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INSPENET Brief

Dr. David Alleyne

CEO, Guided Ultrasonics Ltd.

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A Year of Innovation and Community at INSPENET

Dear Readers,

As this year draws to a close, it's a fitting time to reflect and express our gratitude. At INSPENET, we want to extend our deepest thanks for the trust and support you have shown us. Your enthusiasm for following us, recommending our platform, and becoming avid readers of our technical content, both written and audiovisual, has been the cornerstone of our tremendous growth in 2023.

This year has been truly momentous for us. We've reached significant milestones that reflect not only our growth but also the strength of our community. Over 100,000 users organically visit our platform, we've grown to over 113,000 followers on Instagram, 18,000 on YouTube, 7,000 on LinkedIn, 17,000 on TikTok, and have achieved an impressive 1.5 million views on YouTube. Furthermore, our presence at more than 12 conferences and live events underscores our commitment to connection and continuous learning.

We want to extend a special thank you to all our sponsors and organizations such as ILTA, API, AMPP, ASNT, SLOM, IMCORR, and LatinCorr & Intercorr, Naturgas, Asociación Hidrógeno de México, GPA Midstream. Their trust and the opportunity to be an active part in promoting each of their valuable activities have enabled more professionals and followers to get inspired and actively participate. Their support has been crucial in our mission to spread knowledge and enriching experiences in the energy sector.

Our content has catered to a professional audience deeply interested in new energies, oil and gas, corrosion management, and the use of advanced technologies like NDT. We've strived to keep you updated with standards and best practices emerging from leading organizations like the API (American Petroleum Institute) and AMPP.

This year has brought us countless satisfactions. We've consolidated our brand as a unique platform capable of integrating recognized institutions with leading and emerging companies, professionals, and consultants. Together, we've highlighted and shared efforts and knowledge, contributing significantly to the advancement of our industry.

Looking ahead, we're excited to announce that, while our platform currently operates in English and Spanish, we are working to incorporate Portuguese and Italian by the end of 2024. This is a significant step in our commitment to reach and support a broader and more diverse audience. Additionally, we plan to actively participate in more global events and produce a variety of technical and reference programs for each sector. Our goal for the end of 2024 is to catapult ourselves as a global reference for every professional, company, or institution operating in the energy sector.

Finally, in this festive season, we wish you all a very Merry Christmas and a splendid and happy 2024. May this new year bring health, success, and continuous opportunities for growth and learning.

With appreciation and anticipation for what the future holds,

Eng.Francesco G. Solari.

BECHT

SOLVING YOUR CHALLENGES

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- Mechanical Integrity (RBI/IOW/CCD/etc.)
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At Inspenet, we understand the value of your time. That's why we introduce you to Inspenet TV: your new hub for technical and professional content in the energy sector.

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Terminal Industry Compensation and Benefit

Report Shows a Changing Labor Market

Terminal employees are seeing increases in compensation over last year as terminal operators are paying closer attention to workforce development in the face of competitive job markets.

The need to maintain a highly qualified workforce has implications for safety. Our continued strong safety performance may depend on our ability to attract an experienced terminal workforce in a wide range of disciplines.

The Terminal Employees Compensation and Benefits Report released in November by the International Liquid Terminals Association (ILTA) showed that the total compensation for environmental health and safety supervisors rose 7%, welders rose 8%, and entry-level pipeline integrity engineers rose 28%.

The terminal industry is responding to an increasingly competitive labor market, by raising compensation for people with specialized skills such as engineers, electricians, and welders. According to the Bureau of Labor Statistics, there will be a need for approximately 1 million more science, technology, engineering, and mathematics professionals than the U.S. will produce at the current rate by 2025. The welding industry will face a shortage of 360,000 welders by 2027, according to the American Welding Society. This is due to industry growth and anticipated attrition from retirement.

The 2023 study provides details about compensation for terminal operators, safety professionals, engineers and marketing and administrative professionals. It also includes information on benefits such as insurance, remote working, and wellness programs, among other things.

Safety is our members' top priority and this survey shows our members investing in our workers' training, healthcare and overall well being.

By: Gonzalo Mera Truffini – Vice President of SLOM.

SLOM 20 YEARS

building integration and leading improvement

The commitment of professionals to the development of the sector.

Nothing is more inspiring and mobilizing than achieving individual visions through collective actions. This was the founding principle of the Latin American Society of Maritime Oil Terminal and Monobuoy Operators (SLOM) and is the stimulus that motivates companies and people to get involved and commit to the Society's activities.

The contrast between enormous talent and humility; between knowing and learning, and recognizing that there is always room for improvement, is a hallmark of the women and men who have formed and are an essential part of SLOM. Professionals' human capital and commitment have allowed SLOM to maintain permanent evolution, but with a clearly defined focus – Safer, cleaner and more efficient operations – and whose results, contributions and leadership are widely recognized globally within the industry energy and in the public sector.

SLOM accompanying the transformation of the industry

Maritime and river terminals dedicated to energy products play a fundamental role for the social, economic and industrial development of countries and communities.
The energy industry is slowing down one of the largest transformation processes in its history, the role of the human factor, digitalization and energy transformation, through energy efficiency and new fuels, are the new vectors that direct the industry to places that are not yet clearly defined. That is why the 20 years of this great Community called SLOM will be commemorated by promoting a renewal that accepts the challenges and works for a comprehensive transformation of the sector that allows achievable and sustainable changes over time

AMPP Pioneers Members Centric Initiatives:

A Glimpse into Industry-Leading Innovations

The Association for Materials Protection and Performance (AMPP) underscores its unwavering commitment to member satisfaction with a series of pioneering initiatives tailored to meet their specific needs. This innovative approach demonstrates AMPP's dedication to enhancing accessibility, engagement, and professional development within the materials protection and performance industry.

Redesigned and Redefined Homepage

One of the hallmark changes is the newly redesigned homepage, prioritizing user experience and facilitating easy access to popular content and frequently visited pages. This transformation encourages community building by offering seamless navigation for tasks such as joining committees and exploring advocacy initiatives.

Revolutionary Training Program

The introduction of the Industrial Coating Application (ICA) Training Program marks a significant milestone in industry education. This adaptable and comprehensive program caters to both novice and seasoned professionals, equipping them with practical skills through hands-on workshops and instructional videos. Unlike AMPP's traditional Education programs, this customizable learning experience allows contractors and training providers to shape the journey while still earning AMPP recognition. Available through a subscription model, it provides continuous access to crucial resources like student workbooks, interactive activities, and presentation materials.

Sedriks Research Grant

AMPP's reinstatement of the 2024 Dr. A. John Sedriks Seed Grant Award further highlights its commitment to advancing research in materials protection and performance. This $35,000 grant supports innovative research programs in corrosion, coatings, degradation, and related areas. By targeting emerging academic talent and fostering research endeavors, AMPP aims to drive meaningful progress in the field.

AMPP's member-centric initiatives exemplify its dedication to the professional development and success of its members. As AMPP continues to evolve, members can anticipate further enhancements tailored to their unique needs and priorities, solidifying AMPP's position as an industry leader.

GPA Midstream y GPSA

are leading midstream industry through a time of change.

The energy industry is an era of dramatic change. Concerns about climate change are challenging midstream companies to deliver safe, efficient, and clean energy. The U.S. midstream industry is meeting that challenge by handling record levels of crude oil, natural gas, and NGLs.

Since the shale era began in 2008, midstream companies have invested more than $550 billion to build the infrastructure needed to handle volume of production needed to provide reliable, affordable, and cleaner energy.

GPA Midstream and GPSA Midstream Suppliers play an essential role in the industry. Committees comprised of member company experts share best practices that keep communities and employees safe. Technical committees set standards used to measure the products and operate industry facilities efficiently. Advocacy committees work with government regulators to ensure new rules from Washington are reasonable.

Many of the best practices and technical standards are published in the GPSA Engineering Data Book, the worldwide authoritative resource for the midstream industry and its approved practices and procedures. First published in 1935, the Data Book has found wide acceptance in the petroleum refining, gas transmission, and petrochemical industries.

The era of change creates a different challenge — groups pushing to replace natural gas with renewable resources. Midstream companies are investing in technologies to make natural gas cleaner and safer. But improving technical prowess and even professional government advocacy isn't enough.

To meet this new challenge, the midstream industry must speak up about what we do and the value we provide. We must inject real-world considerations into conversations about energy and the climate.

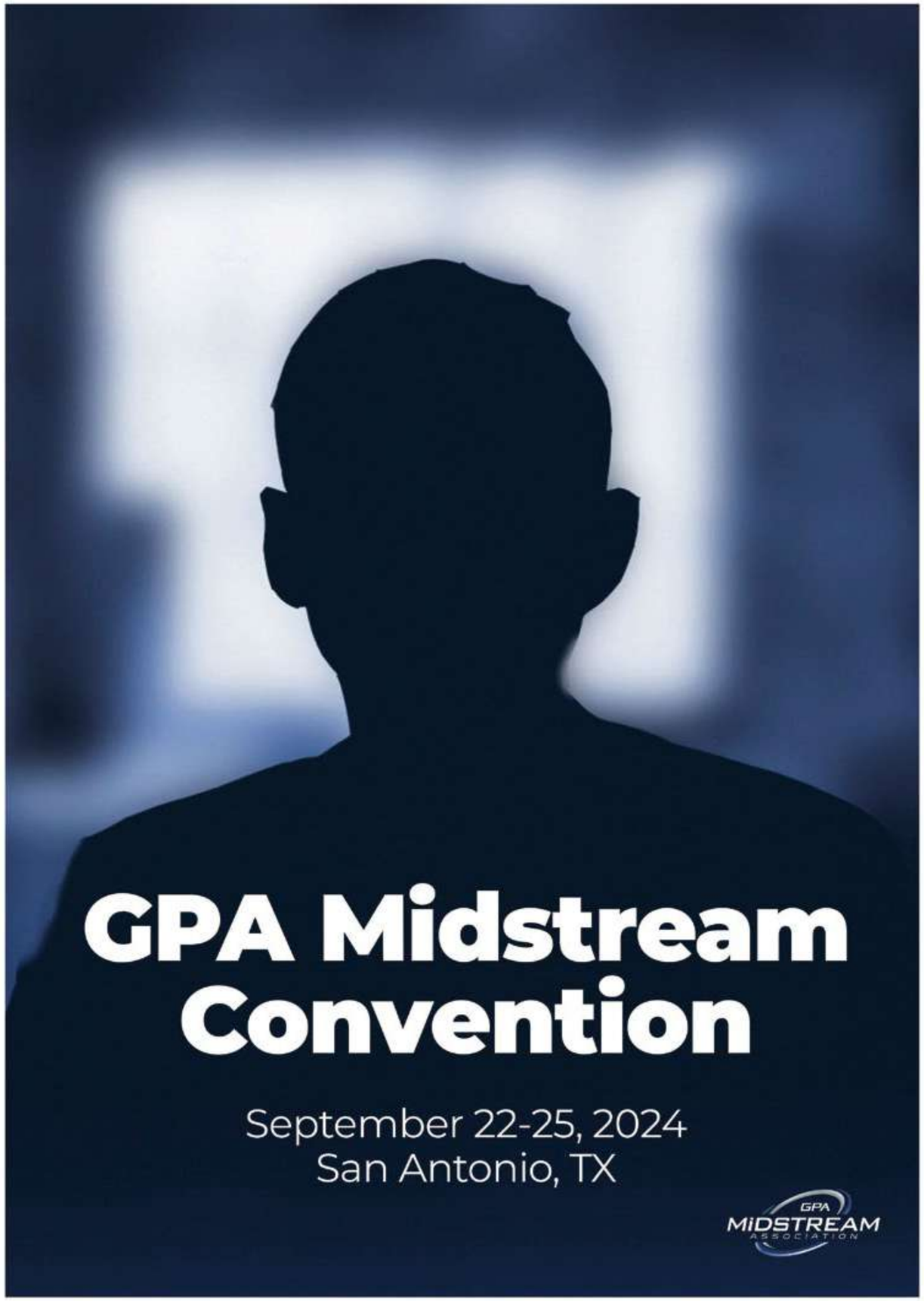
That's why GPA Midstream launched its Let's Clear the Air campaign, a consumer education campaign that provides factual answers to common questions and misconceptions about energy, climate, and efforts to promote an energy transition. Our decision to initiate the campaign is animated by the disconnect between promises and aspirations, and the limitations of capacity, financing, and resources.

For example, in an episode of his New York Times podcast, Ezra Klein told listeners the U.S. needs to build two 400 mw solar arrays per week for the next 30 years to hit a middle of the road renewable energy pathway. He concluded with a stark sentence: "We don't have the capacity to do that."

When it comes to energy and climate, we don't need business as usual partisan wrangling. We need a thoughtful, reasoned discussion that brings together experts from all relevant fields to set realistic goals and chart a path to achieving them. We need to talk about what's possible over what timeframe, as well as the necessary costs and trade-offs. And we need to avoid the trap of making unrealistic plans that can't meet the growing demand for reliable, affordable, and cleaner energy.

The expertise that resides in the midstream is an untapped resource as political leaders seek to change how we produce and consume energy. Let's Clear the Air brings forward the perspective of these industry experts and invites a conversation about the future of energy.

Learn more:
GPA Midstream Association
GPSA Midstream Suppliers
Let's Clear the Air



By: Israel Hurtado and Eng. Isabella Sanchez

Energy Transition Unveiled:
A Glimpse into 2024 in Mexico and Latin America

In the world of energy, where innovation shapes the future, energy experts and companies play a key role in charting the path to sustainability. As we look ahead to 2024, exciting developments enabling the decarbonization of processes in different sectors, the energy transition in Mexico and Latin America are poised to redefine the future.

Over the past decade, Mexico and Latin America have experienced a remarkable shift towards a more sustainable and renewable energy future. Initiatives to reduce greenhouse gas emissions, improve energy efficiency and move away from fossil fuels have been enthusiastically received. Countries across the region have set ambitious renewable energy targets, with solar, wind and hydroelectric projects taking a leading role. The transition to cleaner energy sources is not just an environmental commitment; it is a strategy that promises long-term economic sustainability.
One of the most intriguing developments in the world of clean energy is the growing interest in clean hydrogen as a sustainable alternative. Clean hydrogen, with its impressive energy density and zero emissions when produced using renewable sources, is emerging as a clean substitute for fossil fuels, giving this new industry the potential to transform diverse sectors, from transportation to industrial processes, unleashing a “hydrogen revolution.”

On the other hand, a key component in the adoption of renewable energy is the modernization of energy grids. Smart grid technology, advanced energy storage solutions and advanced grid management systems are currently in the spotlight. These innovations aim to improve grid reliability and flexibility, paving the way for a more resilient energy infrastructure.
Electric vehicles (EVs) are also rapidly gaining ground in the region thanks to government incentives and the development of charging infrastructure. The transportation industry is electrifying at an unprecedented pace, ushering in a cleaner and more sustainable era while reducing dependence on fossil fuels.

It would be optimal for governments in Mexico and Latin America to maintain strong support for clean energy initiatives through favorable policies and regulations, which, in addition to supporting renewable energy projects, will also create an enabling environment for companies in the energy sector.
We can say that the constant search for innovation in renewable energy technologies is the basis for progress. Finding more efficient and cost-effective solutions is an ongoing effort and new ideas for improving solar modules, wind turbines and energy storage systems could be on the rise, which will benefit both suppliers and consumers.

Considering that the renewable energy market in the region demands entrepreneurs and investors with many opportunities, companies involved in the production of materials and equipment for the energy, construction, maintenance, engineering, and consulting sectors foresee an increase in demand for their services and products.

As we stand on the threshold towards 2024, the energy transition in Mexico and Latin America is a tale of relentless evolution. The adoption of clean and sustainable energy sources is more than just an option; it is a gateway to the future. For professionals and companies in the energy sector, this is an open invitation to step into these exciting developments, explore the myriad opportunities and be part of the transition to a greener, more sustainable future.

American Petroleum Institute

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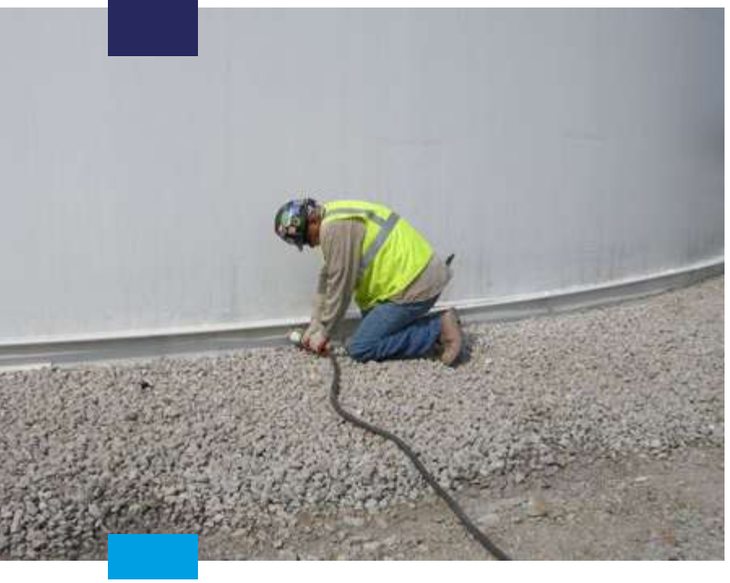


Zerust Oil & Gas is a leading provider of corrosion solutions

for the oil and gas industry, with a primary focus on safeguarding critical infrastructure from the damaging effects of corrosion.

With a wealth of experience and innovative technologies, Zerust offers a range of corrosion prevention products and services to ensure the longevity and integrity of assets within this vital sector.

Corrosion solutions encompass the application of Vapor Corrosion Inhibitors (VCIs), a technology that releases protective molecules into an enclosed environment, forming a corrosion-inhibiting barrier on metal surfaces. This non-invasive method ensures that equipment, pipe casings, storage tanks, and other infrastructure components are protected from corrosion without the need for physical alterations or oftentimes coatings, reducing downtime and maintenance costs.

Zerust's corrosion prevention solutions are not only highly effective but also eco-friendly, as they eliminate the need for toxic coatings or other environmentally harmful practices. These solutions have been extensively tested and validated, making them a trusted choice for many industry professionals.

Their team of experts is dedicated to helping clients implement the most efficient and cost-effective corrosion prevention strategies, ensuring that assets remain productive and safe.

In a field where corrosion poses a significant threat to infrastructure and profitability, Zerust Oil & Gas stands as a reliable partner, offering proven solutions that protect against the pervasive issue of corrosion, extend the lifespan of equipment, and ultimately enhance the operational efficiency of the oil and gas industry.

Microencapsulated Chemistry for Your Wells

Treating oil wells to prevent tubing and pump corrosion, as well as plugging due to scale and paraffin deposits, has traditionally been a major operational expense. Ryte Energy Technology presents a novel solution: a tool that precisely delivers chemistry from downhole. The hallmark of our technology is encapsulating the required chemical formulation within a liquid-soluble shell, enabling continuous chemical delivery to well fluids over extended periods, thus significantly reducing associated costs.

Our innovative EncapTool incorporates multiple chemical bars, which interact with well fluids through small perforations.

This simple design promotes the dispersion of the Chembar matrix and ensures efficient diffusion of chemicals into the flowstream. A key aspect of our microencapsulation process is maintaining a high inhibitor concentration, guaranteeing steady delivery to our clients. The success of our solution hinges on meticulous water and oil analysis, understanding well conditions—particularly temperature and flow rate—and selecting the appropriate Chemical Bar tailored to these conditions.
This method of deployment provides substantial cost-benefit advantages by protecting tubing, pumps (including all types of Artificial Lift Systems), and other well components. It effectively replaces surface treatment, batching, or capillary usage for an extended duration. Another significant advantage is the elimination of expenses associated with chemical injection pumps, tote refilling, and energy consumption, thereby minimizing Health, Safety, and Environmental (HSE) risks with an environmentally friendly solution.

To discover how your company can benefit from cost reductions and receive a customized solution, contact Ryte Energy Technologies: ***sales@ryte-tech.com.***

Revolutionizing Methane Abatement with Picarro

Methane, a greenhouse gas far more potent than carbon dioxide, plays a significant role in the current climate crisis. Its impact on global warming is about 86 times greater than CO2 over 20 years, accounting for about 25% of human-caused warming. The relatively short atmospheric lifespan of methane (12-15 years) presents an opportunity for rapid reduction in greenhouse gases. In this context, Picarro's advanced Emissions Measurement solution is pivotal.

Picarro's solution approach revolutionizes emission factor inventory creation. Traditional methods often fail to provide a full, accurate emissions picture, making effective reduction strategies difficult. Picarro's cloud-based solution equips Distribution System Operators (DSOs) with the means to monitor, quantify, and report emissions accurately, facilitating significant reductions across various geographies.

This technology is crucial for companies aiming to meet Environmental, Social, and Governance (ESG) goals amidst a global mandate to measure and reduce methane emissions. Picarro's solution is vital for DSOs managing emissions along the natural gas value chain. Effective methane management not only furthers ESG objectives but also boosts funding, reputation, and market performance.

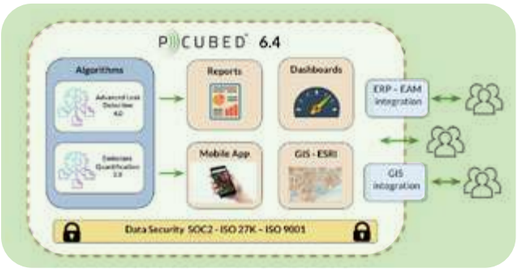
For effective emissions quantification, accurate data is essential. Picarro excels in this area with its mobile Advanced Leak Detection (ALD) system, equipped with a powerful parts per billion (PPB) natural gas analyzer. The Picarro ALD utilizes Cavity Ringdown Spectroscopy (CRDS) along with environmental and geo-positioning sensors. This advanced setup accurately identifies methane emissions, pinpointing their exact locations and concentrations. This system is installed in a vehicle to significantly improve coverage over the gas network. Picarro's ALD technology outperforms other market alternatives, including satellites, aerial-based LIDAR, drones, and handheld devices. Its exceptional sensitivity and scalability render it highly effective for comprehensive emissions measurement and management.

The fourth-generation ALD algorithm demonstrates over 90% leak detection, less than 10% false positives, and more than 90% field of view. Its flow rate estimate accuracy has been proven in controlled-release studies and real-world applications, key for managing fugitive emissions.

After detection, Picarro accurately measures leaks, which is crucial for quantifying emissions at specific sites or assets. Their methods range from direct gas flow measurement to optical imaging, enabling comprehensive emissions assessment and reporting.

Picarro's latest advancements encompass the Network Emissions Measurement application for P-Cubed®, which is the cloud-based component of the Picarro Solution. Powered by the cutting-edge 3rd generation Emissions Quantification (EQ) algorithm, it delivers precise top-down emissions estimates derived from real measurements, enabling a comprehensive inventory of network emissions.

Their GIS-based visualization tools, like the Network Assessment Viewer (NAV), offer an interactive view of methane sources and emissions. This suite of tools, combined with Picarro's measurement technology, forms a complete solution for emissions reporting and reduction.



In summary, Picarro's Emissions Measurement application and technologies present a robust, precise, and scalable solution for methane emissions management. This innovation aids companies in achieving ESG goals and improves market positioning. Utilizing Picarro's solutions, organizations can significantly reduce methane emissions, contributing to a more sustainable and environmentally responsible future.

Hocol: Sharing the Life of Colombia

Hocol, a subsidiary of the Ecopetrol Group, is a company born 67 years ago in Colombia which focuses on energy development and sustainability. After more than six decades of continuous work, Hocol has evolved to become a prominent player in the Colombian energy sector.

Hocol plays an active role in Colombia and works as a strategic partner to build a common and sustainable future in a shared environment. For this reason, the company has strengthened its portfolio with projects that generate social, environmental, and economic value in the regions where it operates, increasing its presence in the country while expanding its portfolio of crude and gas production while ensuring a solid reserve replacement performance in mature assets.

In the near future, Hocol will focus its efforts on consolidating its position in key areas of Colombia to maximize the value of its current portfolio and prioritize the development of substantial assets. It will also seek to expand and strengthen its activities. in the gas sector, enhancing its commercial capabilities and making the most of its existing infrastructure while enhancing its presence in new areas, focusing on gas and light crude, essential for the energy transition and security.

Hocol aspires to lead in sustainability, setting goals related to decarbonization, water-positivity and the generation of welfare and social value. With a current portfolio composed of 65% gas and 35% crude, Hocol aims to be resilient in the face of oil price volatility, ensuring competitive returns while promoting the well-being of its teams and communities.

INSPENET interview with **Tinker & Rasor's President and CEO Mark J. Byerley, Sr.**

Q: How did Tinker & Rasor start?
A: In 1948, Leo Tinker and Jack Rasor created the first Tinker & Rasor Holiday Detector, marking the beginning of a successful venture.

Q: Can you provide a brief overview of the company?
A: Our product line includes Holiday Detectors, Pipe & Cable Locators, Cathodic Protection Instruments and Test Stations. Our products assist in various tasks performed regularly by corrosion professionals, such as coating inspections, pipe-to-soil surveys, insulator testing, short locating in distribution systems, leak detection/location, soil resistivity measurements, instrument accuracy verification, AC voltage monitoring, interrupted surveys, casing shorts, and other activities all corrosion professionals do regularly.

Q: Many businesses face challenges and changes over the years. Can you share some of the significant milestones and transformations that the company has experienced?
A: In 2019, our company underwent a substantial transformation by relocating our entire operation from California to Texas. This move resulted in the departure of employees who collectively possessed over 100 years of combined experience. Rebuilding our team in Texas was a gradual process, and we are grateful for the dedication of those who chose to make the move with us.

Additionally, the COVID-19 pandemic presented a significant challenge to manufacturers. The global supply chain disruptions during this period led to the receipt of defective parts, causing a substantial backlog. With considerable effort, we have successfully overcome these challenges.

Q: What have been the key factors contributing to the company's longevity and success?
A: The key contributors to our company's enduring success include a dedicated focus on employee training, streamlined warehouse processes, rigorous quality control measures, ongoing investment in research and development, and a commitment to innovative product design.

Q: How has the industry evolved over the years, and how have these changes affected the company?
A: Manufacturing technologies have drastically changed manufacturing operations improving productivity and efficiency. These processes effectively make the company much more efficient and have a positive effect on the cost of production.

Q: Can you highlight some of the most notable achievements that the company has been known for throughout its history?
A: In 1999 Tinker & Rasor was honored to receive the NACE Distinguished Organization Award. This Award recognizes companies that have, over a sustained period, made outstanding contributions in the field of corrosion science or engineering, or for a major technological contribution to either field.

Q: What are the principles that have guided the company's operations and decision-making throughout its 75-year history?
A: The company has been steadfast in cultivating a culture centered on elevating customer satisfaction and fostering robust customer relationships.

Q: What do you think is the most significant aspect of your success?
A: Word of mouth is our greatest advertising as we've cultivated an impeccable reputation and a wealth of experience widely recognized in the industry.

Q: You mentioned in 2019 you moved the company from California to Texas. How has that benefited the company?
A: Our New Braunfels facility, spanning 45,000+ square feet, positioned us for future growth. Additionally, our strategic location enables most shipments to be delivered within a few days, contributing to an enhanced customer experience and improved relationships.

MISTRAS Group, Inc.

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MISTRAS Group, Inc. (NYSE: MG) is a leading "one source" multinational provider of integrated technology-enabled asset protection solutions, helping to maximize safety and operational uptime across the oil and gas industry.

Backed by an innovative, data-driven asset protection portfolio, proprietary inspection technologies, and a decades-long legacy of non-destructive testing (NDT) knowledge and leadership, MISTRAS utilizes its depth of asset protection expertise to support safe operations across refineries, petrochemical plants, and other downstream facilities.

MISTRAS supports its clients with specialized inspection, maintenance, access, data management, and equipment solutions. These processes are offered as either an individual service or as part of an integrated, customized, evergreen asset protection program.

MISTRAS delivers an extensive portfolio of solutions, designed to provide the right solution for plants' asset protection needs– that's their "OneSource™" approach. That means the days of calling in specialty 3rd-party contractors for services like at-height access or light mechanical services can now be minimized

MISTRAS also enhances client value by empowering clients to make smarter, data-driven asset integrity decisions. Through MISTRAS Digital® and Plant Condition Management Software (PCMS®), MISTRAS integrates asset integrity data with mobile inspection reporting and an industry-leading asset integrity management services (AIMS) software for maximum data visibility.

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Pipelines
Energy Industry Veins?

Similar to the veins in a human body, the pipelines that transport hydrocarbons represent the vital infrastructure that sustains the energy industry's fluidity. They are the backbone that ensures a steady supply of raw materials, fuels and materials that drive the economy and meet society's energy needs. As with the veins, the health and integrity of these pipelines must be carefully maintained and protected.

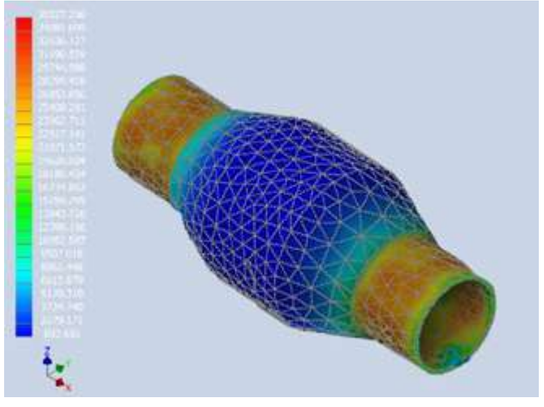
Effective preventive and corrective maintenance practices must be implemented to safeguard the integrity and safety of these energy arteries, using a variety of tools and technologies to ensure optimal performance that requires a comprehensive approach.

Operational failures can have devastating consequences, not only in terms of supply shortages, but also in terms of the population and environmental safety. Therefore, maintenance and reinforcement practices under standards, engineering and quality are of paramount importance.

Advanced tools such as finite element studies are available to understand the behavior of recommended repairs. These studies provide a detailed view of variables, including load increases due to internal pressure, determine the magnitude of the loads and stresses, and demonstrate that the repair method transfers properly the loads from the conductor pipe to the installed reinforcement that guarantees the integrity, with a permanent repair for the lifetime of the pipeline.

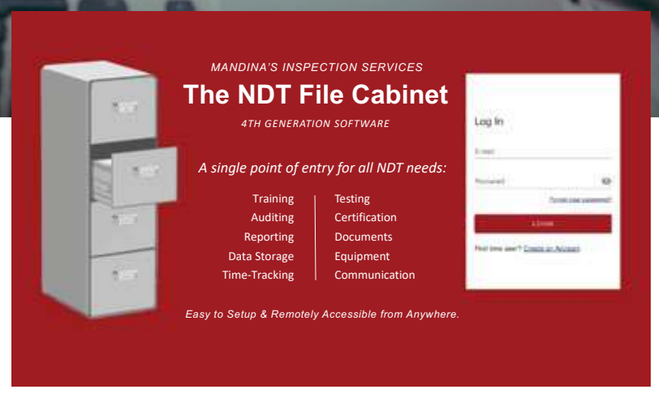
In summary, the analogy between hydrocarbon pipelines and veins in a human body is undeniable. Just as the body needs adequate blood flow to function properly, the energy industry needs safe and efficient pipelines to consistently deliver energy.

It is only through a rigorous approach to maintenance, the use of standards, best engineering practices, a focus on safety supported by advanced tools that we can ensure a reliable and safe energy supply for the future. RAM-100 has successfully ventured into the energy industry utilizing pipeline transportation by RAMFILL™ reinforcements from design and manufacturing under international standards that comply in all, with sizing and tolerances under certified procedures and controlled plant processes.



THE NDT FILE CABINET:

A REVOLUTION IN TRAINING AND DOCUMENT MANAGEMENT



In an age defined by the constant flow of information, the need for efficient document management within the inspection industry has never been greater. Leading the world in NDT 4.0, David Mandina and Mandina's Inspection Services, Inc. are proud to present the NDT File Cabinet—a pioneering solution in this realm, revolutionizing the way organizations handle their records, both physical and digital.

Boasting an array of powerful features, the NDT File Cabinet is an indispensable tool for all aspects of NDT, not just documents. Its intuitive interface makes uploading files easier than ever. Access them anytime with advanced search features and filters to easily create, edit, or navigate exams, documents, equipment, or trainee databases of any size.

While version control maintains a clear record of document revisions for you, calibration control maintains compliance by notifying users prior to upcoming recalibration dates or upon any expiration. Everything needed to stay within compliance of an audit is centralized in the palm of your hand with excellent mobile accessibility, and the platform's scalability provides seamless accommodation for companies of any size.

The NDT File Cabinet is a game-changing program that also provides a digital training database, timesheets, reports, exam creation and editing (practice, course, general and specific), electronic signatures, certificate generation, and more. The time has come to push the boundaries of productivity further, and embrace the digital age of NDT.

Eddyfi Technologies Leads the Way in NDT Solutions:
A Beyond Current Glimpse into 2024

In the dynamic landscape of Non-Destructive Testing (NDT), Eddyfi Technologies continues to be a trailblazer, offering comprehensive solutions that redefine industry standards. As we step into 2024, Eddyfi Technologies is proud to showcase its continued commitment to excellence through an array (no pun intended) of cutting-edge offerings.

At the forefront is the complete Phased Array Ultrasonic Testing (PAUT) package, a gamechanger in the world of NDT. This comprehensive solution comprised of world-class instruments, software, scanners, probes and wedges empowers technicians with advanced capabilities, ensuring precise and efficient inspections. Eddyfi Technologies PAUT solutions are designed to streamline workflows, enhance flaw detection, and improve overall inspection accuracy, setting a new benchmark for excellence in NDT.

Taking NDT operations to new heights, Eddyfi Technologies re-introduces its multi-mission modular inspection crawlers that promise unparalleled versatility and efficiency. These crawlers are equipped with advanced sensing technologies, allowing for seamless navigation through complex geometries and challenging environments. The integration of robotics into NDT operations not only increases productivity but also minimizes human exposure to hazardous conditions.

Looking ahead, Eddyfi Technologies teases exciting innovations set to revolutionize the NDT landscape. With a commitment to pushing the boundaries of technology, the company envisions solutions that will further enhance inspection capabilities, reduce inspection times, and offer unmatched reliability.

In conclusion, Eddyfi Technologies stands as a beacon of innovation in the NDT industry, providing comprehensive solutions that empower technicians and redefine what is possible. As we embark on a new year, the promise of cutting-edge technology and groundbreaking innovations reaffirms Eddyfi Technologies position as a leader in NDT solutions, driving the industry toward a future of unparalleled excellence.

Learn more at www.eddyfi.com

Interview with **Dr. David Alleyne, CEO of Guided Ultrasonics Ltd.**

Can you provide a brief description of GUL and its position in the energy sector?

GUL manufactures guided wave testing and monitoring equipment, focusing on innovation and continuous improvement of our technology and services. By listening to our customers within the energy sector, we refine and deliver better products and services. We aim to add value through expertise and originality, which is why the company values its diverse team of professionals and continues recruiting talent from all over the World.

How has Guided Wave technology evolved? What has been its impact on the inspection and maintenance of energy infrastructure?

We initiated the development of GUL guided wave technology over three decades ago. Since then, a continuous journey of innovation has enabled us to achieve applications that were once considered mere aspirations. Our technology has revolutionized the inspection and maintenance of energy infrastructure by offering practical solutions to considerable challenges. For instance, GUL technology has been successfully employed to test pipes beneath road crossings, eliminating the need for disruptive excavation. Our commitment to advancement has not only introduced new tools and expertise to inspectors but has also provided energy sector clients with innovative solutions. From subsea piping assessments to measuring wall thickness profiles in traditionally inaccessible positions, our impact on global pipeline testing is profound. By consistently addressing challenges deemed unresolvable and offering reliable alternatives, GUL has reshaped industry practices and redefined the standards for pipeline inspection and maintenance worldwide.

Has GUL established any strategic collaborations or partnerships with other companies or institutions in the energy field? How do these partnerships contribute to the company's growth and success?

Since our inception we have fostered a climate of collaborative partnerships with our clients, universities, and major energy companies. The outcome of these collaborations can be seen in many of our products and services, with some having led to patents of new inventions.

What are the emerging trends in the energy sector that could impact GUL in the future?

The rise of automation and the advent of NDT 4.0 in the energy sector present new and promising opportunities for guided wave technologies. At GUL, we foresee a substantial growth in monitoring within the industry. In a proactive response to this transformative trend, we have developed guided wave solutions and tools to address the associated challenges. Consistent with our commitment to quality, we diligently refine and advance these solutions as the trend evolves.

Our focus extends to automated data processing, transforming raw data into valuable information. Simultaneously, we are exploring innovative ways to visualize results and enable seamless integration into databases. All of these efforts facilitate efficient communication among specialized teams, ensuring the exchange of valuable information that triggers informed actions.

Wavemaker House
Unit 3 Brentwaters Business Park,
The Ham Brentford TW8 8HQ
Teléfono: +44 20 8326 18910
info@guided-ultrasonics.com
www.guided-ultrasonics.com

Dr. David Alleyne CEO, Guided Ultrasonics Ltd.

EQUIPCON GROUP Celebrates 30+ Years of Excellence

and Expands Reach with New Office in Mexico

In a remarkable milestone, Equipcon Group is proud to announce over three decades of providing top-notch non-destructive testing (NDT) supplies, equipment, and systems in the USA. This journey of excellence has led to a significant expansion with the inauguration of Equipcon Mexico, a strategic move to cater to the NDT needs of Mexico, the Caribbean, Central, and South America.

Equipcon Group has been a trusted name in the industry, and the new office in Mexico signifies the commitment to serving a broader clientele. The expansion comes at a crucial time when the demand for high-quality NDT solutions is on the rise in the oil and gas, mining, and automotive component manufacturing sectors across these regions.

The new facility in Mexico will specialize in consumable materials for liquid penetrant and magnetic particle inspection methods, meeting the stringent requirements of various industries. Equipcon Group's Value line magnetic particle and fluorescent penetrant systems, ultrasonic thickness gauges, sensors, couplants, and integrated UT Systems will be readily available to address the evolving needs of clients.

This expansion reflects Equipcon Group's dedication to providing cutting-edge solutions to its customers. The move is expected to enhance efficiency and accessibility, fostering stronger partnerships with businesses in the oil and gas, mining, and automotive component manufacturing sectors in Mexico, the Caribbean, Central, and South America. Equipcon Group looks forward to continued growth and success in the years to come, building on a legacy of quality and innovation that spans more than three decades.

Biomethane: An Opportunity for Development and Growth in Mexico

By Ana Laura Luldow

Mexico is in a constant search for innovative and sustainable ways to diversify its energy matrix that can make the most of the natural resources we have, and biomethane emerges as a promising alternative that could play a key role in the transition towards cleaner and renewable sources.

Biomethane is a renewable natural gas produced from organic biomass, such as agricultural and food waste, and sewage sludge. Through a process of anaerobic digestion, these materials are broken down into biogas, which is then purified to obtain high-quality biomethane.

Mexico's existing natural gas infrastructure presents a strategic opportunity for the efficient integration of biogases, such as biomethane, into the gas supply grid. This transition could enable the transmission, distribution and utilization of biogas on a large scale, taking advantage of the infrastructure already in place for natural gas.

One of the main advantages of this adaptation is the physical and chemical compatibility between biomethane and conventional natural gas. Both gases share similar properties, which means that facilities and equipment designed for natural gas can, to a large extent, be used for biomethane without major modifications. This includes pipelines, compressor stations and consumer equipment, which eases the transition and minimizes implementation costs.

At ENGIE Mexico we have paid special attention to this biogas as it takes advantage of the abundant natural resources and the vast amount of organic waste generated in the country by the agricultural sector, transforming it into a valuable energy source.

The integration of biomethane into the Mexican energy mix not only offers a cleaner and more sustainable option, but also fosters the development of an innovative and job-creating industry. By investing in biomethane production technologies and associated infrastructure, Mexico could establish itself as a regional leader in the transition to a more sustainable and resilient energy matrix.

IMC was established by a group of experienced Mexican professionals with over two decades of experience in the private and public Oil & Gas industry in Mexico, Central, and South America. We specialize in mechanical integrity management and related services, encompassing direct and indirect inspections, risk assessment, and cathodic protection systems, among others. However, what truly sets us apart is our specialized experience and knowledge.

We don't just offer a service catalog; we provide tailored solutions to each client's needs. Our approach is highly personalized, recognizing the uniqueness of each client and structure, adapting our technical proposals accordingly. We leverage our most valuable resources: technological innovation and a highly qualified team of experienced engineers and technicians, renowned for their successful track record in the oil and gas industry.

We take pride in using cutting-edge technology and innovation in our projects. From advanced modeling software to remote monitoring systems, we ensure efficient and top-quality solutions.

At IMC, regulatory compliance is essential. We rigorously adhere to all industry standards and regulations, ensuring safety and trust for our clients.

Our distinguishing factors include exceptional customer service and ongoing support. Our commitment extends beyond implementing solutions; we provide continual assistance to ensure the durability and optimal performance of our projects and services.

These core values set us apart, allowing us to offer high-quality solutions and personalized attention to each of our clients.

Some of our Solutions:

FIELD SERVICES:
Our field services offer comprehensive solutions for characterization, maintenance, and safety in rights-of-way (ROW), complying with industry standards. Characterization is simplified through cutting-edge technologies like HOTSPOT AIR VIEW®, employing drones and state-of-the-art cameras to create 360° representations, georeferenced mapping, point clouds, and a potential risk database.

INTEGRITY MANAGEMENT:
Mechanical integrity is crucial in the hydrocarbon industry, and compliance with NOM-009-ASEA-2017 can be challenging. Our consultancy offers comprehensive solutions using the iMSAI software tool supported by experts experienced in the regulations. Trust us to extend the lifespan of your assets, ensuring operational reliability, risk reduction, and straightforward compliance.

CATHODIC PROTECTION:
Our NACE / AMPP-certified engineers provide comprehensive cathodic protection solutions for pipelines, tanks, and metal structures. What sets us apart? Our innovative environmental sensitivity analysis methodology, ensuring highly effective and efficient systems tailored to your specific environment.

REMOTE MONITORING POSTS iTS®:
Programmable automatic devices offering essential SPC measurements remotely, such as pipe potential, direct and alternating current density, transmitted via various technologies like Bluetooth, Radio Frequency, and satellite.

SUSTAINABLE MARKER POSTS AND PROTECTION PLATES:
We manufacture marker posts and flags from recycled high-density polyethylene fibers, reducing theft, alongside protection plates for ducts that help mitigate risks and comply with regulations.

NON-DESTRUCTIVE TESTING:
Our focus adheres to strict regulations, international best practices, and your facility's specific technical requirements. We execute efficient inspection plans using cutting-edge non-destructive testing equipment.

Our highly qualified inspectors are certified ASNT Level 3, and for challenging access inspections, we have IRATA-certified inspectors in ROPE ACCESS.

Our goal is to ensure the reliability and durability of your pipelines and processing plants, minimizing risks and costs.

INDIRECT INSPECTIONS:
External corrosion is the primary wear factor in pipelines, and at IMC, we've developed comprehensive solutions for indirect inspections. These solutions optimize resources and time by efficiently analyzing cathodic protection system results and evaluating duct coating conditions.

INDUSTRIAL ELECTRICS:
We have a highly qualified team of expert engineers ready to provide comprehensive support, from the design to the supply and installation of industrial electrical systems in both medium and low voltage.

LABORATORY TESTING:
Understanding the capacity and composition of your materials ensures operational reliability and efficient resource usage. We conduct tension, Charpy impact testing, and sample analysis through EDS and EMS.

TECHNICAL TRAINING COURSES:
We recognize the fundamental importance of technical training, whether in-person or remote. All our courses are delivered by highly qualified professionals. Explore our complete course catalog on our website.

In summary, our technological solutions and products offer an efficient way to characterize, monitor, and maintain rights-of-way, ensuring safety and regulatory compliance, while also promoting sustainability and environmental care.

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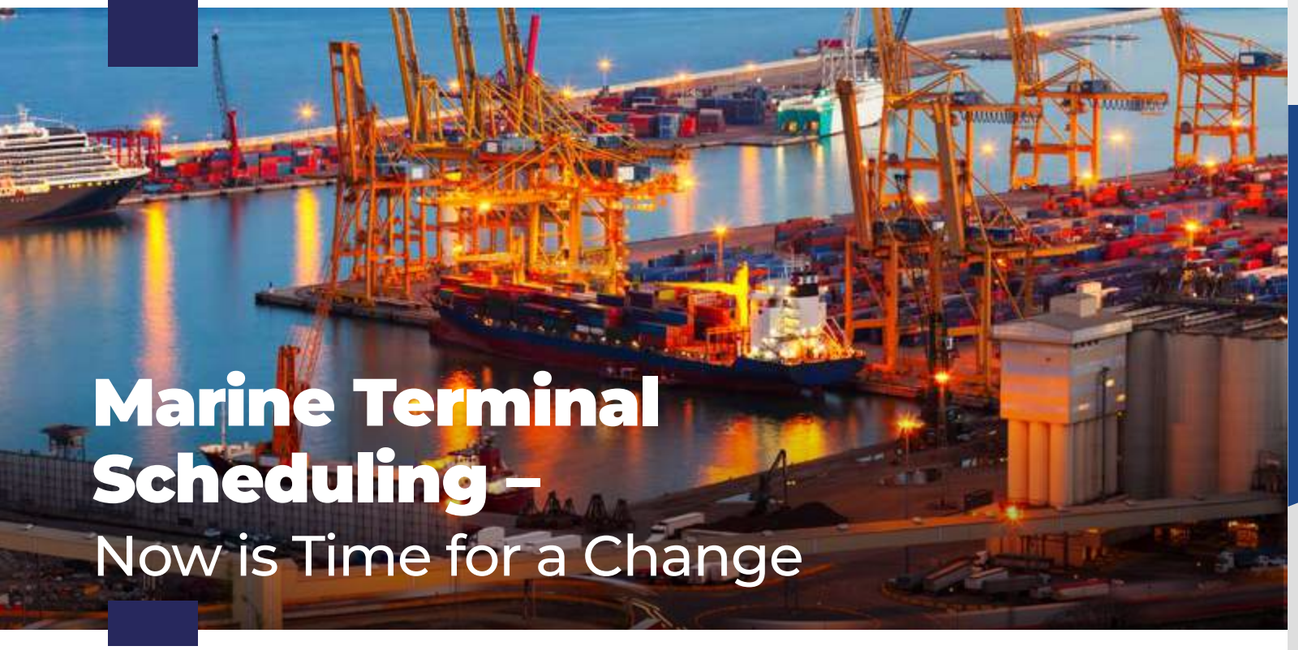


Marine Terminal Scheduling – Now is Time for a Change

With demand for terminals and berths often outstripping availability, coupled with increasing regulations, ever more restrictive environmental targets and compliance-fuelled geopolitical risks, the challenges operators now face in managing marine terminal scheduling has reached new levels of complexity, especially for the oil and gas industry.

The constant movement of vessels in and out of terminals to maximise throughput is often fraught with a number of common issues. From the management of vessel draft and the availability tugs, to changes in vessel ETAs due to unforeseen voyage implications and waiting times, to extensive demurrage charges calculated from delayed operations when accountability is handed out, marine terminal scheduling is a complicated matter.

A Growing Agreement for Change

The rising challenges of the industry have not gone unnoticed. Committees are forming to support the sector in applying industry-wide standards in support of more efficient and connected operations. Paving the way for initiatives throughout 2024, the current train of thought places a high degree of emphasis on the need for collaboration. Collaboration will enable and drive standards across the industry, and it is through a superior level of collaboration that best practice and ways of working will help to define marine terminal operations of the future.

Robert Kessler, MIS Marine Product Manager and sub-committee chair at the Greater Houston Port Bureau (GHPB) Efficiency Committee, who is active in industry standardisation, said, ***'Work of this nature is important, not just in port call optimisation, but the entire voyage evolution. Common agreement of basic terms will provide the foundations for streamlined supply chain management and improved operational efficiency across the full shipping spectrum'.***

Leading the Way in Marine Terminal Operations Management

Understanding the challenges faced, MIS Marine has worked closely with clients to identify ways of working and technical solutions to ease the burden of marine scheduling.

Providing a single source of truth for real-time port call information that all stakeholders can rely on, Marine Terminal Operations helps to address the day-to-day challenges of port congestion, repetitive emails, avoidable berth delays and data-lacking decision-making.

Robert continued, ***'It is systems such as Marine Terminal Operations that will support the industry in addressing the challenges currently faced and realise a more efficient and data-led terminal scheduling operation throughout 2024 and beyond'.***

To find out more or visit: mismarine.com/marine-terminal-operations

Single Point Moorings:

The Future of Offshore Loading and Unloading Facilities for Hydrocarbons

Author: Ph.D. Yolanda Reyes

Over the decades, the oil industry has experienced constant and progressive transformation, largely forged by technological advances that have revolutionized its operational practices. Among these advances, the emergence of intelligent monobuoys stands out as an essential resource in the hydrocarbon logistics chain. Loading and unloading operations Equipped with automation systems, advanced sensors, and real-time communication, they optimize efficiency and safety in maritime oil operations, managing environmental and operational variables to be comprehensive solutions in the loading and unloading of oil tankers in maritime environments, Offshore.

The fundamental role of monobuoys in maritime oil transportation

They are essential for maritime oil transportation, of utmost importance in the oil industry and its logistical operations. The monobuoys, technically known as SPM (Single Point Mooring), represent critical marine structures that play an essential role in the handling and transport of hydrocarbons, both in the form of crude oil and refined products.

These floating platforms are extended in strategic maritime locations, selected based on a series of factors, including water depth, navigation routes, and proximity to land facilities. Their design and construction are meticulously planned to ensure their capability to receive oil tankers of various sizes and classes, providing a safe and efficient transfer point between the vessel and the onshore facilities,

Monobuoy Hydrocarbon Loading and Unloading Systems

Technological Evolution of Monobuoys in the Offshore Oil Industry

While monobuoys have been an integral part of the industry for decades, current technology is taking them to the next level. These intelligent loading units, equipped with state-of-the-art systems, improve operational efficiency, safety, and sustainability in oil loading and unloading operations in maritime environments.

The evolution of intelligent monobuoys not only represents an advancement in engineering and technology applied in the oil sector but also marks a milestone in the constant quest to improve practices and standards in the maritime hydrocarbon transport industry.

These systems are designed to increase efficiency in loading and unloading operations. They incorporate innovations that allow faster and more precise handling of oil, reducing waiting times for oil tankers and therefore, associated costs. Safety has become a top priority, with real-time monitoring technologies that constantly supervise the oil transfer to prevent spills and ensure the safety of workers on the platform and protection of the marine environment.

The Future of Intelligent Monobuoys

As technology continues to advance, intelligent monobuoys are expected to evolve further. The potential integration of artificial intelligence and machine learning could lead to autonomous systems capable of making real-time decisions to optimize maritime operations; promising a safer, more efficient, and sustainable future for the maritime oil transport industry.

In this scenario, operational safety would reach an unprecedented level, as these intelligent monobuoys would be capable of proactively identifying and mitigating risks in real-time to optimize oil transfer and minimize waiting times for oil tankers.

Sustainability is an integral component of this evolution. The integration of advanced environmental management systems and technologies that reduce the environmental impact of operations, contributing to preserving the health of marine ecosystems and the oil industry's image in terms of environmental responsibility.

Own source

Conclusion

Intelligent monobuoys have transformed the oil industry by improving efficiency and safety in maritime operations. Their ability to manage critical variables and move towards autonomous systems with artificial intelligence promises a safer, more efficient, and sustainable future, also opening new opportunities in marine renewable energies.

The 3 Key Factors for Optimizing Turnaround in Oil and Gas Plant

Author: Eng. Mario Toyo

Plant turnarounds in the oil and gas sector are critical events that can have a significant impact on production, costs, and safety. Therefore, it is essential that they are managed effectively to minimize risks and maximize benefits.
The Plant Turnaround Management Process (PSMP) is a business model that provides a consistent method for managing all activities related to a plant turnaround. The PSMP consists of a series of events and activities that must be planned, scheduled, and executed according to an established methodology.

In this article, three key factors of the PSMP model will be analyzed to optimize plant turnarounds in the oil and gas sector:

- **STRATEGIC PLANNING**
- **EXECUTION**
- **MONITORING AND EVALUATION**

1. Strategic Planning: The Foundation of Success

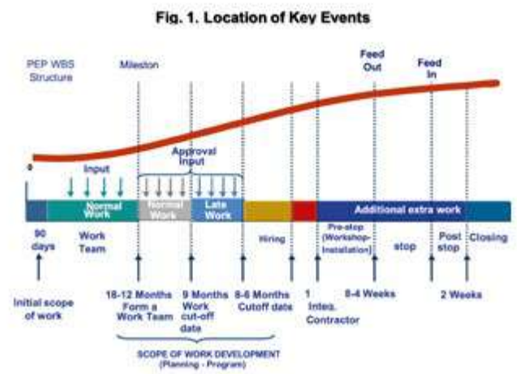
"Planning is the key to the success of any plant turnaround. Good planning will allow for the identification and addressing of potential risks, ensure that objectives are met, and optimize resources.

This factor is based on 'Maintenance based on accurate data', a maintenance approach that has become essential in analyzing real-time historical data; thus, companies can foresee potential failures and carry out appropriate preventive maintenance. This results in more planned turnarounds and a significant reduction in unplanned downtime.
Taking the above into account, the Work Scope is born, which is the document that is based on strategic planning and describes the work that must be carried out during the turnaround. The cost and time of the project will depend on it; therefore, it must be precise, complete, and clear in its activities.

It is important to highlight that this document is based on all those interrelated assets that impact the plant in service. The rest of the assets that do not impact the plant in service are carried out in the Routine.

Summary of Key Planning Elements:
• Define the management team for the turnaround.
• Set goals, objectives, and indicators.
• Establish the working team for the turnaround and assign responsibilities.
• Schedule monitoring and update meetings for the turnaround team.
• Define WBS and availability of process equipment.
• Develop, justify, and minimize the elements of the list.
• Create individual plans for each department for the turnaround, which will integrate into the managerial plan. Everyone should know their responsibilities and fulfill them.
• Approve the initial Work Scope list, the cutoff date, and the budget.
• Develop and communicate the scheduling of the turnaround phases.
• Identification of potential risks.
• Development of a risk response plan.
• Establish the program of key events. In Figure.1, the placement of key events in time can be seen."

Fig. 1. Location of Key Events



2. Execution: Implementing the Plan

La Execution is the practical phase where plans become reality. It must be efficient and safe to avoid delays, additional costs, and occupational risks. This includes processes such as Pre-Shutdown, Change Management, Execution, Progress, and Post-Shutdown.

The most important key elements of plant shutdown execution include:
• Coordination of activities in Pre-Shutdown, Shutdown, and Post-Shutdown.
• Effective communication.
• Risk control.
• Problem-solving execution is the practical phase where plans come to fruition.

3. Monitoring and Evaluation: Ensuring Effectivenes

This phase is vital to ensure effective management of turnarounds and to identify areas for improvement. It includes monitoring progress, collecting data for continuous improvements, and analyzing results. It is crucial for allocating appropriate resources and defining corrective actions for future turnarounds.

x
• Monitor progress in line with the goals and objectives set in the Strategic Planning phase of the project. Is the plan being met? Are there any delays or deviations?
• Collect data for continuous improvement and generation of the Plan. Are there opportunities for improvement? What actions can be taken to improve the process?
• Analyze the data. What information do the data provide?
• Identify areas for improvement. What aspects can be improved?
• Closure of the turnaround. Document the results of the turnaround.
• Lessons learned. What has been learned from the turnaround?

In summary, planning, execution, and monitoring and evaluation are three key factors for optimizing plant turnarounds in the oil and gas sector. Companies that focus on these factors can reduce risks, improve efficiency, and maximize the benefits of their plant turnarounds.

Digital Innovation:

Transforming Safety in the Oil and Gas Industry

By: Ing. Antonio Zavarce

In an industry as vital and challenging as oil and gas, digital innovation is emerging as a beacon of change, promoting not only operational efficiency but also elevating safety standards to unprecedented levels. The integration of digital technologies is redefining how managers monitor and improve operations in oil fields, with a particular focus on accident prevention, worker protection, and minimizing environmental impact.

1. Advances in Safety and Evacuation Procedures

Emergencies in oil fields require quick and precise responses. Projects like OffshoreMuster, driven by digitalization, are revolutionizing emergency management. This system not only provides real-time information on the location and status of workers but also optimizes evacuation processes with advanced electronic registration functions. This system's ability to offer a clear view during chaotic situations is an outstanding example of how technology can be a vital ally in protecting human lives.

2. The Challenge of Emission Monitoring and Sustainability

Exploiting natural resources carries the responsibility of protecting the environment. Here, projects like MethaneMapper in the Permian Basin are making a milestone. This project not only identifies methane emissions in real-time but also traces them to their source. This detailed monitoring capability is crucial for developing strategies to minimize environmental impact and for making informed decisions that balance resource exploitation with sustainability.

3. Improving Processes through Cutting-Edge

Adopting new technologies can be challenging, but it also offers significant opportunities to enhance efficiency and safety. The implementation of hands-free augmented reality technologies in oil fields in the Middle East is an example of how innovation can transform operations. This technology not only improves the accuracy and efficiency of work but also facilitates real-time collaboration with experts, invaluable for improving training and worker performance.

The Importance of Training and Proper Equipment

Despite technological advancements, it's crucial to recognize that technology alone is not enough. Comprehensive safety training and the use of proper equipment are essential components that cannot be replaced. Technology should be seen as a tool that complements, but does not replace, established safety practices.

Worker Participation in Technological Innovation

Feedback and participation of workers in the development and implementation of new technologies are fundamental. Understanding their experiences, concerns, and suggestions not only helps to optimize the use of technology but also fosters a collaborative and respectful work environment. Leaders must be open to adjusting their strategies based on this feedback to ensure that technological innovations are used effectively and efficiently.

Monitoring and Continuous Adjustment

Finally, it's essential for industry leaders to continuously monitor safety and efficiency metrics to assess the impact of implemented technologies. Being willing to make adjustments and improvements based on concrete data is crucial to ensure that the industry not only advances in terms of technological innovation but also maintains and improves its safety and sustainability standards.

Conclusion

In conclusion, the digital revolution in the oil and gas industry is opening new horizons in safety and efficiency. However, this technological progress must go hand in hand with training, proper equipment, and a well-established culture of safety and sustainability. With these elements in place, the industry is well-positioned to face the challenges of the future, ensuring safer and more responsible operations. Technology, in its role as a catalyst for change, not only optimizes processes but also safeguards the well-being of those working in this sector and protects the environment. Thus, the oil and gas industry not only adapts to modern times but also prepares to lead in the era of sustainability and innovation.

Interview with Rosa Solari, Vice President of INSPENET

with over 25 years of experience in the Oil & Gas industry.

Question: As Vice President of Inspenet, what is your vision for the future of the technical platform and how do you expect it to impact the global energy industry?
Rosa Solari's Response:
"My vision for Inspenet, aligned with the objectives of its creator, **Eng. Francesco Guido Solari,** CEO of INSPENET, is to transform the way professionals, corporations, and organizations in the energy sector connect and collaborate globally. We aim to be the platform that drives innovation, accelerating the adoption of sustainable technologies and facilitating strategic collaboration. By doing so, we seek to achieve positive change in the energy industry, promoting efficiency, sustainability, and resilience in an increasingly interconnected world."

Question: Inspenet focuses on connecting and projecting professionals in the energy sector. How do you see the evolution of skills and competencies necessary in this ever-changing industry, and how does Inspenet contribute to this development?
Rosa Solari's Response:
"The constant evolution of the energy industry requires a proactive approach towards skill development. Inspenet aims to be more than a connection platform; it aspires to be a comprehensive facilitator of professional growth. Through educational resources, such as our technical programs on INSPENET TV, special technical events like webinars and discussion panels on current topics in the energy industry, and the creation of specialized communities, we seek to empower professionals to acquire the skills and competencies necessary to thrive in a dynamic and evolving energy environment."

Question: What are the biggest challenges currently facing the global energy industry, and how can Inspenet play a key role in overcoming these challenges?
Rosa Solari's Response:
"The transition to more sustainable energy sources and the need to adapt to a constantly changing energy landscape are crucial challenges. Inspenet positions itself as a facilitator of potential solutions by connecting professionals with necessary skills, fostering collaboration among innovative companies, and providing a space for knowledge exchange. Through these actions, Inspenet aims to be a mediating agent in overcoming the current and future challenges of the energy industry."

Question: How do you see the role of emerging technologies, such as artificial intelligence and blockchain, in transforming the energy industry, and how is Inspenet preparing its users to embrace these innovations?
Rosa Solari's Response:
"Emerging technologies like artificial intelligence and blockchain are reshaping the energy industry, offering opportunities for efficiency and transparency. Inspenet recognizes the importance of preparing professionals to embrace these innovations. We facilitate training in these technologies through strategic partnerships, provide specialized educational resources, and foster collaboration among those at the forefront of technological implementation. By doing so, Inspenet becomes a driver for the successful adoption of emerging technologies in the global energy industry."

Question: INSPENET not only connects individual professionals but also companies and organizations in its corporate section. How does this section benefit companies in the energy sector, and how does INSPENET ensure a conducive environment for strategic collaboration at the corporate level?
Rosa Solari's Response:
"Our corporate section in INSPENET is a cornerstone for companies and organizations in the energy sector. We offer a dedicated space for strategic collaboration, allowing companies to connect with potential partners, access key resources, and participate in joint projects. We ensure a conducive environment for collaboration through specialized features such as detailed corporate profiles, advanced search tools, and exclusive events to foster interaction among leading companies across all areas of the energy sector."

Question: Considering the previous answer, can you tell us specifically who the INSPENET platform is aimed at, and how does it ensure to meet the needs of various sectors within the energy industry?
Rosa Solari's Response:
"INSPENET is designed to meet the needs of various actors in the energy industry, creating a comprehensive space for connection, collaboration, and projection. The platform is aimed at professionals, companies, and organizations operating in a variety of key sectors. From Oil & Gas, Petrochemical, Mining, to New Energies, Maritime Terminals, and the Electrical sector, INSPENET seeks to be the bridge that unites and projects experts and leaders in these fields, fostering strategic collaboration and facilitating the exchange of knowledge to drive progress across the entire industry."

Question: As you lead the commercial and communications part of INSPENET, tell us who can be part of the corporate section of INSPENET and what is the vision for this section?
Response: The corporate section of INSPENET is open to companies and organizations in the energy sector globally. This includes manufacturers of materials and equipment for the industry, construction companies, repairers, maintainers, engineering, inspection, and consulting firms, as well as maritime terminal and electrical sector companies. The vision for this section is to make INSPENET the meeting point where all actors in the energy industry come together, establishing itself as the reference point for the most prominent and important companies and organizations in the sector. We want to provide a space where companies can collaborate, share knowledge, and establish strategic connections to drive growth and innovation in the industry.

Question: INSPENET plays a prominent role in disseminating key events and conferences in the energy industry. How does INSPENET add value to the most important organizations in the sector, ensuring effective visibility and promotion of the most relevant developments presented at these conferences?
Rosa Solari's Response:
"INSPENET positions itself as a catalyst for the effective dissemination of the most relevant advancements in the energy industry. Through our platform, we offer leading industry organizations a global showcase, highlighting their achievements and developments at key events and conferences. We facilitate the connection between prominent companies at exhibitions and interested professionals, promoting the visibility of innovative products, technologies, and services. Additionally, we use our network to publicize the solutions these organizations offer to the sector, thus contributing to advancement and collaboration in the global energy industry."

Question: As a female leader in the energy sector, could you share an inspiring message to encourage professional women to join this industry? Also, how does INSPENET contribute to supporting and empowering women in their professional trajectories within the sector?
Rosa Solari's Response:
"To all the professional women contemplating entering the energy sector, I want to convey a message of empowerment and welcome. This sector, once traditionally considered male-dominated, is evolving and flourishing thanks to the diversity of talents. Each perspective, skill, and contribution is crucial to facing the energy challenges of the future. I believe that a healthy balance of strategic thinking can exist in decision-making in the industry, where women can occupy important roles for the achievement of strategic objectives.

At INSPENET, we recognize the importance of fostering women's participation in this industry. We want them not only to join but also to lead. We inspire and support women by providing spaces to discuss technical topics and industry trends through our technical programs on INSPENET TV, networking events that promote gender equity, and offering educational resources to strengthen key skills. At INSPENET, we believe that when women thrive, the energy industry benefits integrally."

To conclude, "I want to express my sincere gratitude to all members of the INSPENET community. Your participation has been fundamental in establishing us as the platform that connects and projects professionals, organizations, and corporations in the global energy sector. To those who are not yet part of it, we extend a warm invitation to join this network that drives collaboration, projection, and innovation in our industry. Together, we are building the energy future we all aspire to. Thank you for being part of the inspiration that is INSPENET and for sharing experiences and knowledge!" as expressed by the CEO of INSPENET, Francesco Solari, in his famous phrase,

"The knowledge of some will be the strength of all."

INSPENET

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CORTEST

MISTRAS

RAM 100 PIPELINE REPAIR SYSTEMS

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Brown Corrosion Services, Inc.

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AMPP

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VERSA INTEGRITY GROUP

ASNT

DIAPSA Diagnóstico y Asesoría Predictiva

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STORAGE

ANCOR Pipeline Integrity

CFS CONSULTING & FIELD SERVICES

EQUIPCON

iMCO Integrity Management Co.

INSPEALCA LATINAMERICAN SERVICES LLC

GUIDED ULTRASONICS LTD.

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

Ing. Yeimy Baez

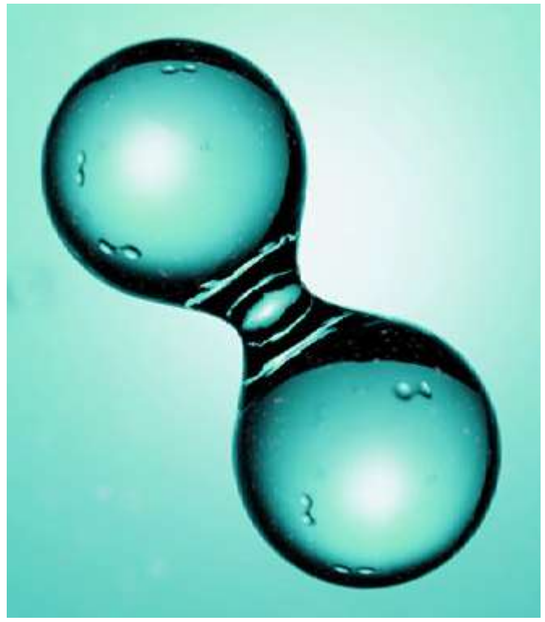
Hydrogen and the Energy Future:

Navigating Promises and Global Challenges

In 2022, global CO2e emissions reached 40,600 MTons, and by 2030, they are projected to exceed the targets set in the Paris Agreement by 8,000 MTons. A significant percentage of these emissions can be attributed to land-use changes, but it is the energy system that sits at the heart of the debate. The challenge is even more significant as we face a trilemma: reducing emissions, ensuring energy reliability, and guaranteeing affordability.

In the face of this challenge, hydrogen emerges as a promising alternative. Capable of releasing 130 Megajoules per kilogram, it surpasses traditional fuels, which range between 40 and 55. However, hydrogen has a low energy density by volume, which limits the efficiency of the process and raises the costs of its use. Its applications are focused on its clean emissions — only water vapor —, its ability to store excess renewable energy, its suitability for heavy industry and transport, and its potential to decentralize production. As of December 2022, 1,000 projects had been announced to produce 38 MTons of hydrogen, representing investments of USD 320 billion, but only 9% have been given the green light in terms of investment.

Hydrogen plays a vital role in the energy strategy of Latin America, a region with significant potential thanks to its abundant renewable resources. However, it is still in the early stages of development. The challenges to be overcome include the large gap between the incentives provided by international programs such as the IRA and RepowerEU, which total USD 520 billion; the need for investment in infrastructure; effective project implementation; and the creation of regulatory frameworks that facilitate investment and energy transition.



Earl Crochet, PE - Owner at Crochet Midstream Consulting

Tanks in 2024 and beyond

The Tank Whisperer has looked into his hazy crystal ball and has made the following predictions for the tank industry.

The Tank Whisperer has looked into his hazy crystal ball and has made the following predictions for the tank industry.

Regulations – Regulations on tanks continue to grow, especially in the United States. New Federal regulations on tank emissions will go into effect in 2024 with more on the way. There will be new regulations (probably) for chemical tanks like the existing EPA SPCC for tanks storing oil. In addition, more States are implementing tank regulations on inspection and integrity (API 653) and to prevent overfills (API 2350).

Technology – New and improved technology will give Owners more options than ever before to operate and inspect their tanks. Robots can now do all the inspections needed to perform a full API 653, both on the inside and the outside of the tank. This allows Owners to assure the integrity of their tanks without removing them from service. This can save time, money, reduce waste and improve ESG scores.

Industry Brain Drain – The Great Crew Change, Covid layoffs and reorganizations, and fewer people choosing to become technical experts have created a situation where Owners often now lack enough internal employees that are Subject Matter Experts in tanks. This means that Owners are more dependent on third party and consultants to solve problems and answer questions.

So, what are Owners to do? Short term, use consultants to help bridge the gaps. Long term, either establish long term relationships with industry experts or create their own in house.

Jorge T. Reyna, MCI

Optimizing Welding Quality:

Eddy Current Inspections for Weld Repairs

Welding stands as a fundamental component across numerous industries, from manufacturing to construction. Ensuring the integrity and quality of welded joints is crucial for guaranteeing the durability and safety of structures. In this context, repair inspections play a pivotal role, and one of the most advanced and effective methods for this task is the use of eddy currents.

What are eddy currents and how do they function in welding inspections?

Eddy currents, also known as Foucault currents, are an electromagnetic phenomenon generated when a varying magnetic field interacts with a conductive material. In the context of welding inspection, eddy currents are utilized to evaluate integrity and detect flaws in welded joints.

The process of inspecting with eddy currents involves the use of special probes that generate varying magnetic fields. These probes are moved over the welding surface, and the resulting eddy currents are detected and analyzed to identify discontinuities or defects, such as cracks, inclusions, or lack of fusion.

Advantages of eddy current inspections in welding repairs

One of the key advantages of this method is its ability to inspect extensive areas of welds in a short amount of time. Additionally, eddy currents can penetrate coatings and paints, making them ideal for inspecting welds that are already in service or have surface layers.

Moreover, this non-destructive approach allows inspection of welds without damaging the material, which is crucial in applications where structural integrity is vital. Additionally, eddy current inspections are highly sensitive to small cracks or defects, contributing to early detection of potential issues.

Challenges and considerations in employing eddy currents for welding inspections

Despite numerous advantages, eddy current inspections also present challenges. The interpretation of collected data can be complex, as defect detection requires expertise and specialized knowledge. Moreover, the shape and size of defects can influence the inspection's accuracy.

The orientation of probes and surface preparation are also key considerations. Inspection precision can be affected by the orientation of defects with respect to the magnetic field or by the presence of coatings or non-conductive materials on the surface.

Applications and recent advancements

Eddy current inspections are used in a wide range of industries, from aerospace to automotive, energy, and manufacturing. Their effectiveness in early defect detection has led to their adoption in inspecting critical components, such as pipes, pressure vessels, metal structures, and machinery components.

In terms of advancements, the integration of digital technologies has significantly improved the accuracy and efficiency of eddy current inspections. The use of enhanced imaging systems, data processing algorithms, and artificial intelligence has allowed for quicker and more precise interpretation of test results.

The future of welding repair inspections

As technology continues to evolve, eddy current inspections are expected to continue playing a fundamental role in ensuring welding quality. Advances in instrumentation and data analysis are anticipated to further enhance this method's ability to detect and evaluate defects with greater precision and speed.

Furthermore, the combination of eddy current inspection with other non-destructive evaluation techniques is expected to lead to more comprehensive approaches to ensuring welding quality, enhancing reliability and safety in a wide range of industrial applications.

Conclusion

Weld repair inspections using eddy currents represent a powerful tool in pursuit of quality and structural integrity across various industrial applications. Despite challenges, their capacity to non-destructively detect defects and their continuous evolution due to technological advances position them as an invaluable technique for ensuring quality in the field of welding.

Ing. Malvin Delgado

The Crucial Role of Business

Leaders in Latin America's Energy Transition

The energy transition is imperative in Latin America's journey towards a more sustainable and less fossil fuel-dependent future. Business leaders play an essential role in this process, as their vision, innovation, and actions can drive the shift towards a cleaner and more sustainable energy matrix in the region.

Business Leadership as an Agent of Change

Latin American business leadership has the opportunity and responsibility to lead the energy transition in the region, significantly influencing the direction and pace of this transformative change. Their leadership is crucial for several reasons. Firstly, they can promote investment in renewable energy, diversifying the energy matrix and reducing exposure to fluctuations in oil and gas prices, which, in turn, stimulates business and job opportunities, fostering sustainable economic growth.

Furthermore, by driving innovation in cleaner and more efficient energy technologies through research and development investments, they lead the adoption of advanced technologies that minimize the environmental impact of energy production and offer cutting-edge solutions to the region's energy challenges. Their ability to promote energy efficiency in their operations by optimizing industrial processes and managing energy demand not only reduces operational costs but also contributes to sustainability by decreasing resource usage and carbon emissions.

Moreover, by integrating sustainability and corporate social responsibility into their strategies and operations, they reduce the carbon footprint and adopt ethical and sustainable business practices that benefit communities and the environment.

Finally, by leading the dialogue in the business community and collaborating with other organizations to drive the energy transition, the formation of business alliances focused on sustainable projects and policies can significantly accelerate the effectiveness of this transformation.

The Benefits of a Sustainable Energy Future

The regional energy transition represents significant challenges and opportunities. It will not only drive a cleaner energy matrix in the region but also bring about significant economic and social benefits. This includes promoting sustainable economic growth through investment in renewable energy and clean technologies, reducing operational costs for businesses through energy efficiency, contributing to mitigating climate change by adopting cleaner energy sources, enhancing energy security through diversifying the energy matrix, and promoting the well-being of local communities by adopting sustainable business practices and investing in clean energy, thus reducing pollution and improving air and water quality in their localities.

Embracing the Transformation

Regional leaders have the opportunity to lead the energy transition in the region and create a legacy of a more sustainable and prosperous future. Their ability to promote investment in renewable energy, foster innovation and energy efficiency, and advocate for corporate social responsibility is essential to expedite this necessary change. By embracing this transformation, they can not only benefit their companies but also significantly contribute to a cleaner and more sustainable energy future.

Juan Caballero, MCI, PCS, CIP Senior.

Sharing Tank Lining Project Insights:

Achieving Key Factors Beyond Technical Procedures for a Successful Project

When embarking on a tank lining project, achieving success is not a solitary endeavor; it's a synchronized series of technical procedures, knowledge of international standards, compliance with project specifications, and teamwork. The project's success hinges on the harmonious collaboration of multiple stakeholders, including the project owner, project management, installation contractors, third-party inspection companies, and coating manufacturers, each playing a vital role in ensuring durability and a solid return on investment. This successful ecosystem starts the owner, engineering firm, or certified protective coatings specialists, executed by accredited contractors with trained personnel, global coatings manufacturers delivering top-quality products and technical support to obtain the best performance of their coatings systems, and third-party inspection companies with certified inspectors guided by their collective wealth of experience and technical know-how to validate specifications compliance. All these known activities need to be aligned under certain Key Factors beyond technical to achieve a successful project.

In a recent tank lining project, I had the privilege of witnessing all these Key Factors come together into synergy firsthand, as all the essential conditions were met, resulting in a seamless project with outstanding outcomes that exceeded the owner's expectations of a successful project.

Firstly, the tank terminal owner's understanding that active involvement throughout the process and awareness of the importance of adhering to a high-quality system, diligently monitoring all critical inspection holding points, and providing unwavering support to the inspection company to promote a quality-oriented process. This approach creates the adequate environment to foster a collaborative environment that has a positive impact to achieve project coating system performance and durability contributing to the terminal assets integrity program.

Secondly, the contractor demonstrated a proactive attitude, diligently executing all specification requirements and self-implementing good practices, swiftly and diligently addressing corrective actions of any non-compliant issues flagged by the inspection company. This demonstrated contractors' awareness of their responsibility in executing project requirements with top quality.

Thirdly, the proactive support from the coating manufacturer was instrumental in providing recommendations and guiding corrective actions whenever necessary. This support from the coating manufacturer, as technical advice on product application, provided additional light on obtaining the optimum product performance to the owner's benefit.
Lastly, as part of the third-party inspection company, with the ability to provide independent judgment based solely on the specification requirements, we contributed to the project's success by always offering an objective technical criterion, free from any conflict of interest. This unique capability of independent inspection companies provides owners with total confidence in every step of the process to validate contractors' quality control compliance with specification requirements.
In conclusion, every stakeholder's role in the project was pivotal, but such harmonious collaboration is only attainable when all parties have an adequate level of awareness of the importance of corrosion prevention, advanced knowledge of standards and industry good practices, and elevated consciousness to comply with project specifications, maintain professional ethical conduct, and possess a genuine spirit of teamwork. These are the key factors together to execute successful projects with an outcome.

As a recommendation to achieve successful projects with coating system expected durability and return of investment, key factors as corrosion awareness, industry experience, technical knowledge, accredited contractors, certified inspectors, and trained personnel are the cornerstones of this collaborative effort. To reach the pinnacle of success in these tank lining projects or similar, it is imperative that all parties involved recognize their responsibilities and roles and work in unison to meet project specifications, surpass industry standards and, in doing so, ensure the longevity and reliability of these crucial assets.

Phd Juan Lugo

Navigating Towards the Future:

Transformative Leadership in the Digital Economy for Excellence in Quality Management

About the Author:
Juan Lugo Marín is an Industrial Engineer with a Master's degree in Quality and Productivity Management and a Doctorate in Administrative Sciences. With over 15 years of experience as a Quality Leader in projects for the Oil and Gas sector, he is a Management Consultant specializing in quality management and strategies. Juan has provided consultancy services to significant companies in Latin America and the United States. He has an extensive academic background as a university professor and researcher, and he is the author of important academic articles and books in the field of management, including "Quality Management in the Digital Economy.

In a business world long dominated by a mechanistic and hierarchical vision, violent changes are on the horizon that will challenge the traditional foundations of organizations. The digital revolution is radically transforming the structure and direction of organizations, overshadowing Cartesian models of the industrial revolution. The current technological explosion is redefining leadership, demanding quick adaptation to a dynamic environment.

Major organizations are forsaking vertical bureaucracy in favor of a horizontal structure based on process organization, flat hierarchies, team management, and results measurement centered on stakeholder satisfaction. Leaders must think and act differently in this new scenario. In this regard, leaders in the digital economy are not only innovating in products and services but are competing in business concepts, adopting a holistic approach to the business. The key to success lies in leadership's ability to guide organizations toward total adaptation to the digital economy.

Amid these developments, quality management is at the heart of this revolution, and visionary leaders are discovering new ways to drive excellence in a dynamic digital environment. How can transformative leaders stand out and guide their teams toward excellence in quality management in this digital economy? Here, we will explore some essential keys.

1. Strategic Vision:

A transformative leader in the digital economy sees change not just as inevitable but as an opportunity to innovate. Establishing a clear strategic vision aligned with the organization's core objectives is essential. This vision not only guides the organization through transformation but also inspires teams to adopt new quality management practices.

2. Organizational Agility:

In a digital environment, agility is key. Transformative leaders foster an agile organizational culture, where the ability to adapt quickly to changes in the market and technologies is an asset. Quality management must evolve at the same pace, and leaders play a vital role in promoting agility at all levels.

3. Digital Empowerment:

Transformative leaders empower their teams with the right digital tools. From implementing data analysis technologies to adopting cloud-based quality management solutions, digital empowerment is essential for improving efficiency and effectiveness in quality management.

4. Cross-Collaboration:

In the digital economy, boundaries between departments blur. Transformative leaders encourage cross-collaboration, where quality teams work closely with development, marketing, and customer service departments. This not only enhances quality management but also strengthens organizational cohesion.

5. Customer Experience Focus:

In a digital world, customer experience is the cornerstone of success. Transformative leaders understand the importance of quality in the customer experience and lead initiatives for continuous improvement. They use data and feedback to adjust strategies and ensure that quality is a competitive differentiator.

In conclusion, transformative leadership in the digital economy not only drives quality management but also sets new standards for business excellence. By adopting a strategic vision, fostering agility, digitally empowering teams, promoting collaboration, and focusing on customer experience, leaders can position their organizations at the forefront of quality management in the digital era.

Jane Brown - CEO Brown Corrosion Services, Inc.

What do you feel is a **wonderful benefit to being in corrosion?**

What do you feel is a wonderful benefit to being in corrosion?

Corrosion is a lifetime career with infinite opportunities to learn and grow personally and professionally. It has always impressed me that people from all education levels can enter this business and find a successful and challenging career in whatever capacity they choose. In corrosion, the PhD's doing research, the engineers building products and designing systems, the technicians and applicators performing the work all make it happen. Our work lives are dependent on all of us contributing our expertise to the equation – none can be successful without the other.

How did I enter the business?

My Father, Jerry Brown, a corrosion engineer, instilled in us early that you must always work hard but find enjoyment and passion in your career. Growing up and seeing his work as a mechanical engineer in the corrosion business always impressed on me his love of the subject matter, his belief that he was positively contributing the betterment of the world and he always seemed to be positive and having fun. This is mostly attributed to his own attitude and gratitude, but I think it was also encouraged by working in a field that is so continuously challenging and enjoyable. After more than 50 years in this business he continues to work and share his passion with clients and folks in our business. It is wonderful to see a life well lived. Why would I not want to follow this? I started in university working for an internal corrosion monitoring company, followed by a stint at a dehumidification manufacturer after university. When Jerry and I took the plunge in 1995, to open our own business, Brown Corrosion Services, Inc. in Houston, Texas, to focus on internal corrosion monitoring and cathodic protection. It has been 28 years of many ups, some downs, and a sincerely wonderful time working with my dad traveling the world solving corrosion issues.

What are the most significant challenges facing the energy industry regarding corrosion today?

Today, undoubtedly the biggest hurdles ahead in corrosion are with personnel – finding them, retaining them, and educating them. Technology has made huge advancements in the areas of coatings, materials, and sound corrosion practices BUT, I fear this will all be derailed if we can't bring in and retain folks to truly invest in their corrosion careers. One of the challenges is that on the contractor side, the learning years when you first start are hard – long days on the road, time spent mainly away from home and not always the highest pay. Conversely though, if a corrosion or coatings technician can get through these 1st years, the sky is the limit for opportunities and career trajectory. On the end user side, engineers and technicians are often "reorganized" away from corrosion (even if this is where their interest lies) and this lack of focus on a single area makes becoming an "expert" all the more difficult. As we see a significant number of folks looking to retire in the next few years, I do believe the corrosion industry will be hard pressed to fill all these vacant roles. I feel very humbled and proud that I have been able to get many folks into this business over the years. My brother-in-law is a corrosion technician for a major operator and I am happy to see the success he has found in this business – as I once told him, corrosion is a career, not just a job.

Due to technological evolution, how has corrosion management changed in recent years?

Although one would imagine that corrosion management should be holistic, i.e. coatings don't work without good CP, or CP does not work well without good materials, there is still a gap, I believe, in tying the big picture together. As companies continue to get bigger, the communication often fails between all the owners of data and this is to all our detriments in solving corrosion issues. Although we have wonderfully advanced software packages, they can't yet think for us and use the data to make solid technical, strong economic and considered approaches to corrosion management – technically strong corrosion folks are still needed. The process has to be a continued endeavor to tie all the aspects together and make sure that all the many facets of corrosion management are tied together to work harmoniously.

What is the role of innovation in corrosion management and how does Brown Corrosion Services incorporate innovation into its solutions?

I am not entirely sure that Brown Corrosion Services is an innovative company beyond one area – although we are in business to hopefully make money, we more importantly have a responsibility to our clients and the industry to provide practical and economic solutions for corrosion management. Very often now, the drive for quarterly profits derails sound business practices and companies providing functional, practical and realistic solutions. There is a lot of really fantastic and innovative new methods and products in the market place but, do they provide solutions to a clients' particular needs? We always ask this question, how can we help you and your company for the solutions you need? Not just to meet regulations but to make your company assets strong, robust and functioning beyond their expected life. The answer is rarely the most expensive for clients, but this is the correct way to work to sustain clients over many years and have systems that function as free of corrosion as possible for as long as possible.

From your experience, what are the specific challenges that women may face in technical or leadership roles in the energy industry and how can these challenges be addressed?

A few years ago someone said to me, how does a woman get a seat at the table? I responded, I wasn't aware that I had to ask for one; I just sat down. My parents never set limits on me and after 33 years in this industry I have rarely if ever thought about the fact I was a woman – I have worked hard and expected the same treatment as everyone else. This is a testament to all the folks who work in corrosion – they, just like me, are interested in the knowledge, skills and hard work you put in, not your sex, color or skin or other defining items. I think regardless of who you are, everyone experiences someone trying to rain on your parade at some point but it has luckily been very rare in my life. During a NACE meeting a few years back I got up in a room to do a presentation, afterward someone, currently on the AMPP Board, got up and said, let me explain what Jane just said and proceeded to pontificate at length in a rather inarticulate way. After the meeting, a group of students attendees who were in the room said to me something to the effect that it was very insulting how I had been treated and the man "mansplaining" to the group so poorly was ridiculous. It was a very good reminder that people see the truth – saying nothing often has a bigger impact than pointing out the injustices around you.

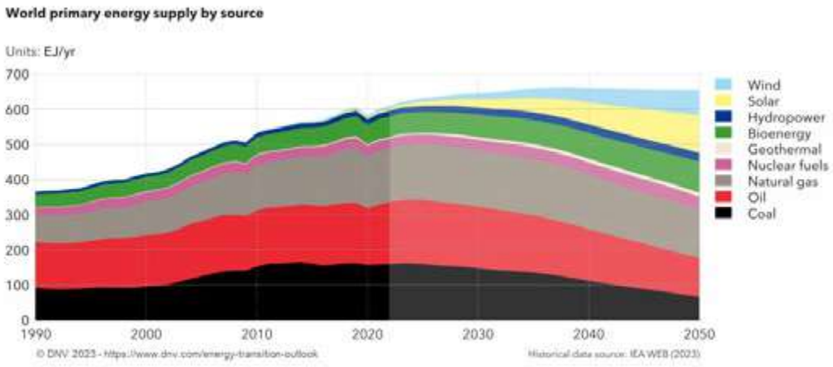
Finally, Jane Brown, an excellent reference in the industry, could you share perspectives and advice that can inspire other women to participate in the energy industry actively?

The energy industry is a challenging, rewarding and fantastic place to work for anyone. I feel proud every day that we help safely create and transport the products that are used throughout the world to lift people out of poverty, and provide opportunities for those who are both educated, and maybe not formally educated, to be part of this dynamic and varied industry. Everywhere I go in the world, I love most meeting corrosion people and seeing the huge passion they have for this business – the science of it, the engineering marvels and pure craftsmanship it involves. It has been a life well spent and I am extraordinarily grateful for my father – he gave me his world and I have been very proud to make it mine!

Phd Jose Vera - DNV

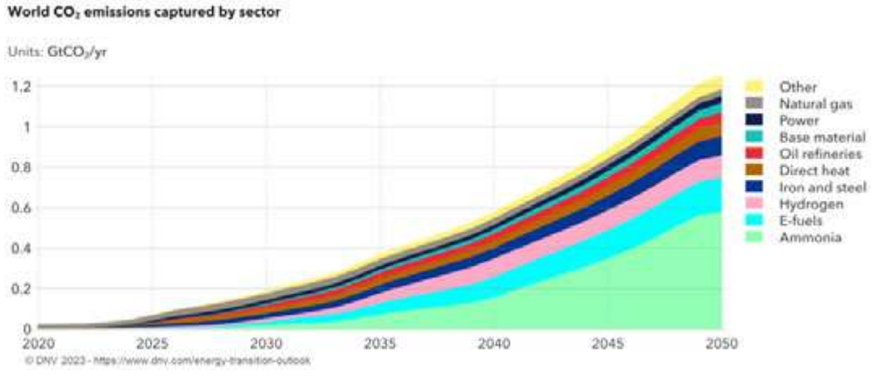
Corrosion Challenges in **Transporting and Injecting CO2 in the Energy Transition**

The energy transition is still in the starting blocks, but we are approaching a future where the world will use less energy, even as the population keeps increasing and the economy continues to grow. The figure below, from the 2023 DNV Energy Transition Outlook report, shows how the world primary energy demand is predicted to start to decrease in 2038 due to large energy-efficient improvements in all sectors and accelerated electrification, mainly produced by renewable energy.



Fossil fuels clearly dominate the energy system today (80%) and, although their contribution is predicted to decrease to 48% mid-century, they will remain important in the foreseeable future. Therefore, to achieve a global target of net-zero emissions, the global efforts in reducing combustion of fossil fuels need to be accompanied by carbon capture, utilization and storage (CCUS).

The figure below shows the CO2 emissions predicted to be captured by different sectors. Currently, most of the CO2 captured globally comes from natural gas. By 2050, 1.25 Gt of carbon emissions (corresponding to 6% of total CO2 emissions) will be captured globally, the majority in industrial processes to produce ammonia, efuels and hydrogen, which can be considered as energy carriers.



However, the sites for carbon storage or utilization are typically far removed from the sources of emissions. Therefore, transporting CO2 efficiently and safely from source to storage will be critical for the success of the CCUS projects.

USA currently has most of the CO2 pipelines in the world (~5300 miles), most of them commissioned since the 1970's. Highly pure CO2 is primarily sourced from underground reservoirs, transported in supercritical (dense) phase, and injected into oil fields for enhanced oil recovery. Achieving net zero emissions by 2050 in the USA is expected to require repurposing existing pipelines and building a new CO2 pipeline infrastructure of more than 25,000 miles.

A major difference between the current CO2 pipeline experience and future CO2 transport and injection projects is the presence of impurities. Potential impurities in the CO2 from CCUS projects depend not only on the CO2 emitter (e.g., H2O, SOx, NOx, O2, H2S, H2) but also on contaminants from upstream processes (e.g., glycol, amines) and added chemicals (e.g., odorants, corrosion inhibitors). In addition, co-mingling from various CO2 sources can lead each CCUS project to have a unique combination and range of impurities, for which previous experience does not exist.

Internal uniform and localized corrosion, as well as stress corrosion cracking (SCC), are credible threats to the pipeline used for transporting CO2 and to the storage infrastructure. Differences in operating conditions between pipelines and storage wells indicate the need of having different types of materials, which present different corrosion threats. Pipelines and well components will primarily be made from carbons steel and from corrosion resistant alloys (CRA), respectively.

The primary strategy for corrosion control in CO2 pipelines and wells is limiting levels of CO2 impurities. The effects of some of the impurities that may be present in CCUS projects are summarized below:

- **Water:** The presence of free water is necessary for corrosion and stress corrosion cracking to take place. However, some impurities may significantly increase corrosion even at water contents lower than theoretical water saturation levels.
- **Oxygen:** Increases carbon steel corrosion rates by delaying onset of protective FeCO3 formation and increases susceptibility of CRAs to localized corrosion and SCC.
- **Hydrogen Sulfide:** Increases susceptibility to pitting corrosion, sulfide stress cracking (SSC) and hydrogen induced cracking (HIC).
- **Sulfur Oxides (SOx).** SO2 produces H2SO3 (week acid) and, in presence of O2 or NO2, produces H2SO4 (strong acid), both of which have very low solubility in CO2 .
- **Nitrogen Oxides (NOx):** NO and NO2 are the most aggressive species, inducing high corrosion rates in carbon steel. Their oxidizing power may also increase susceptibility to pitting and SCC in both carbon steels and CRAs.
- **Carbon Monoxide.** CO in CO2 can promote trans-granular cracking in carbon steel.
- **Hydrogen:** May contribute to hydrogen embrittlement and HIC in carbon steel.

General guidance on the allowable upper limits of impurities to prevent corrosion is available (e.g., DNV RP-F104: "Design and operation of carbon dioxide pipelines") but, as interactions among some of the impurities may significantly increase the corrosion threat, it is recommended the CO2 specification of each CCUS project be further optimized via modelling or experimental validation.

The main internal corrosion challenges are to close the gap in understanding on the impact of different CO2 impurities on corrosion and stress corrosion cracking. This will allow a better definition of the CO2 specifications for CCUS projects, potentially decreasing energy requirements needed to remove some of these impurities down to very low levels. DNV is currently leading four joint industry projects (JIP) to 1) evaluate the H2S limits in CO2 transport, 2) qualify pipeline steels and welds for CO/CO2 SCC susceptibility, 3) select CRAs for CO2 injection wells, and 4) update the DNV RP-F104.

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