real-time information to operators onshore. This remote monitoring capability minimizes worker exposure to hazardous conditions, such as heights and explosive environments, significantly improving safety.

Underwater Robots: Exploration and Maintenance at Extreme Depths
Underwater robots, known as Remotely Operated Vehicles (ROVs), are used to inspect and repair subsea infrastructure, such as pipelines and wellheads, in environments that would be inaccessible or extremely dangerous for divers. ROVs are equipped with high-resolution cameras, robotic arms and advanced sensors that allow operators to perform detailed assessments in real time from the surface. Thanks to these tools, companies can detect and repair problems more efficiently.

Technology Integration for a Safer and More Efficient Future
The integration of these technologies is transforming the offshore industry by combining the capabilities of AI, drones and subsea robots to maximize efficiency and safety in operations. For example, AI analyzes data obtained by drones and ROVs, generating accurate reports and predictions that enable operators to make informed maintenance and production decisions. This technological synergy optimizes operations, reduces the environmental footprint by minimizing human intervention, and improves accuracy in identifying hydrocarbon reserves.

In conclusion, artificial intelligence, drones and subsea robots are transforming offshore exploration and production. These innovations not only improve efficiency and reduce costs, but also play a critical role in protecting personnel and infrastructure. The continued implementation and development of these advanced technologies promises a safer, more efficient and sustainable future for the offshore oil and gas industry.

Midstream perspectives in the New Energy Environment

By: Eng. Mayuly Rodríguez

Introduction
The midstream sector, historically linked to the transportation and storage of fossil fuels, is undergoing a major shift. Driven by the energy transition, this key sector of the energy industry value chain is adapting its infrastructure and processes to efficiently and sustainably store, manage and distribute an increasing variety of clean energies. These adaptations respond to global demands for decarbonization and a commitment to sustainability.
Midstream innovation and projection for a green future
The midstream sector faces a landscape full of pros and cons in the new energy environment, requiring a transformation of its infrastructures and business models. The adoption of advanced technological solutions is leading the way to a greener and more sustainable future. Some trends include:

• Hydrogenation of pipeline systems: Involves the reconversion of existing pipelines to transport green hydrogen. This strategy optimizes existing infrastructure, facilitating the decarbonization of sectors that are difficult to electrify and promoting a more sustainable and efficient energy transition. However, it is critical to address technical and safety challenges to ensure a successful implementation of this technology.
• Energy storage technologies: Innovations such as flow batteries, metallic hydrogen and thermal storage with materials such as molten salts are revolutionizing the ability to conserve energy for industrial processes and power generation.
• Digitalization and automation: The implementation of digital technologies, such as artificial intelligence and the Internet of Things (IoT), is optimizing operations management, improving efficiency, reducing risks and increasing the sustainability of the sector.
• Advanced materials: New developments, such as carbon fiber composites and ceramic coatings, are increasing the durability and energy efficiency of piping systems and storage tanks.

The future of midstream is also linked to the integration of renewables, which will require flexible infrastructures to handle variability in energy supply and demand. In addition, the adoption of circular economy principles will reduce waste and optimize resources, while progressive decarbonization, driven by emerging technologies such as green hydrogen and digitalization, will improve the overall sustainability of operations. Companies that adapt nimbly to these changes will be better positioned to lead the energy transition.

Boosting midstream digital innovation
Digital technologies are innovating the way midstream companies operate within the new energy model. Technologies such as digital twins allow the creation of virtual replicas of infrastructures, facilitating scenario simulation and design optimization, which improves decision-making.
The analysis of large volumes of data, collected through sensors and connected devices, helps to identify patterns, detect anomalies and improve process efficiency, facilitating more proactive maintenance. In addition, blockchain emerges as a tool that increases transparency and security in energy supply chain transactions.

Certifications and strategic partnerships
Strategic alliances between energy, technology, finance and environmental organizations are essential in the midstream sector to meet international standards and promote sustainable practices. Government-driven public-private partnerships are developing sustainable energy infrastructure projects, contributing to the transition to a greener future.

Sustainability certifications, such as ISO 14001 and the GHG Protocol, help companies measure and reduce their carbon footprint, facilitating access to financing and increasingly demanding markets. For example, ISO 14001 certified companies demonstrate their commitment to sustainability and compliance with environmental standards. In addition, partnerships with NGOs and technology startups accelerate the implementation of innovative solutions, improving energy efficiency and resource management.

Promoting R&D for midstream sustainability
Midstream companies must prioritize investment in research and development to address the complexities of the energy transition. Critical areas, such as the development of biofuels, biogas, and advanced materials for energy storage, including high-capacity batteries and efficient hydrogen storage systems, will be necessary actions to remain competitive in this new energy environment.

In addition, feasibility studies are already underway to adapt existing pipelines to hydrogen transport, which is a necessary action for decarbonization, as it allows taking advantage of the current infrastructure while moving towards cleaner energies.

Conclusion
The future of the midstream sector will depend on our collective ability to innovate and adapt to the new energy environment. The transformation to a sustainable system requires technological advances and a broad commitment to economic and social development. The energy transition is an opportunity to redefine midstream infrastructure and operational practices, balancing today's needs without compromising those of future generations.

The Rise of Portable Wind Turbines: Harnessing Energy on the Move

By: Tec.Jose Lopez

In an era of increasing energy demand and environmental awareness, portable wind turbines are emerging as an innovative solution for sustainable energy generation on the move. These compact engineering marvels are transforming the way we think about renewable energy in remote or mobile environments.

As the world transitions to cleaner and more sustainable energy sources, there is a need for technologies that not only reduce reliance on fossil fuels, but also offer energy solutions to communities and places with very limited infrastructure.

Features of portable wind turbines
Their ingenious foldable design ensures easy transport, while their robust construction allows them to withstand wind speeds of up to 45 km/h and operate in temperatures ranging from 0 to 40°C.

One of the most impressive features of these small turbines is their built-in energy storage. Equipped with lithium-ion batteries, they can store the generated energy for use during calm periods, ensuring a constant supply.

The integration of smart technology takes these engineering marvels to the next level. Bluetooth connectivity allows users to monitor wind speed, power output, and battery status in real time via smartphone apps. This level of control and information allows users to efficiently optimize their energy usage.

Advantages of the application of portable wind turbines
One promising aspect is the integration of wind generators in hybrid systems that include solar energy or battery storage. This ensures a more stable supply of energy, since wind and solar radiation can be intermittent. These types of turbines complement such systems and increase the energy self-sufficiency of small installations and devices.

In emergencies, such as after natural disasters, quick access to power is crucial. Portable turbines can provide this workforce for communications, medical systems, and other critical infrastructure without relying on the damaged power grid.

Portable wind energy projection
While we are searching for ways to harness renewable energy sources, portable wind systems are a testament to human ingenuity and our commitment to a greener future. They are not just tools; they are a symbol of our ability to adapt and innovate in the face of environmental challenges.

Smaller wind turbines have made strides in terms of aerodynamic efficiency and power generation. These turbines are designed to take advantage of even low wind speeds, making them useful in a variety of environments.

Some key innovations include the utilization of lightweight, durable materials, such as carbon fiber composites, that improve portability without compromising structural strength.

The future of mobile wind generators is bright. As global demand for clean, portable power sources increases, these devices are poised to play a crucial role in our transition to a more sustainable energy landscape.

Electric Vehicles and User Safety

PhD Yolanda Villegas Energy Specialist

Electric vehicles have gained popularity as a sustainable and efficient solution to the challenges of climate change. This growth is largely due to the global interest in reducing greenhouse gas emissions, combating climate change, and improving air quality in cities. However, their adoption has not been without criticism, much of which is unfounded and can distort public perception of their safety. A recurring topic in this debate is lithium battery fires, which are often exaggerated in the media.

Statistically, electric vehicles are much safer than their internal combustion counterparts. A 2020 study conducted in the United States2 revealed that hybrid vehicles reported 3,475 fires per 100,000 units sold, internal combustion vehicles (gasoline or diesel) had 1,530 fires per 100,000 units, while electric vehicles registered only 25 fires per 100,000 units sold. These figures debunk the idea that electric vehicles are inherently more dangerous.

Additionally, electric vehicle manufacturers implement strict safety standards for batteries and thermal management systems to mitigate risks. These technologies include automatic shutdown systems in case of overheating and the use of fire-resistant materials. Moreover, special coatings are applied to the batteries to provide additional protection in the event of an accident.
Despite these advancements, incidents involving electric vehicles often make headlines. This is largely due to the novelty of the technology and the perception that it is still in an immature stage of development. The media often emphasize isolated cases, such as battery fires, and present them out of context, creating unnecessary alarm. In contrast, fires involving internal combustion vehicles, which are more frequent, rarely receive the same media attention.

This sensationalist approach can fuel fear and misinformation, hindering the transition to cleaner and more sustainable mobility. Without a doubt, the media must adopt a more balanced and data-driven approach to inform the public about electric vehicles. The transition to electric vehicles is a necessary step to reduce greenhouse gas emissions and mitigate the effects of climate change. Therefore, it is essential for consumers, regulators, and the media to work together to combat misinformation and highlight the advantages of this technology.

There is no doubt that electric vehicles are a safe and reliable option, with a significantly lower risk of fire compared to internal combustion vehicles. By adopting an informed and evidence-based perspective, we can foster a faster transition to sustainable and safe mobility.

1 IEEE Spectrum. (s/f). Lithium-Ion Battery Fires. Recuperado de: https://spectrum.ieee.org/lithium-ion-battery-fires

Solving Hydrogen Infrastructure Challenges with Corrosion Inhibitors

Yolanda De-Abreu, Corporate Scientist, ChampionX

Hydrogen is increasingly recognized as a cornerstone of the energy transition, holding the potential to decarbonize sectors that are difficult to electrify, such as heavy industry, aviation, and long-distance transportation. As an adaptable energy carrier, hydrogen can be produced from renewable sources, offering an opportunity to reduce greenhouse gas emissions and contribute to global climate goals. However, significant hurdles remain in harnessing hydrogen's full potential – chief among them, the logistics of large-scale production, storage and transportation.

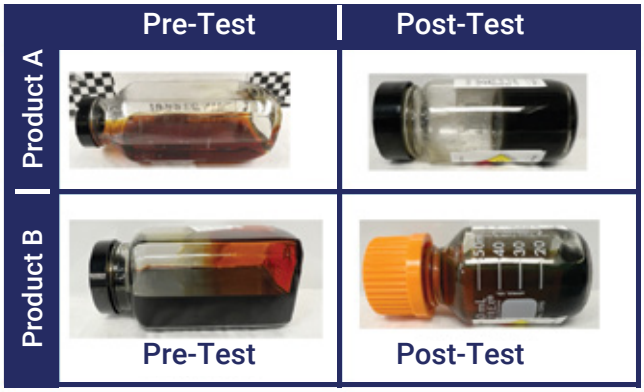
By 2050, global expenditure on hydrogen production for energy is expected to reach USD $6.8 trillion, with an additional USD $710 billion for pipelines and ammonia terminals,1 and supply chain logistics remain a key challenge. As investment grows, pipelines are seen as the most cost-effective hydrogen transportation method, with the United States alone poised to leverage three million miles of natural gas pipelines and over 1,600 dedicated pipelines.2

Blending hydrogen with natural gas enables pipeline repurposing for hydrogen transport, but hydrogen's properties pose challenges like material incompatibility, embrittlement and ductility loss, with one study reporting a 60% ductility reduction in existing pipeline materials.3

Pipeline coatings are widely used to prevent corrosion by creating a barrier between the pipeline material and hydrogen. However, coatings have limitations, such as compatibility issues with hydrogen and other chemicals, diffusion leading to embrittlement, and the risk of material failure from coating defects.

Despite the urgent need for solutions to support the hydrogen economy, research on the use of chemical corrosion inhibitors—commonly employed in the oil and gas industry to mitigate corrosion—has been minimal. As emissions targets continue to tighten, the demand for chemicals compatible with hydrogen is expected to increase. Products like those used in natural gas production and transportation (e.g., corrosion inhibitors, hydrate inhibitors, anti-agglomerates, anti-foulants, amines, and hydrogen sulfide scavengers) will also be needed for hydrogen-blended gas.

ChampionX has conducted compatibility tests to evaluate the performance of its chemistries, revealing that some products with a long track record of stability when subjected to traditional testing showed instability in the presence of hydrogen. The figure below shows results for two different chemistries tested before and after exposure to hydrogen during a gunk test.4 For Product A, undesired solids and a sticky residue formed, which could have a direct impact on pipelines or compressors by causing product accumulation (Figure 1).



Comparison of pre- & post gunk-test results o Product A & Product B hydrogen & palladium on carbon.

ChampionX also conducted tests on API X65 (UNS K03014) steel by cathodic charging in an acid solution to assess hydrogen absorption resistance in the presence of various corrosion inhibitors (once identified which chemistries are compatible).5 The results suggest that the presence of corrosion inhibitors creates a barrier against hydrogen absorption. However, selecting appropriate inhibitors requires careful consideration, as not all inhibitors provided maximum protection.

In this study, INH-1 (a water-insoluble inhibitor) demonstrated the best performance compared to INH-2 (a water-soluble inhibitor). The resistant polarization values (Rp), obtained using electrochemical impedance spectroscopy (EIS) after charging, significantly increased for all potentials when compared with both the blank solution and INH-1 solutions (see Figure 2). The values ranged from 302,300 ohm·cm² to 190,700 ohm·cm², compared to 5,179 and 61 for the INH-1. These high Rp values for INH-2 indicate the formation of an excellent barrier against hydrogen penetration, as it formed a persistent, continuous layer that prevented hydrogen atoms from entering the metal.[5]

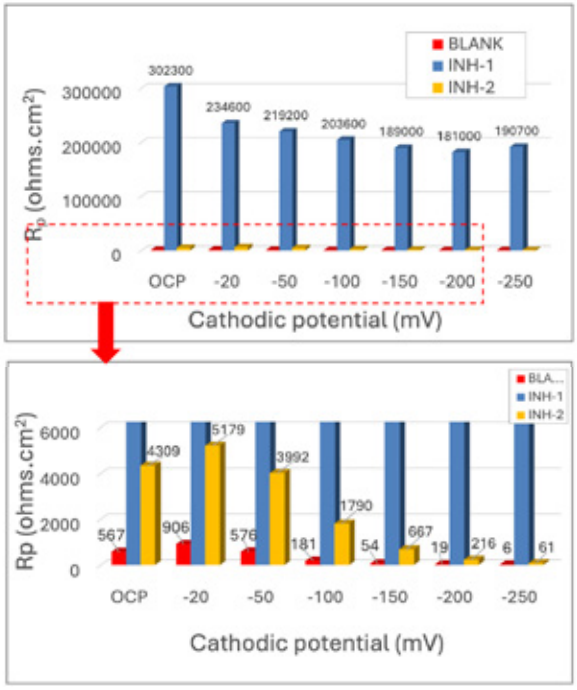


Figure 2. Rp values obtained from EIS Nyquist plots for coupons API X65 after electrochemical hydrogen charging at different potentials in different solutions: INH-1, INH-2, and blank.

A schematic of the Rp results is shown in Figure 3. As observed, INH-2 began to detach from the metal surface (green layer), while INH-1 demonstrated greater persistence under any applied potential (yellow layer)

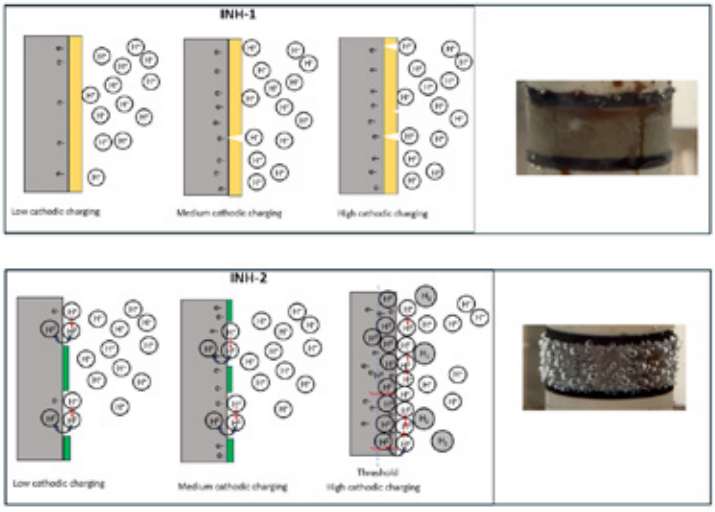


Figure 3. Schematic representation of the cathodic hydrogen charging process for API X65 in presence of INH-1 and INH-2

There is potential to further research corrosion inhibitors for utilizing existing pipeline infrastructure for hydrogen transportation. While identifying the appropriate metallurgy for new infrastructure is ideal, reusing existing assets offers significant cost benefits, especially since many oil and gas pipelines are already equipped to inject and monitor these chemicals.

If hydrogen adoption accelerates as expected, corrosion inhibitors can be effectively implemented and monitored through robust inspection programs. Engaging with pipeline operators will be essential to validate the safety and effectiveness of these solutions, while careful consideration of existing inhibitors is necessary to avoid compatibility issues.

Overall, chemical corrosion inhibitors are a promising avenue for supporting hydrogen's large-scale adoption, but investment in research and development is crucial for ensuring safe and sustainable transport.

ENDS

References:

1 - https://www.dnv.com/focus-areas/hydrogen/forecast-to-2050/

2 - U.S. Department of Energy, "HyBlend: Opportunities for Hydrogen Blending in Natural Gas Pipelines", Hydrogen and Fuel Cell Technology office, December 2022

3 - Hardie D, Charles EA, Lopex AH, 'Hydrogen Embrittlement of High Strength Pipeline Steels', Corrosion Science, Vol 48, pp. 4378-4385, 2006

4 – Caleb Clark, Geeta Rana, Ana Ferrer, Yolanda De-Abreu, Matthew Trevino, Jeremy Bartels, ""Chemistry Matters – Hydrogen Compatibility with Gas Production Chemicals", Proceeding from 19th Pipeline Conference Technology 2023 Conference PCT, Berlin.

The Importance of Standardized Procedures for Laboratory Testing of Materials in Hydrogen

Dr. ULLER, L.
(SURPLUS - President / CORTEST Adviser)

Dr. BEZENSEK, B.
(SHELL - Project and Technology)

Hydrogen is increasingly recognized as a promising alternative to fossil fuels in transportation and a crucial feedstock in producing steel, fertilizer, methanol, and other essential products. However, the current focus is on addressing material challenges in transportation and storage.

Hydrogen gas may be introduced into existing natural gas pipelines. Its impact on the integrity of these pipelines is currently under active research due to the potential for hydrogen to cause damage through Hydrogen Embrittlement (HE). Even low concentrations of hydrogen can have severe effects, and the susceptibility to this damage varies considerably based on stress, pressure, and material vintage. As a result, there is a growing demand for materials testing in the presence of hydrogen gas. Safety considerations for the procedures and the laboratory must be considered, particularly when adapting corrosion test procedures commonly used for H2S sour service testing. Many groups of universities and companies worldwide are developing research lines and test systems to assess the performance of materials in hydrogen environments.

The ***"AMPP Guide 21586 - Guidelines for Laboratory Testing of Materials in Hydrogen"***[1], which is in progress, was approved by AMPP Standards Committee (SC) 26 - Carbon Capture, Alternative Fuels, and Energy Storage. This Guide tests metals to study their mechanical and fracture properties when subjected to static and dynamic tensile stresses in a hydrogen gas (H2) environment. It assists in selecting various metals and alloys, irrespective of their form or application. In addition to the test methodology and interpretation, details for test execution are provided.

One advantage of this guide is that it standardizes testing methods, enabling data comparison from different experimental, academic, and industrial sources. The procedures for conducting strength, fatigue crack growth, and fracture toughness tests in hydrogen gas are covered elsewhere, such as in ANSI/CSA CHMC-1 and, more recently, by the EPRG Guidelines. However, this Guide will not duplicate the information in these existing documents. Instead, it will provide greater detail and a complementary understanding of the evolving developments in material response in hydrogen gas. Thus, we intend this document to be a thorough and essential international point of reference for any laboratory tests involving hydrogen at pressures that necessitate the use of autoclaves or other specifically designed apparatus.

The Guide will cover details on:

- Test specimens focusing on the: Round tensile specimens, Single edge notched beam sample (SENB), and Compact tension (CT) specimen geometries.
- Four Test Methods are considered: 1) Slow strain rate tensile test (SSRT); 2) Endurance fatigue S-N test; 3) Fatigue crack growth rate test (FCGR); 4)Fracture toughness test (FT).
- Setting up the test chamber or vessels and fixtures
- Test environment and reagents (impurities).
- Gas quality requirements and Purging requirements.
- Loading rates and Conducting the Test.
- Data Analysis and Post-Test Examination and Safety considerations.

"Currently, this project includes high-level representatives from over fifteen countriesand significant institutions. An initiative is underway to enhance international collaboration, with contributions from the ESIS - European Structural Integrity Society, represented by Dr. Milos Djukic, the Chairman of Subcommittee C21 on "Hydrogen Embrittlement and Transport". Additionally, the European Pipeline Research Group (ERPG) is also involved, represented by Dr. Bostjan Bezensek from SHELL. The project also welcomes participation from other international societies, industry members, universities, and research centers."

[1] Project Manager of the AMPP Guide 21586

[2] ANSI/CSA CHMC 1-2014 - Test Methods for Evaluating Material Compatibility in Compressed Hydrogen Applications - Metals.

[3] EPRG (European Pipeline Research Group) -June 2024, Guidelines on Fracture Toughness Testing of Pipeline Materials.

AMPP International Standards Committee SC 26 - Carbon Capture, Alternative Fuels, and Energy Storage

Develops and maintains standards, guides, and reports related to materials protection and performance in carbon capture, utilization, and storage and in alternative fuel and energy storage technologies including hydrogen, biofuels, non-fossil and low-carbon fuels, thermal and chemical energy storage, and related technologies.

Key Documents

Guide 21532	Guideline for Materials Selection and Corrosion Control for CO2 Transport and Injection
Guide 21577	Guideline for Laboratory Corrosion Testing for CO2 Transport and Injection
Guide 21579	Hydrogen Transport Guideline
Guide 21586	Guidelines for Laboratory Testing of Materials in Hydrogen
SP21632	Materials Selection and Corrosion Control for Carbon Capture & Storage (CCS) Projects
SP21632-3	Materials Selection and Testing for CO2 Injection Wells

To more about current and upcoming AMPP Standards visit www.ampp.org/standards

AMPP™

Optimizing Environmental Corrosion Cracking Detection With Cutting-Edge Advanced NDT Technologies

Mohammed A. Abufour
Advanced NDT Technologies Engineering Specialist/ASNT Regional Director

Integrity inspection and reliability prediction of critical oil and gas assets are top priorities for operators in the oil and gas industry. Among the degradation issues affecting these facilities, corrosion, hydrogen-induced damage, and stress-related corrosion cracking in steels are particularly serious.

Corrosion is a naturally occurring phenomenon, commonly defined as the deterioration of a material—typically a metal—those results from a chemical or electrochemical reaction with its environment. Environmental corrosion cracking results from the combined action of three factors: a susceptible material, a corrosive environment, and tensile stress. Stresses causing environmental cracking can arise from residual cold work, welding, grinding, thermal treatment, or may be externally applied during service.

To cause damage, these stresses must be tensile. Environmental cracking specifically refers to corrosion cracking triggered by a combination of conditions that can lead to various forms of corrosion damage, such as Stress Corrosion Cracking (SCC), Corrosion Fatigue, or Hydrogen Embrittlement. Consequently, the integrity inspection and reliability prediction of steel assets in the oil and gas industry are high priorities. Some of the most challenging defects include environmental corrosion cracking, such as Chloride Stress Corrosion Cracking (Cl-SCC), Hydrogen Induced Cracking (HIC), associated Stepwise Cracking (SwC), and various forms of Stress Corrosion Cracking (SCC).

These damage mechanisms are difficult to detect, especially in their early stages, and require specialized advanced NDT technologies operated by skilled NDT technicians and engineers. This is particularly important for large-scale inspection surveys that require a thorough focus on data analysis to detect the presence of these critical damage mechanisms.

In general, NDT can be used on any test object to measure wall thickness, identify metal loss, detect welding defects, and identify anomalies. Compared with conventional NDT, advanced NDT technologies provide quicker results, a permanent record, and improved inspection accuracy. Several nondestructive testing techniques are available for identifying HIC, SwC, and SCC. The objectives of using cutting-edge advanced NDT technologies include enhancing personnel safety, proactively preventing failures, improving plant integrity, identifying damage mechanism locations, and developing strategic plans for replacement and budgeting.

Advanced nondestructive testing (ANDT) comprises a wide range of innovative techniques to inspect and analyze anomalies in assets with minimal disruption to operations. Therefore, advanced nondestructive technologies (ANDT) with suitable techniques are used to inspect and detect these critical defects, enabling engineers to conduct assessments and evaluations.

Fortunately, several techniques, which will be discussed in subsequent sections, allow for reliable inspection. Among the most reliable are Automated Advanced Ultrasonic Testing, Eddy Current Array, Phased Array techniques, and Time-of-Flight Diffraction. Advanced NDT technologies, such as the Phased Array Technique (PA), can provide snapshot images of defects, helping to verify any possible linkages between blisters or stepwise cracking. Similarly, Automated Advanced Ultrasonic Scanning (AUT) is another technique that enables the inspection of large areas and is readily able to detect major defects such as blistering, multi-depth inclusions, and laminations, as well as provide a closer examination of suspect areas to monitor the development of stepwise cracks.

In conclusion, advanced NDT technologies provide valuable information on the location, geometric features, and growth of environmental corrosion cracking. These techniques have produced excellent results, as proven through metallurgical analysis, and are invaluable for monitoring corrosion cracks. The data obtained supports engineering evaluations, fitness-for-service studies, extends the life of plant equipment and piping, supports planning for repairs and replacements, and ensures safe operations.

Inspection Technologies for New Construction Projects

Salah AlZahrani, NDT Engineer, ASNT Level III
ASNT Member, Saudi Arabia Section

In the last decade and still, oil companies are being involved in constructing massive and large projects to meet the world's demand of oil and energy industries. The integrity of these new projects is critical to companies to avoid any short- or long-term impact on the energy supply. In projects, thousands of welds with different sizes and specifications are being manufactured. Projects rely heavily on welding inspection utilizing Non-Destructive Testing method such as radiographic inspection, ultrasonic inspection for quality assurance of welds in piping, pipelines and other structural components.

There are technologies, processes and requirements for inspection program that need to take place in order to avoid delays in the execution of projects. Inspection technologies used in weld, preservation and civil activities such as Computed Radiography, Digital Pressure Gauge and Digital concrete maturity meter technology will assist in controlling and completing the projects on time and within the budget.

Computed Radiography (CR) is the digital replacement of conventional film X-ray radiography. CR offers several advantages for the radiographic inspection process like the elimination of hazardous chemicals and a dramatic improvement in image quality and the time it takes to produce the image. Digital images can be electronically transferred and shared between sites and eventually saved on the cloud for easy archiving and retrieval. It improves inspection image quality and interpretation as well enhance safety by reducing exposure time of workers.

Digital Pressure Gauge (DPG) will provide considerable quality control improvements by measuring equipment pressure remotely and providing historical pressure trends. Scattered and remote area projects encounter significant challenges in monitoring pressure containing equipment, such as heat exchangers and pressure vessels, during inspection, operation and mainly during preservation. Digital Pressure Gauge provides continuous, remote monitoring of equipment pressure from shipment until commissioning phase.

Digital Concrete Maturity Meter (DCM) is a non-destructive wireless technology for monitoring development of concrete's strength and temperature over time. A small sacrificial sensor is attached to a steel rebar and fully-embedded in concrete. The sensor collects the temperature data and transfers it wirelessly to mobiles, where the strength of the concrete is then calculated automatically. The test results can be accessed in real-time through mobile apps or Cloud dashboard, and the user can benefit from the smart notification feature to monitor the work.

These inspection technologies can be deployed at projects and operating facilities and found to be capable to speed up project construction and improve quality. They support corporate digital transformation and circular economy initiatives.

Fluid-7: The Future-Proof Solution for New Energy Midstream and Downstream Applications

Eng. Malvin Delgado
CEO Trustwell Energy | GM Fluid-7 Americas

As the energy sector pivots toward greener solutions, infrastructure demands for midstream and downstream operations require a revolutionary approach. Fluid-7's fully structural advanced composite pipeline technology offers the ideal solution, delivering resilience, versatility, and cost-effectiveness. This article explores how Fluid-7 supports new energy transport, from hydrogen and ammonia to carbon capture, setting a new standard for future-proof pipeline systems.

Redefining Resilience and Flexibility

Fluid-7's unique composite design provides remarkable flexibility and seismic resilience in a structural solution—critical in geologically active areas. Unlike traditional steel, which is vulnerable to corrosion and seismic stress, Fluid-7's composite material withstands deflections up to 60%, ensuring structural integrity even in regions prone to earth movements. Operating across a broad temperature range (-40°C to 88°C), Fluid-7 supports extreme environmental conditions without compromising durability, surpassing RTP and fabric liners that lack this resilience.

Optimized for New Energy Fluids

In the evolving landscape of energy transport, versatility in fluid compatibility is crucial. Fluid-7's proprietary fluid membrane barrier enables the safe and efficient transport of hydrogen, ammonia, and CO_2, accommodating the rise of green fuels in midstream and downstream applications. Its low permeability and resistance to VOCs and corrosive gases like H_2S ensure reliable service in multiphase lines, making Fluid-7 an adaptable choice for projects transitioning away from traditional hydrocarbons.

Environmental and Operational Efficiency

Fluid-7 offers a substantial reduction in embodied carbon, producing 65% lower CO_2 emissions than steel—a key advantage as companies strive for sustainable operations. Additionally, Fluid-7's lightweight structure allows for flat-packed shipping, which cuts logistics costs and emissions by over 90%. Its trenchless installation capability minimizes environmental impact during deployment, making it ideal for projects in sensitive or urban locations.

Cutting Costs and Installation Time

The economic benefits of Fluid-7 are clear: the system requires up to 65% less pumping energy, reduces installation time by 80%, and supports trenchless installation methods that further decrease disruption. Fluid-7 also boasts a remarkable strength-to-weight ratio of 4:1 compared to steel, simplifying handling and reducing labor demands. These efficiencies lead to an estimated 50% reduction in capital expenditures (CapEx) and a 75% savings in operational expenditures (OpEx), positioning Fluid-7 as a cost-effective choice for new energy pipelines as well as repurposing and renovation of existing problem pipelines.

A Future-Proof Solution for the Energy Transition

Fluid-7's 75-year lifespan and compatibility with evolving energy demands make it a cornerstone of long-term energy infrastructure planning. As a standalone, fully structural pipeline solution, it outlasts steel and other composite alternatives, providing both reliability and adaptability. Its resilience against corrosion, erosion, and various fluid compositions renders it a true "set it and forget it" solution, allowing operators to focus on expansion without frequent maintenance interruptions.

Bridge to a sustainable future in energy infrastructure

Fluid-7 is more than a pipeline solution—it's a bridge to a sustainable future in energy infrastructure. By addressing the unique challenges of midstream and downstream applications, Fluid-7 supports the shift towards new energy solutions while optimizing operational efficiency, cutting costs, and reducing environmental impact. As energy demands diversify, Fluid-7 stands ready to meet the needs of today's—and tomorrow's—energy landscape.

www.Fluid-7.com

ADVANCED COMPOSITE RELINING AND PIPE SOLUTIONS

FLUID-7
MEMBRANE BARRIER TECHNOLOGY

OPERATIONAL VALUE LEVERS

- Up to **75% reduction** in OPEX over operating life
- **Minimal maintenance** – no corrosion, no erosion, no pigging required
- **Enables Trenchless** or Surface Installation and simplified logistics
- **Lower pumping energy costs** due to 65% lower coefficient of friction (CoF)
- **Fast installation**
- **Reduce project time/downtime** by up to 80%

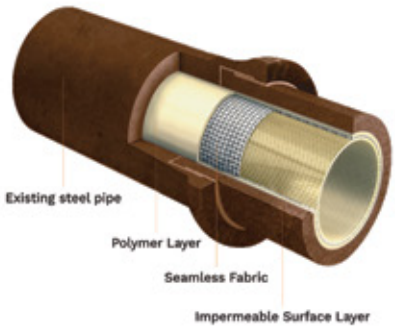
CAPITAL VALUE LEVERS

- **Up to 50%** lower capital investment (Reline or new pipe) based on like for like capacity
- **50-75 year** design life

ENVIRONMENTAL LEVERS

- **65% lower CO_2 footprint** compared to steel
- Suitable for **Carbon Capture** applications
- Key solution for **cutting methane emissions** from leaking pipelines

ADVANCED FLUID MEMBRANE RELINING OR REPURPOSING SOLUTIONS FOR ENERGY PIPELINES



Pipe diameter ID Capability to 48"

-40°F to +190°F no pressure derating

MAOP 145 Psi to 1480 Psi

Up to 2 Mile per day from single crew

"Our innovative membrane technology allows you to convert existing pipelines for hydrogen and other new energy applications".

Why Choose Us?

- **Corrosion Resistance:** Protect your investment with materials designed to withstand the test of time.
- **Speed:** Quick installation means minimal downtime for your operations.
- **Cost-Effective:** Save money with our affordable solutions that don't compromise quality.
- **Minimal Maintenance Required:** Enjoy peace of mind with our low-maintenance solutions.
- **Cheaper to Operate:** Experience significant cost savings over the lifespan of your pipelines.
- **Low Disruption:** Our methods minimize disruptions to your existing infrastructure.
- **75 Years Life Extension:** Invest in long-term solutions that keep your operations running smoothly.
- **Multi-Fluid Capability:** Designed to handle various fluids, ensuring versatility in your operations.
- **Fully Structural:** Our solutions maintain the integrity and strength of your pipelines.

Tested and Certified

NSF Certified to NSF/ANSI 60

CERTIFIED ISO 9001:2015

ASTM INTERNATIONAL

Navigating the Evolving Landscape of Aboveground Storage Tanks: A 36-Year Journey

Earl Crochet
Owner at Crochet Midstream Consulting

Having worked in the midstream industry my entire career, (36 plus years), I have also been dealing with Aboveground Storage Tanks (ASTs) since day one, literally. On my first day of work on June 10, 1988, at Plantation Pipe Line (PPL), now operated by Kinder Morgan, I was told I was going to be the new "Tank Guy". Obviously, I had no idea what that meant but I asked, "Are you going to pay me?" When my boss told me yes, I said "Well, I guess I'm your new Tank Guy". The rest as they say, is history.

Over my career, I have seen many new regulations, both directly involving ASTs and other aspects of the industry. When I started at PPL, which is regulated by the Federal Department of Transportation (DOT), now known as the Pipeline and Hazardous Materials Safety Administration (PHMSA), the only inspection regulation we had on tanks was that we had to perform an inspection on a tank once per year (and no one even told us what said inspection involved or required!).

There were other regulations on ASTs, such as the Environmental Protections Agency (EPA) standards for emissions, called Kb, and a few State regulations on emissions but even those were relatively simple. My, how things have changed over the years.

To put things in perspective, when I started, none of the following regulations were in place: Lock Out/Tag Out (1989); Trenching and Excavation (1989); Bloodborne Pathogen (1991); Process Safety Management (PSM) (1992); Confined Space Entry (1993); Fall Protection (1994 for Construction; 2010 for General Industry).

In the United States, ASTs were regulated in 1999 when DOT/PHMSA mandated breakout tanks to follow American Petroleum Institute (API) Standard 653 for inspection and repairs. Since 2002, EPA has required Owners/Operators storing any kind of oil (crude oil, refined products, vegetable oils, etc.) to follow the Spill Prevention, Control and Countermeasures (SPCC) rules and to follow API 653, or The Steel Tank Institute (STI) SP001, or have a Professional Engineer in the state to write their own plan, among other items.

Today, there are more State and Federal regulations on AST emissions and many States have their own regulations on inspections, repairs, and overfill prevention (Pennsylvania, Florida, North Carolina, Wisconsin and Texas, etc.). There are local specific rules, such as the South Coast Air District of California that in 2024 began requiring Optical Gas Imaging (OGI) to help reduce Volatile Organic Compounds (VOC) from escaping the tanks.

DOT/PHMSA recently updated several of the API standards that are they incorporated into their regulations, including API 2350 which requires Owner/Operators to perform a risk assessment on each breakout tank. Until this risk assessment is performed, they must comply with the Category system (0, 1, 2, and 3), which is based on the technology on the tank (no gauge, local gauge, remote reading gauge, independent alarm). These Categories require between 30 and 120 minutes of excess capacity at the top of the tank to try and prevent an overfill or other damage to the tank.

In May of 2024, EPA published the final Gasoline Distribution MACT and GACT: National Emission Standards for Hazardous Air Pollutants (NESHAP) - 40 CFR 63 Subparts R & BBBBBB to reduce emission from facilities that distribute gasoline. Some of the major changes include: additional fitting requirements for storage vessels (ASTs) with external floating roofs; adding a requirement for ASTs with internal floating roofs to maintain less than 25 percent of the lower explosive limit (LEL)above the roof; require semiannual monitoring and repair leaks identified from these monitoring events or leaks identified by Audio, Visual, and Olfactory (AVO) methods during normal duties.

EPA also recently published the Kc regulations, the update to the previous Kb regulations, officially "Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After (September 2024)". For reference, Kb has been the industry standard since 1984, meaning the regulation has been in place longer than my entire career.

Another new regulation from 2024 is "Final Rulemaking on Clean Water Act Hazardous Substance Facility Response Plans" from the EPA. This applies to facilities that could reasonably be expected to cause substantial harm to the environment, based on their location. Essentially, an SPCC program for many of the chemicals stored at larger facilities. It is based on the Reportable Quantity (RQ) for Hazardous Substances and if the facility stores 1,000 times the RQ and is within 0.5 miles of navigable water or a conveyance, then the facility is in.

Texas passed last year what was called SB 900, officially titled "Texas Commission on Environmental Quality Chapter 338 — Aboveground Storage Vessel Safety Program" that will impact around 36,000 tanks unregulated currently, per the TCEQ. The reason the law references "aboveground storage vessels" is in the State of Texas the term "aboveground storage tank" had a different definition.

This new rule became law on September 1st of 2023 with full implementation on September 1st of 2027. Basically, the rule applies to all tanks 21,000 gallons (500 barrels) that are not currently regulated and contain contents that would impact the waters of the State of Texas if the contents get out of the tank. Major provisions of the new law reference parts of the following: EPA 40 CFR PART 68 (Risk Management Plan); EPA 40 CFR PART 112 (SPPC plan); API 653, parts of Sections 4 and 6 and all of Sections 8 and 9; API 2350, Sections 4 and 5; NFPA 30, Chapter 22 and API 2001Sections 5-11.

Additional recent State regulations include new seismic regulations in Oregon and Washington.

Well, things certainly have changed in tank regulations over the years, and I don't expect the new regulations on ASTs to slow down or stop anytime soon. The AST world will continue to become more challenging for Owner/Operators to comply. I plan to be around for many more years to see what happens and to try and make sense of changes to the regulations.

A Universal Language for NDT: The Power of a Shared File Format

Emilie Peloquín
Executive Director,Global Application Engineering-NDT Industrial División

As we transition into a fully digital age, the NDT industry is facing a pivotal challenge: the need for a common file format. Just as medical professionals worldwide share imaging data through standardized file formats, adopting a universal file format in NDT could unleash unprecedented levels of collaboration, efficiency, and data management.

Imagine a world where NDT professionals, regardless of their equipment brand or inspection technology, could easily share and access data. Today, it's common practice for equipment manufacturers to use distinct proprietary file formats, which isolates brands—and even product lines—preventing data sharing between them. This lack of standardization fragments the industry and limits the ability for teams to work together seamlessly. But there's a promising answer: the .nde file format. Designed to unify inspection data, .nde could be the key to creating a more cohesive and accessible landscape in NDT.

Why .nde?
The .nde format was developed to counter the limitations of proprietary file formats. It offers NDT professionals an open, accessible format that doesn't tie them to specific software, making data usable across the board. Built on the versatile HDF5 framework, .nde supports a broad range of platforms, allowing data to be accessed and organized in a clear, universal way. This means no more proprietary software barriers, no file size limits, and the freedom to choose software based on functionality, not file compatibility.

Opening Doors for the Industry
Adopting a universal format such as .nde would unlock possibilities for NDT. Imagine experts across companies collaborating on the same dataset, comparing findings, or seamlessly accessing historical records. With a universal format, third-party applications could also gain access, making it easier to integrate NDT data into inspection data management systems (IDMS), digital twins, and artificial intelligence (AI) applications, without the current compatibility roadblocks. The improved interoperability could even empower auditors and regulatory bodies to maintain unbiased and transparent industry data reviews across different modalities.

Beyond DICONDE: Meeting Diverse Data Needs
While DICONDE (Digital Imaging and Communication in Non-Destructive Evaluation) has been the pioneer open file format for many years and has sufficiently supported radiographic testing data, it doesn't meet the needs of more complex NDT methods such as ultrasonic or eddy current testing. These methods often generate large, detailed datasets that require full accessibility to the raw information to provide accurate analysis. The .nde format overcomes these challenges by accommodating intricate data structures while also retaining compatibility with simpler DICONDE data when necessary. This dual capacity allows for both backward compatibility and forward-looking data richness.

Future-Proofing Through Flexibility
With its foundation in HDF5, .nde is a stable choice that secures the long-term usability of NDT data. HDF5's hierarchical structure and adaptability enables files to be accessed and organized efficiently across various platforms and programming languages. Furthermore, the open-source nature of HDF5 minimizes the risk of obsolescence and can be extended to include cybersecurity measures, offering a robust framework for safeguarding data.

The Path Forward: Uniting for a Stronger NDT Community
As NDT technology advances, the need for a universal language becomes an imperative. A shared file format would free inspectors, manufacturers, and asset owners from software restrictions, allowing them to use the data they collect in whatever manner they chose. By standardizing the use of the .nde format, the industry could eliminate many compatibility barriers, accelerating collaboration and innovation across the field. As damage mechanisms continue to evolve, so must our knowledge and methods. An increase in the fluidity of information sharing could create valuable learning opportunities, advancing both the NDT industry and society as a whole.

In short, adopting the .nde file format means empowering the NDT community with a consistent, accessible, and flexible foundation that supports current needs and adapts to future demands. A common data language is not just a technical advancement, it's an invitation for the entire NDT industry to work as one, fostering progress and learning for the benefit of all.

NDT 4.0: Revolutionizing Non-Destructive Testing with IoT, SaaS, and Remote Monitoring Technologies

Joshua de Monbrun, CEng
Founder & CEO
SUBSEA NDT & Engineering

The dawn of NDT 4.0 signals a major shift in the non-destructive testing industry, transforming inspection techniques and redefining the roles of technicians in the field. With the incorporation of I**nternet of Things (IoT) sensors, Technology-as-a-Service (TaaS), Software-as-a-Service (SaaS), and remote monitoring technologies,** the NDT sector is becoming more data-driven, automated, and streamlined than ever before. This evolution is timely as the industry grapples with a **shortage of qualified technicians** while simultaneously facing an ever-growing demand for detailed, real-time asset insights.

In the traditional NDT model, technicians were responsible for conducting inspections, collecting data, interpreting results, and reporting findings—tasks often performed on-site. However, with the introduction of NDT 4.0 technologies, many of these responsibilities are shifting to more automated, remotely operated, and AI-driven systems. This transformation not only alleviates the industry's dependency on scarce field technicians but also optimizes the inspection process, making it faster, more accurate, and more efficient.

IoT Sensors: Real-Time Data for Proactive Maintenance
One of the cornerstones of NDT 4.0 is the use of **IoT-enabled sensors**. These devices can continuously monitor critical assets and transmit data to centralized platforms, where anomalies can be detected in real-time. IoT sensors embedded in equipment, pipelines, or structural assets collect valuable data on factors such as temperature, vibration, corrosion, and strain, providing early warnings of potential issues. By leveraging IoT technology, industries can move from reactive or scheduled maintenance to a **proactive, condition-based approach.**

For NDT technicians, this means less time spent on routine, on-site inspections and more focus on analyzing data from centralized hubs or mobile platforms. Instead of labor-intensive testing on the field, technicians can monitor asset health remotely, only deploying on-site when needed for repairs or critical issues. As IoT systems continue to evolve, this shift from traditional testing to proactive monitoring will expand, leading to faster detection of issues, reduced downtime, and increased asset longevity.

Technology-as-a-Service (TaaS) and Software-as-a-Service (SaaS): Cloud-Driven Solutions
The emergence of TaaS and **SaaS** in **NDT** is redefining how inspections and data management are approached. **TaaS** platforms allow companies to outsource their testing needs to cloud-based service providers, which can perform complex data analyses, detect anomalies, and provide recommendations without requiring full-time on-site personnel. This model enables smaller companies to access sophisticated testing capabilities without needing to invest in expensive equipment or hire specialized staff.

SaaS, on the other hand, enables organizations to manage, analyze, and interpret NDT data through cloud-based software. SaaS platforms offer high scalability, ensuring that as a company's data grows, their ability to store, process, and retrieve information expands accordingly. Furthermore, with the support of assisted **AI and Machine Learning (ML),** these platforms can automate data analysis, reducing the burden on human technicians and allowing them to focus on interpreting results and making critical decisions.

Remote Monitoring and Assisted AI/ML: The Role of AI in NDT
One of the most significant advantages of SaaS and IoT-based solutions is the incorporation of **AI and ML** for assisted data analysis. Through **AI-driven algorithms,** these systems can sift through vast amounts of data, recognizing patterns, identifying defects, and even predicting potential failures. This level of automation is invaluable in a time when qualified technicians are in short supply. Rather than spending hours analyzing raw data, technicians can rely on AI to pre-process data, highlight critical information, and generate preliminary reports.

For the modern NDT technician, this means a shift from hands-on testing and data collection to a role focused on **decision-making and quality control.** As AI-assisted software becomes more adept at recognizing issues, technicians will become more akin to supervisors, interpreting AI-generated insights and making informed recommendations. This shift not only leverages human expertise more effectively but also ensures that critical issues are addressed promptly, without the risk of oversight.

Augmented Reality (AR) and Digital Imaging: Enhanced Visualization for Precision Inspections

Augmented Reality (AR) is another technology that is starting to reshape the NDT landscape. By overlaying digital imaging directly onto real-world assets, AR can assist technicians in identifying and interpreting defects more accurately. For instance, technicians can wear AR glasses that display defect locations in real-time, allowing them to visualize internal structures or hidden areas with high precision.

The integration of AR can enhance inspection accuracy, reduce the chance of human error, and expedite the reporting process. Technicians can use AR-based data overlays to mark and review specific areas of concern directly on-site, which is especially valuable for complex structures where defects are not always visible to the naked eye. As AR technology becomes more affordable and accessible, it will become a standard tool for NDT technicians, enabling them to perform high-accuracy inspections with minimal equipment.

Addressing the Skills Gap: The Evolving Role of the NDT Technician

As NDT 4.0 technologies transform traditional inspection processes, the role of the NDT technician is evolving from hands-on testing to **data analysis, management, and oversight.** This transition not only reduces the industry's reliance on field-based technicians but also necessitates a new skill set. Future NDT professionals will need to be proficient in **data interpretation, digital tools, and remote monitoring technologies.**

The shift to NDT 4.0 doesn't eliminate the need for technicians; instead, it broadens their expertise, enabling them to act as overseers who leverage technology to deliver faster, more accurate, and actionable results. Training programs will need to adapt to cover AI/ML, data analytics, and AR visualization, ensuring that technicians are equipped to handle the increasingly digital nature of the field.

Conclusion: Embracing the Future of NDT

The implementation of NDT 4.0 marks a new era in non-destructive testing, providing a pathway for the industry to address current challenges while elevating the quality and efficiency of inspections. As IoT, SaaS, TaaS, and AI-driven remote monitoring become more widespread, the role of the NDT technician will continue to evolve, emphasizing **data interpretation, decision-making, and system management** over traditional inspection tasks. This evolution not only supports the industry amid a labor shortage but also drives improvements in inspection precision, response times, and safety.

Ultimately, embracing NDT 4.0 technologies offers a sustainable way forward, allowing companies to meet the increasing demands of modern infrastructure while empowering technicians to operate at the forefront of innovation. As this transformation unfolds, the future of NDT promises a blend of human expertise and cutting-edge technology, ensuring a robust, reliable, and efficient approach to asset management and quality assurance.

Quality Management and Climate Change: A Strategic Approach to Sustainability

Dr. Juan Lugo Marín. Industrial Engineer. Master in Quality and Productivity Management. Doctor in Administrative Sciences. Director of Inspenet Academy and Management Consultant.

The Impact of Climate Change

Climate change has emerged as one of the most complex and pressing challenges of the 21st century, profoundly impacting social, economic, and environmental systems on a global scale. Phenomena such as rising temperatures, glacier melting, and the intensification of extreme weather events are creating significant repercussions for the natural environment while reshaping the expectations of societies, markets, and, in particular, organizations.

For organizations, climate change presents risks such as resource scarcity, disruptions in supply chains, and increasing regulatory demands. However, it also opens doors to opportunities in areas like technological innovation, energy efficiency, and corporate social responsibility. This context calls for organizations to adapt their business models and operational processes, not only to survive but to thrive in an increasingly challenging environment.

Climate Change and Quality Management

The recent February 2024 amendment to various management system standards, including ISO 9001 for quality management, represents a milestone by incorporating climate change as a key aspect. This development positions climate management not only as an ethical imperative but also as an essential strategy for maintaining competitiveness and ensuring long-term sustainability.

In this context, integrating climate considerations into quality management transitions from being optional to becoming a strategic priority. Quality management systems, as defined by ISO 9001:2015, provide a solid foundation for tackling climate-related challenges, enabling the development of strategies that enhance operational sustainability and create market value.

Organizations implementing ISO 9001 quality management systems are equipped with a robust framework to anticipate and mitigate climate-related risks. These systems can serve as catalysts for diversifying suppliers, adopting renewable energy, and developing sustainable products. By integrating these considerations, businesses can ensure operational continuity, strengthen resilience, and align with the growing expectations of stakeholders increasingly aware of the importance of sustainability.

Moreover, this broadened vision of ISO 9001 quality management systems allows organizations to position themselves as leaders in climate change management, a key differentiator in markets where environmental responsibility is in growing demand.

Strategically Integrating Climate Change into Quality Management

Incorporating climate change into quality management systems goes beyond regulatory compliance, becoming a strategic approach to leading in sustainability and resilience. Key benefits include:

- **Advancing environmental sustainability:** Implementing measures to mitigate environmental impact enables organizations to reduce their ecological footprint, actively contributing to the global fight against climate change while generating value for their surroundings.
- **Proactive regulatory compliance:** Adopting the provisions of the 2024 ISO 9001 amendment ensures adherence to climate-related regulations, reduces legal risks, and strengthens operational stability.
- **Enhancing corporate reputation:** Sustainability is a competitive differentiator that fosters trust among consumers, investors, and strategic partners, positioning companies as leaders in environmental responsibility.
- **Optimizing operational costs:** Efficient use of resources and waste reduction lower costs and improve profitability, ensuring greater resilience to market fluctuations.
- **Catalyzing sustainable innovation:** Integrating climate change fosters the development of eco-friendly products and services, enhancing competitiveness and unlocking new market opportunities.

Conclusions

Climate change is a strategic challenge that affects both sustainability and business success. The ISO 9001:2015 standard, strengthened by the 2024 amendment, provides organizations with an effective framework to address climate risks and capitalize on the opportunities this phenomenon presents.

Integrating climate considerations into quality management systems not only ensures regulatory compliance but also drives innovation, reinforces environmental commitment, and enhances long-term competitiveness. This proactive approach allows organizations to lead in sustainability, resilience, and corporate responsibility, standing out as key players in building a future that balances progress with environmental preservation.

INSPENET

NEWS for 2025

Inspenet invites you to participate as a speaker and/or sponsor of our Discussion Panels or Summit live, online, during 2025:

Driving Innovation and Efficiency in Tank & Terminal Operations
26 March 2025

News tendences in Gas, LNG, Biometano & Biogas.
23 April 2025

Next – Gen Energy: Live Insights on the Future of Alternatives Energies. 23 July 2025

Cutting – Edge NDT: Emerging Technologies and Industry Trends
1 October 2025

For more information, please contact: rosa.solari@inspenet.com

Visit now at **www.inspenet.com**

INSPENET

NEWS for 2025

INSPENET BRIEF 2025

We are pleased to announce our editions for 2025 in digital + print version, English + spanish

---

May 2025 (Topics Alternative Energy, LNG, Midstream, Downstream, Upstream, Offshore & more)

September 2025 Special Edition Official Magazine XXI SLOM Conference Panama 2025, Referring To Tanks, Terminals and Monobuoys.

December 2025 (Topics Alternative Energy, LNG, Midstream, Downstream, Upstream, Offshore & more)

---

www.inspenet.com

DISCOVER INSPENET Brief!

Leader in the Energy Transition

ENGIEMexico