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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-342-SPE | | **Title:** | Leveraging Sustainalytics Ratings To Drive Esg Excellence: A Data-driven Management Tool For Sustainable Oil & Gas Operations & Projects | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | ESG | | **Keyword2:** | Sustainalytics | | **Keyword3:** | Sustainability | | **Keyword4:** | Excellence | | **Authors:** | M. Tayab, NMDC Group; H.G. AlSuwaidi, A. Hashem, ADNOC | | **Abstract:** | **Objectives/Scope:** The integration of ESG (Environmental, Social, and Governance) considerations into the business operations of oil and gas companies is increasingly crucial as stakeholders demand higher transparency and accountability. This paper explores the role of Sustainalytics, a leading ESG rating provider, in assessing and improving ESG strategies, particularly within the context of major National Oil Companies (NIOCs). The research highlights how NIOC can leverage Sustainalytics’ data-driven approach to enhance its sustainability performance and align its operations with global ESG standards. Through the integration of Sustainalytics’ ESG Risk Ratings, oil and gas companies can effectively identify risks, optimize sustainability initiatives, and create long-term value by balancing operational performance with environmental responsibility, social impact, and strong governance practices. **Methods, Procedures, Process:** This paper outlines the ESG risk rating methodology employed by Sustainalytics, focusing on its application in the oil and gas industry. Sustainalytics’ ESG Risk Rating methodology evaluates a company's exposure to and management of Environmental, Social, and Governance (ESG) risks. The methodology consists of three main components: . • Management of ESG Risks - This evaluates how effectively a company mitigates ESG risks through policies, practices, and governance structures. Strong ESG management includes carbon reduction strategies, environmental compliance, workforce safety programs, ethical governance, and transparent stakeholder engagement. **Results, Observations, Conclusions:** This paper outlines the ESG risk rating methodology employed by Sustainalytics, focusing on its application in the oil and gas industry. Sustainalytics’ ESG Risk Rating methodology evaluates a company's exposure to and management of Environmental, Social, and Governance (ESG) risks. The methodology consists of four main components: • Exposure to Material ESG Issues (MEIs) - This assesses a company’s vulnerability to ESG risks based on industry-specific factors, geographic operations, and business model. For oil and gas companies, key MEIs include carbon emissions, water management, health and safety, regulatory compliance, and community impact.• Management of ESG Risks - .• Unmanaged ESG Risk - .• The final ESG Risk Rating score is categorized into five levels: Negligible (0-10), Low (10-20), Medium (20-30), High (30-40), and Severe (40+). Companies with lower risk ratings are considered more sustainable and better positioned to manage ESG challenges, attracting investors and meeting regulatory expectations **Novel/Additive Information:** The study includes a comparative analysis of ADNOC’s ESG performance with other leading global oil and gas companies, emphasizing key industry trends, performance gaps, and best practices. A data-driven approach is used to evaluate the integration of ESG metrics in ADNOC's operational and strategic decision-making, ultimately demonstrating the value of adopting a comprehensive ESG framework to enhance both operational sustainability and stakeholder engagement. Key findings reveal that ADNOC’s initiatives align with global trends in carbon emissions management, water conservation, and workforce safety. However, opportunities remain for enhanced reporting transparency, community engagement, and long-term sustainability efforts.• | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-1688-SPE | | **Title:** | Developed Crude Quality Dashboard: Enhancing Operational Excellence In Gosps | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Digital | | **Keyword2:** | AI Solution | | **Authors:** | A. Alsaeed, Aramco | | **Abstract:** | **Objectives/Scope:** Crude oil quality is a cornerstone of efficient operations in Gas-Oil Separation Plants (GOSPs). In GOSPs, where diverse reservoirs yield varying crude characteristics, ensuring consistency and high-quality output is vital. To address challenges in monitoring, analyzing, and optimizing crude quality, a sophisticated Crude Quality Dashboard has been developed. This dashboard provides real-time insights, enabling operators and decision-makers to maintain operational excellence while adhering to market demands and environmental standards. It delves into the features, benefits, and impact of the newly developed dashboard, exploring its contribution to improving operational efficiency. **Methods, Procedures, Process:** The implementation of the Crude Quality Dashboard has brought significant improvements to GOSPs to Enhanced Crude Quality Consistency by ensuring that crude oil meets required specifications by providing real-time monitoring and rapid response capabilities. Improved Decision-Making with access to accurate and timely data, operators can make proactive adjustments to maintain optimal crude quality. Increased Efficiency with an automated data integration and reporting reduce manual workload, allowing personnel to focus on higher-value tasks. Cost Savings by the ability to identify and address quality deviations early reduces waste, prevents equipment damage, and minimizes the risk of non-compliance penalties. The Crude Quality Dashboard aligns with broader digital transformation goals in the oil and gas industry. It integrates seamlessly with existing digital tools such as Digital Twins by feeding real-time crude quality data into digital twins, operators can simulate scenarios and optimize processes. Artificial Intelligence (AI) Models where the dashboard’s data serves as a foundation for AI-driven optimization models, enhancing production planning and resource allocation. Cloud-Based Solutions where the dashboard’s cloud compatibility ensures scalability and facilitates collaboration across geographically dispersed teams. **Results, Observations, Conclusions:** The Crude Quality Dashboard is a transformative tool for GOSPs, addressing long-standing challenges in crude quality management. By providing real-time insights, advanced analytics, and automated alerts, the dashboard empowers operators to optimize processes, reduce costs, and ensure product consistency. As the oil and gas industry continues to embrace digitalization, tools like the Crude Quality Dashboard will play an increasingly critical role in achieving operational excellence, environmental compliance, and long-term sustainability. **Novel/Additive Information:** Managing crude oil quality involves a complex interplay of factors, including wash water performance, level controller’s performance, separation efficiency, crude specifications monitoring and transformers outages performance. Operators in GOSPs faced several challenges, including Data Fragmentation where Crude quality data was scattered across multiple systems, making holistic analysis difficult. Manual Reporting where Time-consuming manual processes led to delays in decision-making and increased the potential for human error. Inconsistent Monitoring where the variability of crude quality required a more robust and real-time approach to maintain specifications. Operational Risks where Deviations in crude quality could lead to equipment fouling, pipeline corrosion, and suboptimal production rates. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-1818-SPE | | **Title:** | Strategic Portfolio Reshaping: Applying “Best In Class” Lessons To Unlock ~30% Portfolio Carbon Intensity Reduction | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Portfolio Transformation | | **Keyword2:** | Carbon Intensity | | **Keyword3:** | Investment Framework | | **Keyword4:** | Acquisitions & Divestitures | | **Keyword5:** | Energy Transition | | **Authors:** | P. Carydias, V. Au, Wood | | **Abstract:** | **Objectives/Scope:** Energy incumbents face risks and opportunities from the energy transition, requiring portfolio-wide decarbonisation (typically >30-40% carbon intensity (CI) reduction by 2030) necessitating structural change. Traditional merger & acquisition evaluation lacks systematic integration of carbon intensity as a core performance metric. This paper introduces a practical framework to manage portfolio transformation as a key lever for CI reduction, demonstrated through a composite case study for a major NOC targeting ~30% portfolio CO2e abatement while maximizing commercial value. **Methods, Procedures, Process:** Achieving step-change CI reduction via acquisitions and divestments (A&D) requires moving beyond purely financial metrics. Distilling “best in class” project experience and lessons, we present a structured, stage-gated framework embedding CI management throughout the portfolio transformation lifecycle by: 1) Recognising risk though CI targets and baselines to quantify portfolio risk exposure and defining CI-weighted A&D screening criteria; 2) Building value by mandating CI verification and impact modelling within due diligence/valuation, linking CI to short-term efficiency and long-term value drivers (e.g., access to capital); 3) Enabling the vision by implementing governed execution and portfolio-level CI tracking to ensure long-term strategic transformation. **Results, Observations, Conclusions:** **1. Risk Management Foundation:** The framework first addresses CI as a strategic risk. Establishing a clear target CI state (e.g., from ~0.45 to ~0.25 tCO2e/boe by 2030) and mapping the baseline identifies high-CI risk assets. CI-weighted screening criteria explicitly filter targets based on their risk/contribution profile before significant portfolio activity. **2. Integrating CI for Commercial Value:**Rigorous due diligence quantifies the CI impact of potential opportunities and associated carbon costs/risks. The valuation explicitly incorporates CI factors and carbon pricing (e.g. $50−70/tCO2e), demonstrating how lower CI contributes directly to commercial attractiveness (~$100MM portfolio NPV in the case study). This links decarbonisation to near-term financial evaluation and positions the portfolio for long-term access to debt/capital markets. **3. Governed Execution for Long-Term Vision:**The framework aligns CI-focused portfolio transformation with corporate investment governance, requiring proposals to articulate CI reduction contributions alongside financial justification. Approved transactions are sequenced onto a transformation roadmap, enabling board-level stewardship beyond short executive tenures. AI-driven portfolio management systems provide ongoing visibility and action nudging, tracking actual CI reduction against the target pathway and verifying the realised financial value, ensuring strategic goals translate into sustained results - a long-term perspective inherent to successful major energy companies. **Novel/Additive Information:** This paper presents a practical framework for proactively managing portfolio carbon intensity transformation. By embedding CI as a core risk and value driver within screening, due diligence, valuation, and long-term governance - demonstrated through the NOC composite case study achieving a ~30% abatement pathway with positive NPV - operators can identify and execute the most commercially attractive transactions to meet significant targets, effectively transforming their asset base for sustained value creation in a lower-carbon future. [[Several different types of software  Description automatically generated with medium confidence](https://files.abstractsonline.com/CTRL/E7/5/838/86B/204/46A/6B8/7B3/23B/C90/D0D/4E/g1818_1.JPG)](https://files.abstractsonline.com/CTRL/E7/5/838/86B/204/46A/6B8/7B3/23B/C90/D0D/4E/g1818_1.JPG) | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-2017-SPE | | **Title:** | Emerging Challenges In Right-of-user (rou) Management Of Petroleum Pipelines | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | #ROU MANAGEMENT | | **Authors:** | K. CHAVHAN, BPCL | | **Abstract:** | **Objectives/Scope:** The objective of this paper is to explore the emerging challenges in managing Petroleum Pipeline Right of User (ROU, with a specific focus on surveillance, urbanization, mining impacts, third-party activities, and theft. The scope includes the evaluation of advanced technologies, regulatory frameworks, and collaborative strategies to enhance the safety, resilience, and integrity of pipelines across diverse terrains. **Methods, Procedures, Process:** This paper adopts a comprehensive, multi-disciplinary review approach. It evaluates existing and emerging challenges through case studies, technical evaluations, and literature analysis. The methodology involves the assessment of advanced surveillance systems such as UAVs, satellite imagery, and Pipeline Intrusion Detection Systems (PIDS) and their integration in ROU monitoring. It also examines geotechnical and mapping technologies for urban and mining-related risks. The process includes analyzing regulatory mechanisms, community engagement practices, and theft mitigation technologies to form a holistic framework for sustainable ROU management in the petroleum industry. **Results, Observations, Conclusions:** The study identifies key vulnerabilities in pipeline ROUs due to pilferage, unauthorized encroachments, mining-induced ground subsidence, and urban expansion. Advanced surveillance tools, such as UAVs, PIDS, and satellite imagery, significantly enhance early threat detection across remote and high-risk areas. Urbanization demands integration of pipeline safety into city planning, with successful case studies illustrating how collaboration between operators and authorities reduces encroachment. Third-party damage remains a critical concern but can be minimized through GIS-based mapping and regulatory awareness programs. Theft, one of the most persistent threats, is addressed through acoustic sensing, fiber-optic leak detection, and community involvement strategies. Overall, a multi-pronged strategy combining technology, regulation, and stakeholder collaboration proves effective in enhancing pipeline ROU resilience and security. **Novel/Additive Information:** This paper contributes novel insights into integrating advanced surveillance technologies with geospatial and regulatory tools for ROU management. It uniquely synthesizes technical, procedural, and community-based responses to theft and damage, offering a comprehensive framework for modern pipeline integrity strategies within the petroleum industry. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-2082-SPE | | **Title:** | Enhancing Environmental Sustainability In Sour Water Treatment: A New Perspective On Zero Liquid Discharge Projects | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Sustainability | | **Keyword2:** | Water | | **Keyword3:** | Sour | | **Authors:** | Q. Saeed, S.T. Haider, NESR | | **Abstract:** | **Objectives/Scope:** This study investigates the environmental implications and sustainability of sour water treatment processes within Zero Liquid Discharge (ZLD) projects. It aims to establish innovative methodologies for assessing the sustainability of these treatment methods, thereby enriching the current literature. The findings will offer critical insights for engineers engaged in sour water treatment and ZLD initiatives, promoting more sustainable practices in the industry. The primary goal of this paper is to evaluate the environmental impacts and sustainability of sour water treatment in ZLD projects. The scope includes:   * **Identification** of key environmental parameters influenced by sour water treatment. * **Assessment** of potential environmental risks linked to various treatment techniques in ZLD projects. * **Development** of methodologies to quantify the environmental footprint of sour water treatment processes. * **Analysis** of sustainability factors, such as resource consumption, energy use, and waste generation, related to ZLD projects.   **Methods, Procedures, Process:** A multidisciplinary approach is adopted, integrating principles from environmental science, engineering, and sustainability assessment. The methodologies employed include:   * A comprehensive **literature review** on sour water treatment and ZLD systems. * **Field measurements** and laboratory analyses to gather data on sour water characteristics and treatment methods. * Utilization of **Environmental Impact Assessment (EIA)** frameworks to evaluate the impacts of sour water treatment processes. * Assessment of sustainability performance through indicators like carbon footprint, water usage, energy efficiency, and waste output. * A **comparative analysis** of various sour water treatment technologies to identify the most sustainable options.   **Results, Observations, Conclusions:** The research is expected to produce:   * A detailed quantification of the environmental footprint associated with sour water treatment in ZLD projects. * Identification of significant environmental parameters and their impacts during the treatment process. * An evaluation of different treatment approaches' sustainability performance, emphasizing the most eco-friendly options. * Practical recommendations for enhancing the environmental performance and overall sustainability of sour water treatment in ZLD projects.   **Novel/Additive Information:** This paper contributes valuable new insights by:   * Delivering a thorough assessment of the environmental impacts tied to sour water treatment in ZLD contexts. * Formulating tailored methodologies for evaluating the sustainability of these treatment approaches. * Providing critical information that can assist engineers in designing more environmentally responsible sour water treatment systems within ZLD frameworks.   By bridging existing knowledge gaps and offering a comprehensive analysis, this study advocates for a more sustainable approach in ZLD engineering practices. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-2218-SPE | | **Title:** | Hydrogen Gas (H2) Generation In Hermetically Sealed Oil Filled Power Transformers: Evaluating HSE Risk, Addressing Challenges & Deploying Mitigation Measures | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Power Transformer | | **Keyword2:** | Hermetically Sealed | | **Keyword3:** | Hydrogen Gas | | **Keyword4:** | Dissolve Gas Analysis | | **Keyword5:** | Gas Chromatography | | **Authors:** | A.K. Khatua, S.S. ALJNEIBI, ADNOC Offshore | | **Abstract:** | **Objectives/Scope:** This paper investigates the abnormal increase in hydrogen (H2) levels observed during pre-energization Dissolved Gas Analysis (DGA) test of 4 Nos. hermetically sealed oil filled Power Transformers at ADNOC Umm Al Dalkh (UAD) Offshore Platform. These transformers have been stored in warehouse for over one year prior to installation. DGA results diagnosed H₂ concentrations ranging from 323 ppm to 1141 ppm, significantly exceeding the ~100 ppm threshold defined by IEEE C57 and IEC 60599 standards, posing potential risks to HSE, operational & asset integrity, business continuity, and production. **Brief Objective & Scope:** a) Identify Potential Sources of H2. b) Evaluate HSE Risk. c) Address Challenges. d) Recommend Actionable Mitigation Measures. **Methods, Procedures, Process:** In accordance with IEC 60422:2024, Dissolved Gas Analysis (DGA) is a key diagnostic tool for assessing transformer health. Commonly monitored gases include hydrogen (H₂), methane (CH₄), ethylene (C₂H₄), acetylene (C₂H₂), carbon monoxide (CO), carbon dioxide (CO₂), and other light hydrocarbons. The analysis was conducted using ASTM D3612 Method C, which involves extracting dissolved gases through a headspace sampler and analyzing them using Gas Chromatography (GC) for accurate identification and quantification. **Results, Observations, Conclusions:** The primary cause of the increased H2 levels was identified as a chemical reaction between the synthetic MIDEL oil and the hot-dip galvanized tank surfaces during prolonged storage. Since the transformers were only energized during factory inspection tests (FAT) and not exposed to high temperatures, H2 generation due to electrical stress, partial discharge or ionization is considered unlikely. **Potential Sources of H2:** i) Chemical Reaction between synthetic Oil and Transformer Tank during prolonged storage. ii) Aqueous corrosion of Zine coating. iii) Partial Discharge (PD) / Corona Discharge (CD). iv) Stay Gassing. v) Free Water Electrolysis. **Possible Mitigation Measures (Pilot / Short Term):** Filtration of Oil for Dehydration and Degasification. **Final Mitigation Measures (Permanent / Long Term):** 1. Replacement of Oil. 2. Annual DGA testing to monitor the dissolved gas. Following oil filtration and reconditioning, all transformers were successfully energized and are currently in service. Currently, hydrogen levels are within the allowable limits and continue to be closely monitored. Should the short-term mitigation measure prove ineffective, long term permanent measures will be implemented. **Novel/Additive Information:** This paper provides distinctive contributions through a comprehensive analysis of hydrogen gas generation in hermetically sealed oil filled Power Transformers. With a focus on addressing challenges and proposing mitigation strategies, it aims to offer actionable insights for practicing engineers. The meticulous exploration of HSE risks enhances understanding of hazards related to power transformers, positioning the paper as a valuable resource for refining risk management and safety protocols particularly in the oil and gas industries.  [[A diagram of a machine  Description automatically generated](https://files.abstractsonline.com/CTRL/7E/9/14E/85B/B22/427/8AD/D46/385/B52/567/2E/g2218_2.jpg)](https://files.abstractsonline.com/CTRL/7E/9/14E/85B/B22/427/8AD/D46/385/B52/567/2E/g2218_2.jpg)  [[A machine with a diagram of a system  Description automatically generated with medium confidence](https://files.abstractsonline.com/CTRL/7E/9/14E/85B/B22/427/8AD/D46/385/B52/567/2E/g2218_1.jpg)](https://files.abstractsonline.com/CTRL/7E/9/14E/85B/B22/427/8AD/D46/385/B52/567/2E/g2218_1.jpg) [[A large white machine next to a scaffolding  Description automatically generated](https://files.abstractsonline.com/CTRL/7E/9/14E/85B/B22/427/8AD/D46/385/B52/567/2E/g2218_3.jpg)](https://files.abstractsonline.com/CTRL/7E/9/14E/85B/B22/427/8AD/D46/385/B52/567/2E/g2218_3.jpg) [[A graph with blue and orange bars  Description automatically generated](https://files.abstractsonline.com/CTRL/7E/9/14E/85B/B22/427/8AD/D46/385/B52/567/2E/g2218_4.jpg)](https://files.abstractsonline.com/CTRL/7E/9/14E/85B/B22/427/8AD/D46/385/B52/567/2E/g2218_4.jpg) | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-3273-SPE | | **Title:** | Enhancing Control And Automation Efficiency In Project Delivery | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Control and Automation | | **Keyword2:** | project | | **Keyword3:** | challanges | | **Authors:** | A. Ba Alawi, PDO | | **Abstract:** | **Objectives/Scope:** **This research aims to comprehensively address the key challenges encountered in the integration of control and automation systems within complex industrial projects, with a particular emphasis on the oil and gas sector. The study investigates the multifaceted issues associated with vendor management, engineering integration, external influences, and collaboration with consultants. These elements are examined in terms of their influence on project timelines, cost efficiency, and overall success. The objective is to provide a detailed understanding of how these factors impact the execution and performance of control and automation systems, which are critical for operational efficiency and safety in industrial environments.** **Methods, Procedures, Process:** **The research employs a qualitative approach, utilizing in-depth case studies and expert interviews to gather data from industry professionals, project managers, vendors, and consultants involved in control and automation projects. This method enables a holistic understanding of real-world challenges and the dynamic interactions between various stakeholders. The study explores key phases of project execution from planning and design to commissioning and maintenance and how systemic and external factors influence each phase. Special attention is given to the role of regulatory requirements, economic volatility, and environmental considerations, all of which can necessitate changes in project scope or implementation strategy. The research also identifies best practices for fostering effective communication and coordination among stakeholders to mitigate risks and enhance project outcomes.** **Results, Observations, Conclusions:** **Findings indicate that vendor-related issues, such as delivery delays, inconsistencies in product quality, and communication gaps, significantly disrupt project schedules and resource allocation. Engineering challenges, particularly those involving the integration of new automation technologies with existing legacy systems, require adaptive solutions and iterative testing. External factors including evolving regulatory frameworks, market fluctuations, and environmental constraints often force project teams to reassess priorities and adjust plans accordingly. While consultants bring in specialized knowledge and technical proficiency, misalignment with internal teams and unclear role definitions can lead to inefficiencies. The research concludes that robust project management practices, proactive risk mitigation, stakeholder alignment, and open channels of communication are essential to successfully navigate these challenges and ensure timely and effective project delivery.** **Novel/Additive Information:** **This study contributes meaningful insights into the often-overlooked details of integrating control and automation systems in large scale projects. By highlighting the interdependencies among vendors, engineers, consultants, and external conditions, it underscores the need for a systems thinking approach. The research offers actionable strategies tailored to the oil and gas industry, aiming to improve collaboration, enhance adaptability, and ultimately increase the success rate of automation and control system implementations across complex project landscapes.** | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-3523-SPE | | **Title:** | Enhancement Of Alarm Management System In Adnoc Offshore | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Alarm Management | | **Authors:** | H. Awais, ADNOC Offshore | | **Abstract:** | **Objectives/Scope:** To share ADNOC Offshore’s Operation Excellence Operating Integrity journey to improve Alarm System Performance of Operator Consoles across entire ADNOC Offshore facilities to avoid major process safety incidents and ensure efficient operation. The paper shall also describe continuous efforts by ADNOC offshore to sustain alarm system performance at acceptable level. **Methods, Procedures, Process:** Methodology adopted by ADNOC offshore to improve alarm system performance is as follow: 1. Unified Alarm Management Standard rolled out across all ADNOC offshore assets. 2. Comprehensive checklist prepared to perform Gap Assessment performed against Standard requirement. 3. Alignment of all the stakeholders from Operation/ Operation Support & Engineering on identified gaps. 4. Action plan was prepared and tracked for implementation to improve compliance. 5. Develop a tool to calculate Alarm System KPIs using alarm logs (In-Terim solution). 6. Deployment of Alarm Management Software and benchmarking of alarm KPIs 7. Reporting mechanism established to measure Alarm System Performance ***8. Focus on quick wins first: Bad Actors, Chattering Alarms, duplicate alarms, Standing alarms, etc.*** 9. Performing alarm rationalization at assets where alarm loads are high. 10. Establish Dashboard for visibility to Executive Leadership Team on Asset wise performance of alarm management to receive necessary support **Results, Observations, Conclusions:** Alarm management is not one time activity rather it is a continuous process and persistent improvement can be derived by assessing alarm system performance regularly. Operator consoles should be equipped with Alarm Management Software to provide reports on alarm KPIs, bad actors, root cause etc. Alarm Management Software should have features like dynamic alarm suppression of alarms to ensure operators are not overwhelmed by unnecessary or irrelevant alarms. Moreover, Bi-weekly/ periodic review of alarm performance reports by the site alarm management committee for elimination of bad actors can lead to more focused actions that can improve operator effectiveness and thus reduce the risks of economic loss, damage to environment and unsafe situations. Most importantly, leadership commitment and involvement in managing alarms are vital in terms of providing resources (trainings to operators, support for remediation of bad actors etc.,) to improve alarm system performance. **Novel/Additive Information:** This paper can provide guidelines and lessons learnt of ADNOC Offshore to operating companies in the Oil and Gas Industry on how to optimize alarms to operator in an efficient way. It will also showcase how the commitment of resources and monitoring and tracking of continuous improvement actions can reduce the events of alarm floods. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-3695-SPE | | **Title:** | Saudi Aramco’S Largest And Heaviest Offshore Jackets - Marjan Gas Oil Separation Plant #4 | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Jackets | | **Keyword2:** | Fabrication | | **Keyword3:** | Safety | | **Keyword4:** | Simulation | | **Keyword5:** | offshore | | **Authors:** | A.J. Albahrani, Saudi Aramco; H. Alshaiban, ARAMCO; A.W. Ruhaili, Saudi Aramco | | **Abstract:** | **Objectives/Scope:** The Marjan Increment Program’s development of the Marjan Gas Oil Separation Plant No. 4 (MGOSP-4) is set to become one of the world’s largest offshore complexes. The development includes the fabrication, offshore installation, and commencement of six primary jackets that constitute the base of the new GOSP. This paper outlines the challenges and the mitigation undertaken by the project team to overcome and achieve the successful fabrication and installation completion. **Methods, Procedures, Process:** The fabrication challenges include but not limited to, large dimension and heavy weight of the structures, fabrication yard space constraint and challenging completion schedule to meet the installation target date. The installation challenges include the weight and dimension and precision requirement to ensure the alignment of the topsides and bridges. To overcome these challenges the project implemented several techniques and technologies that are detailed in the paper. These include, the utilization of material handling tracker and QR based weld consumables management system, automatic welding Tanique’s, zero gap welding approach, augmented reality training for working at height, and jacket installation simulation. **Results, Observations, Conclusions:** As a result of the utilizing the abovementioned Tanique’s, the project met the fabrication and installation completion target date with zero lost time injury. The QR code technology facilitated real-time tracking of welding consumables through the scanning of unique QR codes, leading to enhanced control, improved welder productivity, efficiency, and automation. This resulted in weld automation boost from 55% to 75%, reporting efforts were streamlined, and welding productivity soared by approximately 30%. Furthermore, approximately 300 metric tons of welding consumables were issued through the QR coding system, providing enhanced accountability, and real-time monitoring of stock status. Moreover, the welding process was further optimized through the implementation of Zero Root Gap Welding, where the Groove design is made such that no root gap with 2-4 mm root face. The welding process demonstrated improved speed and efficiency compared to other welding methods. This approach facilitated the even dispersion of heat and effectively minimized the chances of distortion or warping. This enhancement translated to 30% increase in productivity, evident across more than 2800 joints that were welded using a zero-root gap technique. Lastly, the simulation of the jacket installation supported and safe and efficient installation of the structures at offshore. **Novel/Additive Information:** This paper will provide details of the utilized technologies and Tanique’s that can serve as a reference for future fabrication and installation projects for Mega Offshore structures. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-3701-SPE | | **Title:** | Novel Approach To Avoid Hydrogen H2 In Electrical High Voltage Splitter Box At Offshore Well Head Tower Due To 11kv High Voltage Subsea Cables. | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Hydrogen | | **Keyword2:** | splitter box | | **Keyword3:** | 11KV | | **Keyword4:** | wellhead tower | | **Keyword5:** | subsea cables | | **Authors:** | M.E. Debbache, L. Yarlagadda, Adnoc Offshore | | **Abstract:** | **Objectives/Scope:** Due to the high voltage of subsea composite electrical cables, it has been observed that high concentrations of hydrogen (including H2S and CO) accumulate in newly installed splitter boxes, J-tubes, and RMUs. Over time, this accumulation can increase pressure and potentially lead to a pressurized burst or internal explosion in the presence of ignition sources (terminals). **Methods, Procedures, Process:** The following methodology and sequence were employed for the midterm implementation:1. Installation of high flow rate breathers in all splitter boxes.2. Ventilation of J-tubes.3. Replacement of existing Ex-d drain plugs with Ex-e drain plugs.Despite these midterm mitigation measures, the hydrogen (H2) level in the splitter box remained high. Therefore, it is proposed to introduce a fully ventilated breakout box with barrier cable glands.A pilot implementation was completed at two Well Head Towers (WHTs). Following the successful completion of the pilot, there was no detectable concentration of hydrogen, ensuring the safety of both the equipment and personnel working in the WHT **Results, Observations, Conclusions:** Based on the Root Cause Analysis report from various consultants, it was determined that gas is entering the splitter box through the subsea cables. To mitigate this issue, it is planned to vent the gas before it enters the splitter box. The gas from the High Voltage subsea cables will be ventilated at the breakout box before entering the splitter box. The breakout box will feature full ventilation and barrier cable glands. **Novel/Additive Information:** This submission aims to provide critical insights into the selection of High Voltage Subsea Cables, Splitter Boxes, and Breakout Boxes to prevent gas accumulation in Splitter Boxes, Ring Main Units, and potential internal explosions in the presence of ignition sources (terminals). The implemented solution not only enhances the performance of the Electrical System at offshore locations but also significantly reduces the exposure of personnel to Hydrogen (H2) in the offshore environment. Additionally, it mitigates the high investment costs associated with potential internal explosions of electrical equipment at Offshore Well Head Towers (WHTs). The solution ensures the safety of both the equipment and the personnel working in the WHT | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-4066-SPE | | **Title:** | Sacrificial Anode Installation On Flexible Cargo Line Flanges | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Sacrificial Anode | | **Authors:** | M.Y. Fakhari, ADNOC Onshore | | **Abstract:** | **Objectives/Scope:** The objective of using anodes on marine hoses is to protect the metal components from corrosion caused by constant exposure to seawater with application an additional barrier is overcome loss of containment incidents due to metal loss. Anodes serve as sacrificial metals, corroding in place of the hose’s critical metal parts through a process called cathodic protection. This helps extend the hose’s service life, maintain structural integrity, and ensure safe and reliable operation in marine environments, especially in offshore oil and gas applications. **Methods, Procedures, Process:** **1. Method: Sacrificial Cathodic Protection** Sacrificial anodes (zinc, aluminum, or magnesium) are attached to the hose or its metallic parts. These anodes corrode instead of the protected metal. **2. Procedures:** **a. Anode Selection:**   * Zinc for saltwater * Aluminum for salt/brackish water * Magnesium for freshwater   **b. Placement:** Install near metallic parts—end fittings, flanges, exposed wires. Ensure secure attachment for electrical contact. **c. Continuity Check:** Verify the anode is electrically connected to the metal for active protection. **d. Coating:** Use minimal coating; apply dielectric shielding only where necessary. **Results, Observations, Conclusions:** **Results:** **Corrosion Prevention:** Anodes prevent corrosion of metal components in marine hoses by acting as sacrificial elements, reducing degradation of critical parts. **Extended Hose Lifespan:** Anodes extend the hose and component service life, ensuring functionality in harsh marine environments. **Maintenance Cost Reduction:** With corrosion minimized, replacements and repairs decrease, leading to cost savings. **Observations:** **Anode Depletion:** Anodes wear down over time, confirming their effectiveness in protecting metal parts. **Protection Effectiveness:** The hose system maintains structural integrity, with minimal corrosion observed on protected areas. **Inspection Frequency:** Regular inspections show anodes should be replaced when 75-90% of material is consumed. **Conclusions:** **Effective Corrosion Control:** Anodes provide a reliable method for protecting marine hoses from seawater corrosion, ensuring operational reliability. **Critical for Safety and Performance:** The continued use of sacrificial anodes is vital for safety, performance, and durability in offshore and high-risk marine environments. **Proactive Maintenance is Key:** Regular checks and timely anode replacement are essential for long-term corrosion protection and minimizing downtime. **Novel/Additive Information:** This detailed explanation of using anodes for corrosion protection in marine hoses provides novel insights into practical methods for extending hose lifespan and reducing maintenance costs. By emphasizing sacrificial anodes’ effectiveness, the information adds value to existing literature by offering a clearer understanding of corrosion management in offshore petroleum operations. It highlights the importance of proactive maintenance and precise anode monitoring, enhancing operational safety, reducing downtime, and contributing to more efficient and cost-effective offshore oil and gas production | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-4665-SPE | | **Title:** | Securing Excellence: Cyber-resilient Automation For Oil & Gas Infrastructure | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | OT | | **Keyword2:** | Cyber Security | | **Keyword3:** | Automation | | **Authors:** | B. KOTTAYIL, ADNOC Sour Gas | | **Abstract:** | **Objectives/Scope:** As Oil and Gas industries accelerate their journey toward digitalization and automation, the underlying Operational Technology (OT) systems are becoming increasingly interconnected—and consequently, more exposed to cyber threats. With the integration of advanced process control, real-time optimization, and other Industrial platforms, ensuring the cybersecurity of automated systems is not just a compliance requirement but a business imperative **Methods, Procedures, Process:** This abstract explores comprehensive approaches to embedding cybersecurity within automation frameworks for operational excellence. It presents real-world scenarios of cyber risks impacting automated OT environments and offers practical mitigation strategies. The strategies are aligned with global standards like ISA/IEC62443 and the Cybersecurity Framework to ensure robust defence mechanisms. **Results, Observations, Conclusions:** Employing cyber risk assessment methodologies specifically designed for automated operations significantly enhances the security posture of these systems. By applying Zero Trust Architecture and network segmentation within OT networks, vulnerabilities can be reduced drastically. Moreover, secure access and endpoint protection for connected environments proved vital in mitigating cyber threats. Lifecycle cybersecurity management, encompassing the entire span from design to decommissioning, shall demonstrate a robust approach to maintaining security integrity over time. Additionally, integrating cybersecurity metrics into operational objectives and safety cases provides a comprehensive framework for evaluating and ensuring ongoing protection. These underscore the importance of a holistic and continuous approach to cybersecurity in automated and connected environments. **Novel/Additive Information:** This presents a practical framework for integrating zero trust and lifecycle-based cybersecurity into critical OT environment, an area often overlooked in traditional automation strategies. It provides actional insights on aligning cybersecurity with operational goals, bridging the gap between technical security and business-driven automation goals. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-4722-SPE | | **Title:** | Ensuring Safe Logging Operations: A Focus On Equipment, Environmental Hazards And Personnel Protection | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | job safety analysis | | **Keyword2:** | tool box talk | | **Keyword3:** | permit to work | | **Keyword4:** | risk register | | **Keyword5:** | incident-near miss reporting | | **Authors:** | K. Thammisetti, ONGC | | **Abstract:** | **Objectives/Scope:** The objective of this paper is to evaluate and enhance safety protocols in logging operations, with a focus on mitigating risks related to equipment malfunctions, environmental hazards and personnel safety. By reviewing industry best practices, identifying common safety challenges and incorporating lessons learned from recent field data, this paper aims to propose improved safety measures for logging teams. Additionally, it will explore the role of innovative technologies, real-time monitoring, automated systems and comprehensive safety training in ensuring a safer, more efficient operational environment. Ultimately, the goal is to minimize operational downtime, prevent accidents and protect personnel in logging operations. **Methods, Procedures, Process:** Risk Register: Conduct Job Safety Analysis (JSA) and Risk Assessment studies to identify potential hazards. A Risk Matrix will be used to assess the severity and likelihood of each risk, helping prioritize mitigation actions.Real-Time Monitoring Systems: Implement real-time monitoring tools to track wellsite parameters, equipment health and personnel status, enabling early detection of potential safety issues and ensuring continuous surveillance. Safety Training, Emergency Preparedness & Mock Drills: Utilize simulation-based training, regular safety drills in radiation safety procedures and adherence to best safety practices to ensure preparedness for emergencies. Incident Reporting and Continuous Improvement: Establish a robust incident reporting system and conduct root cause analysis (RCA) to identify failures and improve safety practices, ensuring that lessons are applied to future operations. **Results, Observations, Conclusions:** **Results:** Implementation of structured safety practices, including risk matrix assessments, real-time monitoring, and regular training, led to a measurable reduction in safety incidents during logging operations. Near-miss reporting increases up to 25%, indicating improved hazard awareness, while recordable incidents decreased by 10% over the past six months. **Observations:**   * The use of a risk matrix helped prioritize high-impact hazards, improving decision-making in the field. * Real-time monitoring enabled early identification of equipment anomalies, reducing reaction time during critical operations. * Simulation-based training significantly improved team response during drills, highlighting the value of practical preparedness.   **Conclusions:** Integrating structured risk assessment, technology and competency-based safety training and various mock drills which enhances overall operational safety in logging. This proactive approach fosters a strong safety culture, reduces incident rates and increases personnel confidence. The methodology is adaptable and can be applied across various field environments to improve safety performance consistently. **Novel/Additive Information:** This paper proposes an integrated safety approach for logging operations by combining traditional risk assessments with modern technologies and proactive training. A structured risk matrix, real-time monitoring and simulation-based training enhance hazard management and incident prevention. Results show increased near-miss reporting and fewer incidents. The adaptable, scalable workflow offers a repeatable model to improve safety performance across various wellsite environments, especially in high-risk logging scenarios. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-5228-SPE | | **Title:** | Supplier Evaluation And Performance Management In The Oil And Gas Industry, Incorporating Hse And Sustainability Metrics: An Integrated Approach Using Hierarchical Fuzzy Inference System | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Supplier Evaluation | | **Keyword2:** | Health Safety and Environment (HSE) | | **Keyword3:** | Supply Chain Management (SCM) | | **Keyword4:** | Sustainable Development Goals (SDGs) | | **Keyword5:** | Multi Criteria Decision Making (MCDM) | | **Authors:** | H. Ahsan, MOL Pakistan Oil and Gas Co. B.V | | **Abstract:** | **Objectives/Scope:** The Oil and Gas (O&G) industry operates in complex, high-risk environments and has historically prioritized the adoption of best practices in Health, Safety, and Environment (HSE). As competition intensifies, companies increasingly emphasize robust supplier evaluation mechanisms to ensure operational excellence. Despite the multidimensional nature of supplier evaluation, existing frameworks often prioritize traditional metrics such as cost, delivery, and quality, with limited integration of critical factors like occupational safety, sustainability, and HSE risk, particularly in outsourced service contexts. This study aims to bridge this gap by proposing an integrated, risk-aware, and sustainability-driven framework for supplier selection and performance management in the O&G sector. **Methods, Procedures, Process:** A comprehensive Decision Support System (DSS) is developed using a Hierarchical Fuzzy Inference System (HFIS) grounded in a Multi-Criteria Decision-Making (MCDM) approach. The evaluation framework consists of six core themes: Technical, Commercial, Quality, Financial, HSE, and Sustainability, where HSE and sustainability serve as central pillars. These criteria were identified through a combination of literature review and expert input from 12 industry professionals and were refined through multiple expert consultation sessions. Additionally, a Delphi method involving 20 O&G operations specialists was employed to define HSE risk profiling parameters. The system further integrates Kraljic’s portfolio matrix to classify services and align supplier strategies with risk and criticality profiles. **Results, Observations, Conclusions:** The proposed HFIS effectively models the uncertainty and interdependencies in supplier evaluation. It enables a comprehensive assessment that differentiates suppliers not only by their technical and commercial competencies but also by their environmental compliance, safety performance, HSE risk nature of services, financial stability, and quality assurance. By embedding HSE and sustainability considerations into a fuzzy logic-based evaluation framework, the proposed DSS addresses key shortcomings in traditional procurement approaches. It provides procurement professionals with a robust, transparent, and adaptable tool for making informed, sustainability-aligned supplier decisions. Ultimately, the framework supports improved corporate environmental responsibility, enhanced SDG alignment, and increased stakeholder confidence in supply chain governance. **Novel/Additive Information:** The proposed novel system offers a comprehensive approach by embedding sustainability and HSE considerations into a fuzzy logic-based supplier evaluation framework tailored to the operational realities of the O&G industry, capable of bridging the gap between traditional procurement methods with occupational safety and environmental management imperatives. The proposed DSS provides a robust and transparent structure for procurement professionals, enabling sustainability-driven, risk-informed supplier decisions that enhance corporate environmental responsibility, better SDG reporting and stakeholder trust in the overall supply chain | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-5355-SPE | | **Title:** | A Comparative Study: Various Modeling (empirical, Integral, 3d Cfd) Approach For Accurate Consequence Analysis And Risk Management Of Accidental Release Of Ammonia. | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Emergency Response Planning | | **Keyword2:** | Process Safety | | **Keyword3:** | Risk Management/Assessment | | **Keyword4:** | 100% HSE | | **Keyword5:** | hazard identification and risk assessment for safe | | **Authors:** | G. PATIL, GexCon India Pvt Ltd; R. Lodha, ADNOC Offshore | | **Abstract:** | **Objectives/Scope:** Ammonia and hydrogen are vital contributors to a net-zero carbon economy due to their carbon-free consumption. Ammonia, in particular, serves as an efficient medium for hydrogen storage and transportation, owing to its thermodynamic properties. However, its highly toxic and explosive nature poses significant hazards during storage and handling. Recent global incidents involving ammonia leaks, toxic dispersions, and explosions have led to fatalities and injuries, raising serious concerns. This paper aims to investigate the consequences and risks associated with ammonia through a 3D-CFD simulation approach, to support safer designs and better emergency planning at the conceptual design stage of projects. **Methods, Procedures, Process:** Various modeling techniques are available for assessing ammonia-related risks, including Gaussian plume models, empirical methods, 2D dispersion models, and experimental testing. Experimental methods, while accurate, are often impractical due to high costs and safety risks. Traditional 2D models are limited in their ability to capture complex environmental geometries and turbulence patterns, leading to oversimplifications. In contrast, 3D-CFD (Computational Fluid Dynamics) modeling offers a robust alternative by accounting for real-world factors such as terrain, congestion, and wind profiles. In this study, a hypothetical accidental ammonia release scenario was simulated using 3D-CFD tools to assess gas dispersion and explosion potential. Key variables such as terrain complexity, structural congestion, and low wind effects were integrated into the simulation. **Results, Observations, Conclusions:** The simulation results from the 3D-CFD model revealed a significantly more accurate prediction of gas dispersion and explosion zones compared to 2D models. It was observed that environmental geometries, such as terrain and equipment congestion, substantially influence the flow path and concentration of ammonia. The study demonstrated that 3D modeling captures the complex interactions between the released gas and its surroundings, which are often overlooked in 2D models. These insights are crucial for optimizing the placement and design of safety systems, including toxic gas detection zones, emergency response facilities, and passive and active protection systems. The improved accuracy helps reduce unnecessary capital expenditure (CAPEX) while ensuring compliance with 100% HSE objectives. **Novel/Additive Information:** This paper highlights the critical advantages of using 3D-CFD modeling over traditional methods for ammonia risk assessment. It not only enhances the accuracy of consequence predictions but also supports inherently safer design by allowing the evaluation of different operating conditions and environmental complexities. A comparative analysis between 2D and 3D modeling underscores the limitations of the former and advocates for the adoption of advanced numerical simulation tools for future ammonia and hydrogen-based infrastructure projects. The findings emphasize the role of early-stage risk assessment in preventing catastrophic incidents and ensuring sustainable, safe industrial growth. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-5447-SPE | | **Title:** | Value Digital Loto | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | LOTO | | **Keyword2:** | Safety | | **Keyword3:** | Innovation | | **Keyword4:** | Security | | **Keyword5:** | Excellence | | **Authors:** | P. Rodriguez, VALUE HYBRID GLOBAL S.L | | **Abstract:** | **Objectives/Scope:** The objective is to present the Value Digital LOTO platform—a patented digital solution that transforms traditional Lockout/Tagout (LOTO) procedures into modern, efficient, and traceable digital workflows. The scope includes industrial environments with high safety risks, aiming to enhance worker protection, reduce downtime, and integrate seamlessly with existing enterprise systems. **Methods, Procedures, Process:** The Value Digital LOTO platform was designed using a modular, microservices-based architecture to ensure scalability and easy integration with ERP, CMMS, and access control systems. It includes a centralized web management platform, mobile applications for real-time field execution, and smart hardware (Bluetooth padlocks and logic-layered devices). The implementation process involves a structured rollout, including functional consulting, technical infrastructure setup, staff training, and full support. Integration is tailored to each site’s operational needs. All procedures are configured to be traceable, user-friendly, and adaptable to various safety requirements and corporate compliance standards. **Results, Observations, Conclusions:** Deployment of the Value Digital LOTO platform across various industrial facilities has shown significant improvements in safety compliance, procedural accuracy, and operational efficiency. Observations confirm that replacing manual and paper-based LOTO systems with digital workflows led to - A measurable reduction in equipment downtime during maintenance. - Increased traceability through real-time data, audit trails, and visual verification. - Enhanced worker participation and accountability in safety protocols. Supervisors gained full visibility into who performed each action, when, and where, while automated permissions reduced human error and unauthorized interventions. The analytics module provided valuable insights into procedural bottlenecks and safety performance, enabling continuous process optimization. Users highlighted the intuitive interface of the mobile apps and the ease of integrating the platform with their existing IT systems. The inclusion of virtual personal padlocks through the mobile apps added a new layer of individualized safety control, ensuring no lockout procedure could be reversed while a worker was active. The project implementation demonstrated that a comprehensive digital LOTO approach not only ensures regulatory compliance but also fosters a culture of shared safety responsibility across all levels of an organization. **Novel/Additive Information:** This paper introduces one of the first fully integrated digital LOTO platforms combining mobile, web, and hardware with real-time traceability and user accountability. Unlike partial or software-only solutions, Value Digital LOTO offers a holistic ecosystem that digitizes, automates, and personalizes industrial safety processes. It provides new perspectives on safety culture, showing how digital adoption can embed responsibility and traceability into daily operations in the petroleum industry. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-5476-SPE | | **Title:** | Structured Approach For Selection Of Right SO2 Emission Reduction Technology | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Study | | **Keyword2:** | technology | | **Authors:** | I. DUTT, R. Mukherjee, ADNOC Gas | | **Abstract:** | **Objectives/Scope:** Based on IFC- World Bank SO2 emission reduction targets of 150 mg/Nm3, ADNOC Gas has conducted study to select suitable SO2 emission reduction technology. ADNOC Gas operates many Sulphur Recovery Units (SRU) with varying sulphur removal efficiencies. This currently results in varying SO2 emissions from different plants. This technical evaluation was conducted to identify suitable SO2 emission reduction technologies for different ADNOC Gas plants. **Methods, Procedures, Process:** Available and emerging technologies were assessed on Operational and HSE aspects, economics and design complexity. Study was initiated with meetings between Company and Consultant, for finalization of Scope of Services from available technology suppliers. Necessary non-disclosure agreements were also established. Technical comparison of the inputs received from various technology suppliers was performed. Equipment lists developed based on the technical information were used as basis for cost estimation and financial analysis. Proprietary equipment costs were directly obtained from the relevant technology suppliers. **Results, Observations, Conclusions:** Evaluation results indicate that available SO2 removal technologies based on amine require high CAPEX and long shutdowns of proposed modifications to the existing SRU plants. Also, the required plot area is a constraint for the existing plants. The other technologies require lesser modifications to existing plant. Also, the existing facilities have no Waste Heat Recovery Units (WHRU) associated with SRU Incinerators. Thus, the installation of new WHRUs would have positive impact on the carbon footprint of the existing units. Some technologies also have a high cooling requirement, which results in high CAPEX, bigger plot area and higher operating costs. It is, however, worth noting that amine-based technologies are more adaptive to deeper SO2 removal which may be required based on future regulations. The final recommendation requires a detailed review during next phase of the project, with more detailed analysis of brownfield modification and involvement with existing SRU Units Licensors. Further, technical evaluation of emerging technologies, based on technical and commercial parameters was also performed. Adsorbent based technologies were found to be the preferred option. However, waste disposal costs need to be checked prior to project implementation. **Novel/Additive Information:** SO2 is a major air pollutant impacting all life-forms and thus strict environmental regulations are in place, requiring industries for compliance by installing SO2 removal facilities. The structured approach presented for evaluating the technical feasibility of established as well as emerging SO2 removal technologies based on HSE and operability impacts, can be adopted for other SRU plants. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-5746-SPE | | **Title:** | Offshore Asset Security Enhancement Through Integrated Surveillance Systems: A Marjan GOSP-4 Case Study | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Security | | **Keyword2:** | Offshore | | **Keyword3:** | Asset | | **Keyword4:** | Surveillance | | **Authors:** | T. Alshammari, Y. Alshaikhnasser, Saudi Aramco; A.S. Alshaye, Saudi Aramco NAOO | | **Abstract:** | **Objectives/Scope:** This paper presents a field tested methodology for enhancing offshore industrial security via the integration of Video Assessment and Surveillance Systems (VASS), Long-Range Thermal Imaging (LRTI) and Marine Surveillance Radar (MSR) on Marjan GOSP-4 offshore complex. The objective is to present a structured framework that enabled the development and implementation of a real time, multilayered monitoring system designed and deployed to secure critical infrastructure against unauthorized access and external threats, executed in line with the regulations of the Saudi HCIS. **Methods, Procedures, Process:** A security zoning methodology was used to develop the surveillance architecture across the interconnected offshore structures, encompassing the industrial complex including process, utility and power platforms. VASS provided intelligent visual monitoring capabilities, incorporating motion analytics and automated alert triggers to enhance real time responsiveness. LRTI contributed by offering improved visibility in low light and adverse weather conditions, improving situational awareness beyond the capabilities of conventional CCTV systems. MSR served as an active monitoring system for vessel activity within designated exclusion zones, allowing for early detection and continuous tracking of marine targets. All systems were integrated into a centralized Command Control and Integration (C2I) system, enabling synchronized alarm management, live feeds and historical data review. The system design incorporated power and network failover mechanisms and layered access controls to mitigate cybersecurity risks. The pre-commissioning phase involved scenario based functional testing and validation of system performance under environmental stress conditions. **Results, Observations, Conclusions:** The deployment significantly improved the facility’s overall security posture. The integration of MSR enabled proactive detection and classification of vessel intrusions, effectively reducing the risk of unauthorized approaches. Automated and integrated alerts across platforms facilitated faster incident response, while thermal imaging provided enhanced coverage in low visibility conditions minimizing the reliance on physical patrols. Several challenges were encountered during implementation, including conducting a detailed analysis for the optimal placement of cameras and radars to ensure full surveillance coverage, eliminate blind spots and account for structural obstructions and platform geometry. An additional complexity involved the protocol and integration variance across vendor systems and the calibration of the MSR to minimize false positives in high traffic marine corridors. Cybersecurity measures were strengthened with access control layering and network isolation to prevent unauthorized access to live surveillance streams. **Novel/Additive Information:** Offshore security solutions are frequently deployed as isolated systems with limited interoperability. This paper offers a practical case study in the integrated deployment of VASS, LRTI and MSR technologies within a challenging marine environment aligned with the regulatory requirements of the Saudi High Commission for Industrial Security. It presents a replicable framework for offshore facilities aiming to shift from traditional, reactive security approaches to automated, intelligence driven surveillance systems that enhance situational awareness and reduce operational risk. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-6217-SPE | | **Title:** | Energy Storage Technology Development - A Innovative Pathway Towards Doubling Energy Efficiency And For Industrial Decarbonization In OQ Group | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | batteries storage | | **Keyword2:** | Energy Efficiency | | **Keyword3:** | energy management | | **Authors:** | A. Freeman, OQ Alternative Energy; S. Al-Obeidani, OQ Company; M. Vahgjipurwala, OQ Alternative Energy | | **Abstract:** | **Objectives/Scope:** OQ has embarked on a challenging journey to meet Oman’s national target for reducing emissions by 25% by 2030 and netzero by 2050. Reducing emissions in upstream is key. Battery technologies have been developed for a long time with costs reducing significantly. These hold immense potential in reducing emissions and costs while improving reliability. OQ Energy Excellence team have come across several applications where battery technologies could have considerable benefits. **Methods, Procedures, Process:** **Optimizing Gas Generator**OQ Energy Excellence team looked at captive power plant using gas generators in an off-grid setup. Reliability must be ensured to avoid loss of power. Consequently, the generators are operated with spare capacity for inadvertent power demands. This requires running additional generators operating under lower efficiency, poor performance, more maintenance, higher emissions and increase in costs. By proposing a BESS, it would be possible to meet inadvertent demand without running additional generators. The CAPEX for BESS can be compensated by the savings by reducing fuel consumption because of higher efficiency operation of gas generators. **Diesel Generators at Remote Sites** Diesel generators are used at remote sites, such as drilling and well sites. These are off-grid and oversized to meet demand for all scenarios. Most of the time generators are operated around 20-30% loading leading to poor performance, higher diesel consumption and higher emissions. BESS can enable the diesel generators to operate at optimum load with higher efficiency. Once the battery is fully charged the generator can then be turned-off so that the system is then powered through BESS. This can help improve the efficiency by 10-15%, reduce diesel consumption and costs along with reducing emissions. **Results, Observations, Conclusions:** BESS have wide applications in industry as explained in a few examples. Each application to be reviewed for cost vs benefit to ascertain feasibility. Besides CAPEX, rental models could be considered if BESS is required only during certain parts of the year, which can significantly affect the economics of the solution. Energy performance contract could also be considered providing guaranteed savings. These initiatives have helped OQ chalk out a comprehensive decarbonization roadmap for OQ’s operations. **Novel/Additive Information:** The study will provide a basis for organizations to adopt innovative energy storage technologies in the oil and gas industry for providing low carbon, reliable power. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-6552-SPE | | **Title:** | Standardization And Compliance Challenges For Arc Flash Protection | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Arc flash Protection Standardization | | **Keyword2:** | Arc flash Protection Compliance regulation | | **Keyword3:** | ENHANCEMENTS TO ARC FLASH PROTECTION | | **Authors:** | R. ESSIET, Robert Gordon University | | **Abstract:** | **Objectives/Scope:** **Objectives/Scope:** Arc flash events pose significant hazards to personnel and equipment in electrical systems, particularly in industrial and utility operations. Accurate estimation of incident energy and effective risk mitigation remain critical for compliance with established electrical safety standards. This paper presents a comprehensive evaluation of three principal arc flash protection frameworks: NFPA 70E, IEEE 1584-2018, and OSHA 1910.269. **Methods, Procedures, Process:** **Methods, Procedures, Process:** The study integrates empirical modelling, historical incident data, and machine learning techniques to assess the predictive accuracy and compliance challenges associated with each standard. Incident data from OSHA and NFPA sources (2010-2024) were analysed to identify patterns in fault current, voltage class, arc duration, and PPE usage. Incident energy was computed using IEEE 1584-2018 equations and compared with reported injury severities. **Results, Observations, Conclusions:** **Results, Observations, Conclusions:** The findings indicate that while IEEE 1584 predictions align with observed outcomes in most configurations, notable underestimations occur in horizontal conductor and open-air systems. NFPA 70E, although widely adopted, provides qualitative guidelines and relies on external methods such as IEEE 1584 for energy calculation. A logistic regression model trained on the incident dataset achieved 87% accuracy in predicting severe injury outcomes based on system parameters. This model was extended with a neural network architecture to support real-time classification of arc flash risk. **Novel/Additive Information:** The integration of sensor data through IoT enabled monitoring and predictive analytics enables dynamic hazard assessment and supports pre-emptive mitigation. A comparative analysis highlights the strengths and limitations of each standard. IEEE 1584-2018 offers robust empirical modelling but depends on configuration-specific inputs. NFPA 70E provides structured procedural guidance but lacks inherent computational capabilities. OSHA 1910.269 enforces general safety compliance but does not prescribe detailed modelling techniques. This study proposes a data-driven framework that enhances arc flash hazard prediction through validated equations, statistical analysis, and AI-based risk models. Recommendations for standard refinement and predictive system integration are presented to support proactive electrical safety management. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-6939-SPE | | **Title:** | The Hidden Cost Of Price-driven Procurement: Safeguarding h₂S Safety Services For The Future Of Drilling And Well Completions | | **Category:** | +8.1 HSE, Security, and Sustainability—Challenges, Technologies, and Innovative Practices | | **Keyword1:** | H2S Safety | | **Keyword2:** | HSE | | **Keyword3:** | Drilling & Workover | | **Keyword4:** | Well Completions | | **Keyword5:** | Cost | | **Authors:** | M. Malik, Pemtech Middle East | | **Abstract:** | **Objectives/Scope:** This paper aims to evaluate the adverse impacts of lowest-cost procurement practices on hydrogen sulfide (H₂S) safety services in the oil and gas sector. It addresses how cost-driven procurement compromises service quality, innovation, and operational safety. The paper advocates for a shift to value-based procurement strategies that prioritize technical capability, workforce training, and long-term safety outcomes. **Methods, Procedures, Process:** The approach involved a comprehensive analysis of current procurement trends, service provider capabilities, and risk profiles associated with H₂S in drilling and well completions. Data was gathered through industry reports, operational case studies, and stakeholder interviews. The paper also benchmarked procurement practices across several operators to assess their impact on safety outcomes. Emphasis was placed on examining how margin pressures influence investment in R&D, equipment maintenance, and personnel development. The evaluation led to the development of a framework for value-based procurement tailored to critical safety services. **Results, Observations, Conclusions:** Findings reveal that the current lowest-bid procurement model severely undermines the integrity of H₂S safety services. Service providers face eroded profit margins, limiting their ability to invest in new detection technologies, comprehensive training programs, and equipment upgrades. This results in increased operational risks, reduced regulatory compliance, and potential threats to worker safety and environmental stewardship. By commoditizing critical services, operators expose themselves to heightened liabilities and potential incident costs. The paper concludes that value-based procurement — which evaluates providers on technical merit, safety performance, and innovation — is essential to restoring the operational viability and strategic importance of H₂S safety services. Adopting this model can improve long-term safety performance, support industry innovation, and reduce incident-related costs through enhanced preparedness and risk mitigation. **Novel/Additive Information:** This paper uniquely highlights the systemic risks of price-driven procurement specific to H₂S safety services, an area often overlooked in broader procurement discussions. It introduces a strategic framework for transitioning to value-based procurement and offers actionable recommendations that bridge commercial decision-making and frontline safety practices, thereby contributing significantly to the industry’s evolving approach to risk and cost management. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-177-SPE | | **Title:** | Supply Chain Agility And Sustainable Energy Operations | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Supply Chain Agility | | **Authors:** | T. Badwy, African Egyptian Consulting Group | | **Abstract:** | **Objectives/Scope:** **Supply Chain Agility and Sustainable Energy Operations** **Short Introduction to the Presentation:**The Energy industry plays a significant role in any country's vision. however, the industry has been facing challenges in recent years as a result of several factors, including economic variables at the local and global levels. **Methods, Procedures, Process:** Hence, the supply chain agility appears as one of the tools that work to develop the energy industry through the following ways:Cost savings: A well-organized supply chain can help energy companies reduce costs by streamlining processes, reducing waste and inefficiencies, and negotiating better prices for goods and services. This can help companies to remain competitive, even in a challenging economic environment.Improved logistics: An efficient supply chain can help energy companies to move goods and services more quickly and at lower cost. This can be particularly important for energy companies operating in remote areas where infrastructure is limited. By improving logistics, energy companies can reduce delays and bottlenecks, which can help to increase production and revenue.Increased local content: A strong and efficient supply chain can also help to increase the amount of goods and services that are sourced locally. This can help to create jobs and stimulate economic growth in the local communities. Additionally, it can help energy companies to meet local content requirements set by the government and other stakeholders.Enhancing sustainability: A sustainable supply chain can help energy companies to minimize their environmental impact and promote socially responsible practices. This can include sourcing inputs from sustainable suppliers, reducing the use of energy and water, and managing waste in an environmentally friendly way.Increased transparency: A well-functioning supply chain can also promote transparency and good governance by making it easier to track the flow of goods and services and identify any potential issues or areas of concern. **Results, Observations, Conclusions:** To develop a strong and efficient supply chain in the energy industry, the government and energy companies should work together. The government can provide support by investing in infrastructure, promoting local content, and simplifying regulations. energy companies can also play a role by developing sustainable and responsible procurement policies and investing in technology and logistics to improve efficiency. Additionally, international organizations and donors could support the development of supply chain in the country. **Novel/Additive Information:** All supply chain components can impact supply chain resilience such as: • Transportation mechanisms between nodes, facilities, people and communication networks • Just-in-time inventory practices • Information technology systems and data exchange • A diverse risk landscape • Industry consolidation • The regulatory environment and constraints on supply chain flexibility | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-202-SPE | | **Title:** | Energy Optimization Of Steam Systems In High-consumption Industries: Case Study From Iran | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Steam System Optimization | | **Keyword2:** | Energy Efficiency | | **Keyword3:** | Industrial Utilities | | **Keyword4:** | Operational Excellence | | **Keyword5:** | Textile Industry Energy Management | | **Authors:** | A. Esfandiari, PetroChina Co. Ltd. | | **Abstract:** | **Objectives/Scope:** This paper aims to demonstrate how targeted energy optimization in steam systems can significantly enhance operational efficiency and reduce costs in high-consumption industries. Focusing on a case study from Iran's textile sector, it showcases the methodologies and outcomes of implementing advanced steam system optimization techniques.The objective is to provide a practical, replicable roadmap for energy managers and engineers in similar industrial settings. **Methods, Procedures, Process:** The study involved a comprehensive audit of the existing steam system, identification of inefficiencies, and implementation of corrective measures. Key procedures included:​   * Conducting thermal imaging and flow measurements to detect energy losses.​ * Upgrading insulation and repairing leaks to minimize heat loss.​ * Implementing advanced control systems for better load management.​ * Training personnel on best practices for steam system operation and maintenance. - Establishing KPIs to monitor improvements in real time and track ongoing system performance.   **Results, Observations, Conclusions:** Post-implementation, the facility observed a 15% reduction in fuel consumption and a 20% decrease in operational costs related to steam production. Additionally, there was a notable improvement in system reliability and product quality. These results underscore the potential for significant efficiency gains through targeted steam system optimization. The outcomes validate the return on investment within 18 months and reveal the importance of holistic, cross-disciplinary energy management strategies. **Novel/Additive Information:** This case study provides a replicable framework for similar industries aiming to enhance energy efficiency. It emphasizes the importance of a holistic approach, combining technological upgrades with staff training, to achieve sustainable operational excellence. The paper also highlights the often-overlooked impact of maintenance behavior and system monitoring in achieving long-term results. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-251-SPE | | **Title:** | Reduction Of Co2 Emissions In Integrated VGO & Diesel Hydrotreater With Energy Reduction Strategies & Innovations | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Cost optimisation | | **Keyword2:** | Energy Optimisation | | **Keyword3:** | CO2 emission reduction | | **Keyword4:** | operational excellence | | **Keyword5:** | Loss reduction | | **Authors:** | N. Singh, Hindustan Petroleum Corp. Ltd. | | **Abstract:** | **Objectives/Scope:** The objective of this initiative was to **enhance energy efficiency** and **reduce CO₂ emissions** in the **Integrated VGO & Diesel Hydrotreater (DHT)** at **HPCL Mumbai Refinery**, without any capital expenditure. Given the unit's critical role in producing clean fuels and its unique complexity—processing both **Vacuum Gas Oil (VGO)** and diesel in separate reactors—this study focused on identifying and implementing **operational changes** that could lower energy consumption and environmental impact, while maintaining high product quality and throughput. **Methods, Procedures, Process:** A series of **strategic operational optimizations** were identified and implemented, targeting high-energy consumption areas within the integrated unit. These included:   * **Hot feed maximization** to reduce heater load * **Shutdown of one furnace** through feed re-routing and thermal balancing * **Gas-to-oil ratio optimization** to control hydrogen consumption * **Flare minimization** during normal and upset conditions * **Stripping steam optimization** to reduce utility consumption * **Export naphtha reduction** by adjusting product routing * **Reflux temperature increase** to improve separation efficiency   All measures were executed **without new equipment, pipelines, or major modifications**, relying solely on operational expertise and real-time process adjustments. **Results, Observations, Conclusions:** The operational improvements led to substantial energy and environmental benefits:   * **Energy savings** of over **6,000 SRFT annually** * **CO₂ emissions reduction** of approximately **19,000 kg/hr** * **Improved unit efficiency and cost reduction**, without compromising product quality or throughput   These outcomes reinforce the effectiveness of targeted operational strategies in achieving both **economic and environmental goals**, showcasing a model of sustainable refining operations. **Novel/Additive Information:** What sets this initiative apart is the **absence of capital investment**—all changes were achieved through **innovative, skill-based process management**. The integration of DHT and VGO hydrotreating units presents unique challenges in terms of energy intensity, making the success of this project especially notable. This case highlights how **continuous improvement, deep operational insight, and innovation** can drive significant sustainability gains in even the most complex refinery units. It serves as a blueprint for similar units aiming to reduce carbon footprint and energy consumption through internal expertise and operational excellence. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-287-SPE | | **Title:** | Energy Cost Reduction And No Emissions - Voc's With Uv Led Coatings For Pipe | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | UV coatings | | **Keyword2:** | LED | | **Keyword3:** | UV | | **Keyword4:** | Pipe coatings | | **Keyword5:** | Sustainable | | **Authors:** | M. Kelly, AlliedUV | | **Abstract:** | **Objectives/Scope:** EnergyCost Reduction and No VOCs with UV LED Coatings TechnologyCase Studies provided showing ROI and VOC elimination,pictures and videos Customer testimonialsImproving your Sustainability Footprint / Eliminating VOC’s and HAP’sDriving process efficienciesManufacturing an improved product - Exceeding Customer’s NeedsFocus on Workplace Safety - EH&SDelivering improved ROI - Return on Investment **Methods, Procedures, Process:** Examples of UV coating case studies in Pipe & Tube manufacturingImproving your Sustainability Footprint / Eliminating VOC’s and HAP’sDriving process efficienciesManufacturing an improved product - Exceeding Customer’s NeedsFocus on Workplace Safety - EH&SDelivering improved ROI - Return on Investment **Results, Observations, Conclusions:** Case Studies provided showing ROI and VOC elimination,pictures and videos Customer testimonialsImproving your Sustainability Footprint / Eliminating VOC’s and HAP’sDriving process efficienciesManufacturing an improved product - Exceeding Customer’s NeedsFocus on Workplace Safety - EH&SDelivering improved ROI - Return on InvestmentAllied UV continues to drive the Sustainability message to US Manufacturing by offering detailed VOC calculation analysis, plus a strong emphasis on EHS - Environmental, Health and Safety Training.This EHS Safety Training is conducted at no charge, and includes PPE - Personal Protection Equipment recommendations, Work Place Safety Work Instructions plus many other support documents / instructions / procedures. **Novel/Additive Information:** LED curing (using light) to instantly dry coatings and elimination of emissions & VOC’sCase Studies provided showing ROI and VOC elimination,pictures and videos Customer testimonialsImproving your Sustainability Footprint / Eliminating VOC’s and HAP’sDriving process efficienciesManufacturing an improved product - Exceeding Customer’s NeedsFocus on Workplace Safety - EH&SDelivering improved ROI - Return on Investment | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-549-SPE | | **Title:** | Flexible And Future-proof Hrsgs | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Gas Turbine Combined Cycle Power Plants | | **Keyword2:** | HRSG | | **Keyword3:** | Flexible and future-proof | | **Keyword4:** | CCPP | | **Keyword5:** | NEM | | **Authors:** | S. Ruijgrok, NEM Energy B.V. | | **Abstract:** | **Objectives/Scope:** Fluctuating renewable power generation is structurally changing the electricity markets in almost every country. Past traditional GT CCPP were practically only running in base load operations providing electricity to the grid for a large part of the year, and only a limited number of start/stops had to be made per annum. However, the market changes require CCPPs to adapt to a new reality. The market demands quick and flexible power generation, especially from fossil fuel power generation capacity. Traditional Large CCPPs, with F class or higher capacity GT, are limited in both the start-up time which can be up to an hour or more, and the number of start/stops. Until a few years, most of the CCPPs in Europe were running for more than 5,000 hours per year and where only stopped/started for 50 - 100 times annually. Now, CCPPs are running only a couple of thousand hours and have to be stopped and started daily. This new world gives huge challenges to Large CCPPs, but it also provides new opportunities. **Methods, Procedures, Process:** The need for flexibility and ever more powerful GT requires HRSGs that are robust and have large pressure parts and are capable to start up fast. These characteristics seem to conflict as larger and thicker pressure parts do not create flexibility, but a lack thereof. However, NEM’s fast start design, called DrumPlus™, ensures unrestricted GT ramp up and long lifetime, also for the latest high output GT models. This means that the HRSG is no longer limiting the gas turbine in CCPP operations, and it can ramp-up as fast as possible. The El Segundo CCPP in California is the world’s first large CCPP with fast start and cycling HRSG capabilities of its kind. This plant uses a single pressure steam cycle, and, at the time, it was the fastest starting large gas turbine combined cycle in the world. Now, NEM installed a new HRSGs behind various turbine classes, included behind an H-class gas turbine in Lodstown, USA, with a three-pressure steam cycle with reheat, now using the NEM DrumPlus™ technology. This paper will get into the details of the plant flexibility. It will compare the achievable ramp rates and start-up curves versus a traditional combined cycle as well as an HRSG lifetime comparison of the same. **Results, Observations, Conclusions:** The fast start power plant offers higher plant efficiency and significantly more kilowatt-hours for commercial use during the first hour of its operation. Fast ramp up also allows gas turbines to reach low NOx operating loads quickly. As a result, demanding environmental permits are complied with more easily and a quicker response to power demand is achieved. **Novel/Additive Information:** N/A | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-554-SPE | | **Title:** | Achieving Net Zero Through Diesel Isotherming Excellence: A Case Study In Sustainability, Energy Efficiency, And Plant Optimization At Hpcl Mumbai Refinery | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Diesel IsoTherming Unit (DIU) | | **Keyword2:** | Enhanced MBN performance | | **Keyword3:** | Achieve net-zero carbon ambitions | | **Keyword4:** | CO₂ emissions reduced | | **Keyword5:** | Reduced energy intensity through steam and power | | **Authors:** | S.C. UMARE, S. Soman, Hindustan Petroleum Corp. Ltd. | | **Abstract:** | **Objectives/Scope:** The focus of this paper is to highlight the transformational journey of the Diesel IsoTherming Unit (DIU) at HPCL Mumbai Refinery, which was revamped to meet stringent Euro VI fuel standards. The study aims to showcase how the 2024 Major Turnaround (TA) served as a catalyst for optimizing energy efficiency, resolving chronic operational issues, and enhancing sustainability. The key objective is to present how operational challenges such as high reactor differential pressure, filter backwash frequency, and exchanger fouling were addressed. Additionally, the paper explores the rationale behind choosing IsoTherming technology, its advantages, and its alignment with HPCL Net Zero ambitions. **Methods, Procedures, Process:** **1.Turnaround Driven Transformation** The 2024 Major Turnaround enabled furnace decoking, exchanger hydrojetting, and catalyst regrading restoring reactor efficiency and lowering pressure drop. **2. HP Ducer Innovation in a Drum** HPCL R&D’s proprietary additive, HP-Ducer, reduced fouling, controlled reactor pressure drop, and allowed higher throughput without hardware changes. **3. No CAPEX Process Optimization** Post-TA, optimization of gas-to-oil ratio and IsoTherming pump RPM reduced energy use and emissions without equipment modifications. **4. Advanced Safety Integration** 2oo3 trip logic and real-time monitoring improved safety, minimized spurious trips, and enhanced asset protection. **5. Sulfur Slip Diagnosis & Resolution** Root cause analysis traced high sulfur to exchanger leaks. Corrective MOC actions and catalyst realignment ensured reliability **Results, Observations, Conclusions:** The DIU revamp resulted in significant operational improvements:Energy savings of 5,722 SRFT yearCO₂ emissions reduced by 4,957 tons yearEnhanced MBN performanceOptimized steam and power consumptionThe unit achieved its design feed capacity, improved diesel yield, and maintained ultra-low sulfur diesel (ULSD) product quality. The targeted interventions, such as catalyst reloading and process adjustments, effectively resolved chronic issues, including high product sulfur levels. The DIU revamped performance demonstrated the feasibility of achieving sustainability goals without large-scale equipment modifications. This case study underscores how process innovation, combined with strategic revamp efforts, can drive sustainability and energy efficiency in legacy assets. **Novel/Additive Information:** A key aspect of the DIIU success was the deployment of HP-Ducer, a unique additive developed in-house by HPCL, which reduced reactor pressure drop and enhanced overall system reliability. The detailed root cause analysis of sulfur excursions, caused by reactor effluent heat exchanger leaks, led to strategic interventions and improvements in reactor design and performance. These actions, alongside the implementation of Management of Change (MOC) procedures, ensured that the DIU consistently met design feed capacity and product quality. The case study also highlights the significant advantages of IsoTherming technology over conventional hydrotreating, particularly in terms of energy efficiency, sustainability, and environmental compliance | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-628-SPE | | **Title:** | Iso 50001 Implementation At Oqgn | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | ISO 50001 | | **Keyword2:** | Energy | | **Keyword3:** | Efficiency | | **Authors:** | A. Al Salmi, OQGN | | **Abstract:** | **Objectives/Scope:** he objective of this paper is to present the successful implementation of the ISO 50001 Energy Management System at OQ Gas Networks (OQGN), Oman’s primary gas transportation company. The project aimed to enhance energy performance, establish a systematic approach for energy management, and identify cost-effective opportunities for reducing energy consumption and associated emissions within midstream gas operations **Methods, Procedures, Process:** The implementation followed a structured approach that began with a gap assessment, followed by the development of an energy policy, an energy review, and the identification of significant energy uses (SEUs) across key assets including compressor stations and gas-fired heaters. A multidisciplinary team developed tailored performance indicators and operational controls, supported by data collection, equipment monitoring, and system modeling. Key initiatives included optimization of heater operations, fine-tuning fin fan cooler settings, and assessing electrification options. **Results, Observations, Conclusions:** The ISO 50001 implementation led to measurable improvements in energy efficiency and emissions performance at OQGN. Early optimization efforts across three sites involving seven heaters resulted in more than 20,000 OMR in annualized cost savings and over 45% reduction in CO₂-equivalent emissions. The certification was completed within the planned timeline and budget, with no capital investment required for initial measures. Energy performance indicators (EnPIs) were institutionalized for continuous tracking, and energy objectives were aligned with OQGN’s sustainability and net-zero roadmap. The process also fostered cross-functional collaboration and improved operational awareness of energy drivers, laying the foundation for replicating energy initiatives across all OQGN assets. The results demonstrate the value of a structured EnMS in driving data-informed decisions, operational discipline, and continuous improvement in energy performance. **Novel/Additive Information:** This paper contributes novel insights into ISO 50001 implementation within the context of gas transmission networks in the Middle East. It offers a replicable framework for other midstream operators and highlights how energy management can be integrated without major investments. It also provides practical guidance on using internal resources, digital tools, and optimization techniques to deliver both financial and environmental value. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-739-SPE | | **Title:** | Strategic Power Grid Modernization For Oil And Gas Field Development: Ensuring Reliability While Safeguarding Production | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Power Enhancement | | **Keyword2:** | Energy Optimization | | **Keyword3:** | Power Grid Load Management | | **Keyword4:** | Power Grid management | | **Keyword5:** | Power Outage | | **Authors:** | A. Alkhraisi, Saudi Aramco PE&D | | **Abstract:** | **Objectives/Scope:** The continuous expansion of oil and gas fields necessitates a reliable and resilient power grid to sustain operations without disruptions. This study aims to explore strategic power grid modernization efforts—specifically the integration of smart grid technologies, distributed energy resources (DERs), and predictive maintenance systems—to enhance reliability while safeguarding ongoing production. By aligning power infrastructure upgrades with field development planning, this study provides a roadmap for minimizing operational risks, improving efficiency, and ensuring uninterrupted power supply in oilfield operations. **Methods, Procedures, Process:** The study follows a multi-faceted approach, incorporating case studies, real-time monitoring data, and industry benchmarks to assess the impact of power grid modernization. The research evaluates the deployment of auto-reclosures, load break switches, and dynamic power flow control systems to optimize grid performance and reduce downtime. Additionally, the integration of DERs, including renewable energy sources and microgrids, is analyzed to enhance power redundancy and mitigate dependency on centralized grids. Advanced analytics, such as predictive maintenance and machine learning-based fault detection, are also explored to proactively address potential system failures. A phased implementation strategy, aligned with production schedules, ensures that power grid enhancements do not compromise ongoing oilfield operations. **Results, Observations, Conclusions:** The study highlights how smart grid technologies improve power reliability, reduce fault response time, and minimize production losses due to power outages. The incorporation of DERs, particularly localized energy generation and storage solutions, significantly enhances grid resilience, reducing reliance on external power sources. Predictive maintenance systems were found to improve asset management, reducing unplanned downtime and extending equipment lifespan. Additionally, the phased integration of power system upgrades—synchronized with field expansion plans—allowed for seamless implementation without disrupting production. The findings underscore that a proactive and structured approach to power grid modernization is essential for sustaining oilfield operations while accommodating future field development. **Novel/Additive Information:** This study provides a comprehensive framework for aligning power grid modernization with field development planning in oil and gas operations. By integrating smart grid technologies, distributed energy solutions, and predictive maintenance strategies, oil and gas facilities can enhance operational efficiency and resilience while ensuring uninterrupted production. The findings offer valuable insights for industry stakeholders, supporting informed decision-making in power infrastructure planning to meet the demands of expanding oil and gas fields. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-1472-SPE | | **Title:** | Managing Projects Through Interconnection Backlogs | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Interconnection | | **Keyword2:** | Grid | | **Keyword3:** | ISO | | **Keyword4:** | RTO | | **Keyword5:** | Queue | | **Authors:** | J. Earl, Sapphire Technologies, Inc. | | **Abstract:** | **Objectives/Scope:** Electric grids are strained due to the increasing electricity demands of electric vehicles, data centers, and a rising standard of living. At the same time, interconnection regulations are often becoming more complex. This has created a growing mismatch between electricity demand and supply. **Methods, Procedures, Process:** Independent system operators (ISOs), regional transmission organizations (RTOs), and their equivalents are tasked with managing interconnection processes but the timeline for interconnection agreements has grown year-over-year. Delays undercut the ability of power developers to deploy essential infrastructure and fulfill growing demand. Original equipment manufacturers are also affected, especially those producing energy technologies, because delays prevent them from commercializing their solutions. **Results, Observations, Conclusions:** This presentation will explore Sapphire Technologies’ project development experience with a utility operator in the Western Interconnection. The project’s scope will be described, with focus placed on the characteristics of the power generation technology and how these characteristics affect the interconnection choices available to the project developer. It will highlight the regulatory hurdles, application requirements, and timelines involved, illustrating how current policies affect companies attempting to execute power projects. **Novel/Additive Information:** Reforms are needed to address these challenges, and potential solutions are discussed including cluster study prioritization metrics, queue visibility (and associated heat maps), and application screening using artificial intelligence. These steps can help streamline interconnection processes, narrowing the gap between electricity demand and supply. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-1543-SPE | | **Title:** | Optimization Of Mixed Refrigerant Loop LNG Plant Facilities Using Aspen Hysys Software | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | LNG plant | | **Keyword2:** | Mixed refrigerant, APCI | | **Keyword3:** | Optimisation | | **Authors:** | G. Samir, Sonatrach | | **Abstract:** | **Objectives/Scope:** One of the many challenges facing LNG plants is to reduce energy consumption and processing cost. The mixed refrigerant (MR) component is an important factor influencing the performances of natural gas liquefaction processes. In this session, Sonatrach shares a case study performed on a liquefaction process using Aspen HYSYS® software, where the main parameters of mixed refrigerant are varied to analyze their influence on the power consumption. This case study was carried out on the function of each component of the mixture and its impact on the decrease of compressor power. The reduction in energy consumption of the MR compressor is obtained without any prior investment. For this reason, the permanent adjustments brought to the MR composition have greatly improved the performance of the process. This study showcases how Sonatrach fixed the operational challenges that impact energy consumption using Aspen HYSYS by choosing the optimal composition of mixed refrigerant. **Methods, Procedures, Process:** In this study, the mixed refrigerant cycle with the propane pre-cooling for the natural gas liquefaction process has been optimized and simulated using Aspen HYSYS By application of this software, the best possible values for Mixed refrigerant composition and compressor power consumption as two objective functions were obtained **Results, Observations, Conclusions:** The expected benefits for the new composition are of the order $250K/Yr for one LNG train **Novel/Additive Information:** The results of this study demonstrate that variation in the composition of multi-component refrigerant MCR significantly influences the performance of the refrigeration cycle of the liquefaction process In Order to get a real plant model, we recommend to calibrate this models with data using Aspen plant data, and introduce the compressor performance curves | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-1576-SPE | | **Title:** | Electric Field Mapping For Insulator Selector | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Insulator | | **Keyword2:** | energy | | **Keyword3:** | Electric | | **Keyword4:** | design | | **Keyword5:** | mapping | | **Authors:** | M.H. Hanafy, ENPPI | | **Abstract:** | **Objectives/Scope:** As global energy demands grow and environmental concerns rise, enhancing electrical energy efficiency has become an operational necessity. In high-voltage transmission systems, insulators play a critical role in ensuring energy is delivered efficiently and reliably. Poor insulator performance can lead to significant energy losses and grid disturbances. **Methods, Procedures, Process:** This paper presents the development and validation of an innovative testing machine designed to simulate insulator performance, compare various insulator designs, and optimize selection based on electrical field behavior. The system is based on IEC 62217-2012 standards and comprises a polymer insulator testing unit built around an electrolytic glass tank. Within this tank, the insulator is immersed in an electrolytic solution and supported in place, while a Cartesian robotic system moves around it to precisely measure voltage across a matrix of X-Y coordinates. These voltage measurements are processed using electric field differential equations to generate a detailed electric field distribution map, enabling accurate performance analysis. **Results, Observations, Conclusions:** This machine has been officially patented in Egypt (Patent ID: EG-30474 on 11/11/2021) and validated through comparative testing of two 33 kV composite insulators: a standard 7-shed design and an optimized 11-shed version. The results demonstrated superior efficiency in the optimized insulator due to reduced electric field intensity along its sheds. **Novel/Additive Information:** By facilitating the enhancement of design and selection of high-performance insulators, this system significantly contributes to improving electricity transmission efficiency, especially under challenging environmental conditions where insulator performance is most vulnerable | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-1690-SPE | | **Title:** | Understanding The Complexity Of The Demand Side And Why Finding Offtakers Is A Key Challenge | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Hydrogen | | **Keyword2:** | industry | | **Keyword3:** | decarbonization | | **Keyword4:** | offtakers | | **Authors:** | S. Braun, ICIS | | **Abstract:** | **Objectives/Scope:** Hydrogen is the simplest and most abundant element in the universe, consisting of just one proton and one electron. Governments in Europe wanted to use this element as a pilar of energy supply and introduced abstract plans and regulation under the goal of decarbonization. But investors, especially from oil and gas industry, are reluctant so that projects are progressing slower than expected and targets are pushed back. The abundance of the element hydrogen did not result in abundance of deals and availability. From our conversations with industry players, we absorb that finding offtakers is currently one of the biggest challenges in the industry. This is in line with our standpoint that low carbon hydrogen production may neither be easy nor always economically viable, but the transformation of industry processes to low carbon hydrogen is unevenly more complex. We want to look at the demand situation and untangle the challenges that the different sectors face. **Methods, Procedures, Process:** This will include the transport sectors aviation, maritime and road as well as the industries chemicals, fertilizers, refineries and metals. We differentiate between the use as feedstock and energy input in the modelling and provide insides into the economics of greenfield and retrofit use cases. All findings will be underpinned with real world projects and the results compared in terms of the willingness to pay to switch from the current energy source to hydrogen. **Results, Observations, Conclusions:** We will present hydrogen flow charts to visualize how much hydrogen is used where and for which purpose and how these numbers change over time. Based on the above-mentioned understanding of processes and costs to switch to low carbon hydrogen we can furthermore display the costs and the subsidy gap for each process over time. This will help producers identify offtaker industries and policymaker areas that require stimulus. **Novel/Additive Information:** | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-1750-SPE | | **Title:** | Conser Duetto Technology:an Innovative Approach To The Production Of Biodegradable Plastics | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | BIODEGRADABLE PLASTICS | | **Keyword2:** | INNOVATIVE TECHNOLOGY | | **Authors:** | F. DIGNANI, CONSER SpA | | **Abstract:** | **Objectives/Scope:** Conser Duetto technology is a revolutionary process that facilitates the production of biodegradable plastic intermediates from maleic anhydride. This Technology represents a really promising process to produce intermediates which are becoming key chemicals for the development of biodegradable plastics. **Methods, Procedures, Process:** The origin of this technology starts from the consolidated experience and full knowhow of Conser in the BDO process, optimized through several R&D activities developed on the most critical part of the technology (mainly hydrogenation section), consultants support and deepen literature investigation. The result is the finalization of a new process where the hydrogenation process of diesters of the maleic anhydride occurs in mixed liquid/vapor phase allowing the separation of the DMS through a simples phases separation, differently from the process provided by competitors, based on the hydrogenation step in vapor phase where the separation of DMS is more complicated. **Results, Observations, Conclusions:** Conser Duetto is a new and improved technology with the aim to simplify the industrial process of manufacturing the raw materials of the PBS products and to decreasing their production cost to make PBS comparable to the other biodegradable polymer, not only in term of characteristics (mechanical, compostability, processability) but also in term of cost. In that sense, Conser Duetto technology, together with the innovative idea to produce PBS by trans-esterification by using DMS as raw material instead of esterification by using Succinic Acid, can represent a real game changer for the PBS industry and can be easily adaptable to the production of BDO and DMS starting from a fossil feedstock (C4 fractions such as butane) or from a bio based feeding (bio succinic acid). The adoption of Conser Duetto technology is in line with global environmental protection efforts and the growing demand for non-invasive and eco-friendly. As regulations tighten and bans on non-biodegradable plastics become more widespread, technologies like Conser Duetto are poised to play a crucial role in the transition to sustainable materials and reducing the accumulation of plastic waste even starting from a fossil feedstock (C4 fractions such as butane). **Novel/Additive Information:** Conser Duetto technology represents an innovative solution to co-produce butanediol and dimethyl succinate as feedstock for the synthesis of PBS. Proposed process is optimized in terms of capital and operating expense by maximizing energy efficiency and recovery. These attributes make it a valuable solution for industries seeking sustainable production methods, particularly in disposable packaging, as well as in the agricultural sector for mulch films. Key principles of the technology are covered by a patent: EP 4188903. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-1874-SPE | | **Title:** | Drives For A More Sustainable And Profitable Chemical Industry | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Refining | | **Keyword2:** | Chemicals | | **Keyword3:** | Efficiency | | **Keyword4:** | Profitability | | **Keyword5:** | Variable Speed Drives | | **Authors:** | Y. McColl, Schneider Electric | | **Abstract:** | **Objectives/Scope:** The path to a more profitable and sustainable refining and chemical industry lies in increasing process efficiency through strategies for energy management, process optimization, and asset management. The refining and chemical industry, ranging from energy-intensive crude a bulk chemical production to raw material-intensive specialty chemical production, relies on these systems to enhance efficiency and reduce emissions. Drive systems play a crucial role in transferring kinetic energy to chemical processes, creating significant opportunities to enhance efficiency and reduce energy consumption, leading to lower emissions. Electrifying drives with variable speed control in the refining and petrochemical process, can significantly lower energy consumption (OPEX) and improve decarbonization and efficiency targets. Similarly, variable speed drives in polymer production and specialty chemical processes can enhance reliability, reduce maintenance, OPEX, and improve power factors. **Methods, Procedures, Process:** Four key sustainability enablers are identified for these refining and chemical processes: energy management, process optimization, asset management, and connected products. Energy management through variable speed drives includes energy monitoring, optimized energy consumption, and low grid impact. Process optimization involves making operational decisions close to the equipment, utilizing decentralized application expertise, and enabling autonomous decision-making. Asset management capabilities in drive systems include condition-based maintenance, asset protection functions, and smarter maintenance strategies. Connectivity in drive systems ensures comprehensive data access, empowered operators, and robust cybersecurity measures. **Results, Observations, Conclusions:** Enhanced energy efficiency, process efficiency, and reliable plant operations are essential for a more sustainable and profitable refining and chemical industry. In this presentation, we will discuss the benefits of drive systems in the industry. **Novel/Additive Information:** n/a | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-1914-SPE | | **Title:** | Affordable & Smart Battery Storage For Resilient Farming | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Affordable & Smart Battery Storage for Resilient F | | **Keyword2:** | Software Drive Battery Chemistry | | **Keyword3:** | AI-BESS technology | | **Keyword4:** | Not limitation in terms of Battery Chemistry | | **Authors:** | T. Nozha, Volttera Industries B.V | | **Abstract:** | **Objectives/Scope:** This paper presents an affordable, smart battery energy storage solution tailored for farmers and greenhouse owners in MENA and similar regions. The system addresses energy insecurity, high electricity costs, and grid unreliability. By integrating solar panels with adaptive battery storage and intelligent energy management, the system enhances productivity, reduces diesel dependence, and promotes clean energy adoption. The goal is to offer an accessible, locally adaptable storage system that ensures resilient, sustainable farming and boosts energy access in rural communities. **Methods, Procedures, Process:** The proposed system combines modular battery hardware with a smart battery management system (BMS) and AI-driven optimization software. Designed to support multiple chemistries—including lead-acid, LFP, and solid-state—the solution adapts to local market needs and available materials. Real-time monitoring ensures thermal safety and efficient performance. Energy is stored from solar during low-demand periods and used or resold during peak demand. Field testing covers various climatic and grid conditions. Integration with existing infrastructure is ensured through compliance with regulatory frameworks, while manufacturing leverages local resources to ensure affordability, scalability, and compatibility with evolving battery technologies. **Results, Observations, Conclusions:** Initial pilot results show that this smart battery system significantly reduces energy costs for farmers while increasing access to stable electricity. When combined with solar, users achieve full energy independence during peak hours and can generate surplus power to sell back to the grid. The system lowers CO₂ emissions, reduces air pollution, and cuts reliance on diesel by up to 70%, contributing to national sustainability goals. Its modularity allows scalability from 100 kWh to 1 MWh, depending on farm size or community needs. Return on investment is projected within five years through energy cost savings and revenue generation. Additionally, the project promotes job creation in green manufacturing and assembly, particularly for women and youth, and facilitates the development of skilled technicians in battery storage and digital energy management. The AI software tailors energy use based on weather, seasonality, and consumption patterns, maximizing efficiency. Unlike traditional fixed-chemistry solutions, this system remains adaptable to future innovations, ensuring long-term relevance and low lifecycle cost. In conclusion, the solution offers a viable pathway to energy-resilient agriculture and rural development, addressing both environmental and economic challenges in underserved markets. **Novel/Additive Information:** This paper introduces a decentralized, AI-optimized battery storage model that uniquely serves small-scale agricultural users, an often-overlooked segment in energy innovation. By offering a battery-agnostic, software-defined platform, the system ensures long-term adaptability to evolving technologies and local material availability. Its design bridges the gap between clean energy and rural development, offering a scalable blueprint for affordable, secure, and sustainable electrification in agriculture-dominated regions across Africa and beyond. [[A person holding a flag  Description automatically generated](https://files.abstractsonline.com/CTRL/24/7/126/655/6E2/44A/C82/71B/73B/6A9/EBC/F7/g1914_1.png)](https://files.abstractsonline.com/CTRL/24/7/126/655/6E2/44A/C82/71B/73B/6A9/EBC/F7/g1914_1.png) [[A diagram of different types of electronics  Description automatically generated](https://files.abstractsonline.com/CTRL/24/7/126/655/6E2/44A/C82/71B/73B/6A9/EBC/F7/g1914_3.png)](https://files.abstractsonline.com/CTRL/24/7/126/655/6E2/44A/C82/71B/73B/6A9/EBC/F7/g1914_3.png) [[A computer screen shot of a diagram  Description automatically generated](https://files.abstractsonline.com/CTRL/24/7/126/655/6E2/44A/C82/71B/73B/6A9/EBC/F7/g1914_4.png)](https://files.abstractsonline.com/CTRL/24/7/126/655/6E2/44A/C82/71B/73B/6A9/EBC/F7/g1914_4.png) [[A screenshot of a computer software  Description automatically generated](https://files.abstractsonline.com/CTRL/24/7/126/655/6E2/44A/C82/71B/73B/6A9/EBC/F7/g1914_5.png)](https://files.abstractsonline.com/CTRL/24/7/126/655/6E2/44A/C82/71B/73B/6A9/EBC/F7/g1914_5.png) | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-2059-SPE | | **Title:** | Advancing Energy Efficiency With Orcan Organic Rankine Cycle, The Second-generation ORC Technology | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Waste Heat Recovery | | **Keyword2:** | Energy Efficiency | | **Keyword3:** | Organic Rankine Cycle | | **Authors:** | R. Fruggi, Orcan Energy | | **Abstract:** | **Objectives/Scope:** The International Energy Agency (IEA) recognizes energy efficiency as the "First Fuel" for a sustainable future. Energy-intensive industries, particularly refineries and petrochemical plants, offer significant opportunities for efficiency gains, with Europe’s waste heat recovery (WHR) potential estimated at 300 TWh per year. The Organic Rankine Cycle (ORC), a well-established technology with over 150 years of history, provides a proven solution for harnessing waste heat. Today, more than 2,700 ORC plants operate worldwide, generating 4.5 GW of power, half installed in the past five years. **Methods, Procedures, Process:** Second-generation Orcan’s ORC technology introduces a standardized, cost-effective WHR solution with a containerized, plug-and-play design. It features a closed water loop interface, ensuring a steady flow without disrupting industrial processes. Using an organic refrigerant that evaporates at lower temperatures instead of steam, Orcan’s ORC systems operate safely with non-toxic, non-ozone-depleting, and non-flammable fluids, minimizing environmental impact. Unlike traditional ORC systems that require centralized heat collection, Orcan second-generation ORC enables decentralized deployment. Modular units can be installed at various refinery locations, accommodating fluctuating heat sources and adapting to operational changes. This is especially beneficial for older or space-constrained refineries where large-scale WHR systems are impractical. **Economic and Regulatory Incentives** Second-generation Orcan’s ORC technology offers payback periods of 3-5 years, it reduces energy costs and generates revenue through surplus electricity sales. Funding mechanisms, including white certificates, decarbonization funds, and innovation grants, further enhance its business case by shortening payback periods. Regulatory policies are also accelerating adoption. For instance, Germany’s Energy Efficiency Act (§ 17 (4) EnEfG) mandates that companies consuming over 2.5 GWh annually assess and report waste heat potential. **Results, Observations, Conclusions:** Orcan’s ORC integration presents an effective strategy for boosting energy efficiency, cutting emissions, and promoting sustainability. With technological advancements, financial incentives, and regulatory support, refineries can optimize energy use and contribute to a greener future. **Novel/Additive Information:** If fully implemented in European refineries, second-generation ORC technology could save 750 million tons of CO2 annually, driving industrial decarbonization forward. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-2166-SPE | | **Title:** | Implementation Of BFW Injection In The Preheat Train Of CDU | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Preheat | | **Keyword2:** | Efficiency improvement | | **Keyword3:** | BFW | | **Authors:** | S. GAUTAM, Indian oil corporation limited | | **Abstract:** | **Objectives/Scope:** Crude oil is preheated through a network of Pre-Heat Exchangers Train (PHT), utilizing hot product streams to heat the feed thus reducing the duty of the fired heater. But, over a period of time, heat exchanger fouling occurs reducing heat transfer & thereby increasing fired heater load. Typically, exchangers are taken offline for mechanical cleaning and may require up to a week per cleaning cycle thus adversely impacting the energy efficiency of the unit. This paper presents the conceptualization, process simulation, detail engineering & implementation of the project for the in-situ cleaning of pre heat exchanger in PHT-3 of CDU by Boiler Feed Water (BFW) injection. The cleaning efficiency is almost equivalent to mechanical cleaning thus eliminating additional fuel required in fired heater during offline cleaning & saving mechanical cleaning cost, giving two fold benefits.. **Methods, Procedures, Process:** In-situ cleaning primarily occurs due to the increased fluid velocity - owing to partial phase change of the injected BFW to steam creating a two-phase flow regime - thus significantly increasing the fluid velocity, increasing turbulence & creating scouring action resulting in dislodging of deposits. This is the horizontal deployment of the present principle of water/velocity steam injection in Delayed Coking Units (DCU) & Visbreaking Units (VBU). Leveraging this concept, a controlled BFW injection system was engineered and implemented at Mathura Refinery (MR) CDU. A comprehensive simulation study was carried out to evaluate the thermos-hydraulic behavior of the system during BFW washing. The study involved detailed modeling of fluid dynamics and heat transfer to ensure reliable system performance under a range of operating conditions. However, due to the high steam expansion ratio, precise control of injection rates needed to be determined as excessive vapor velocity may lead to erosion, vibration, or pressure imbalances in the associated piping & equipments. A detailed stress analysis of the complete piping network under dual-phase flow conditions was conducted using CAESAR-II software for confirming calculated stresses, displacements & heater nozzle loads remained within the tolerance levels. Dynamic analysis was performed by identifying excitation frequencies, for ascertaining any potential vibration issues & remedial actions, like supports reinforcements, installation of guides & limit stops etc were implemented. This integrated analysis confirmed the structural integrity , validating its operational reliability and safety even under dynamic two-phase flow conditions **Results, Observations, Conclusions:** Successful implementing of In-situ BFW washing has resulted in measurable improvements in exchanger performance, preheat temperatures, overall energy efficiency of the unit and in practice since the last 4 years **Novel/Additive Information:** A novel application of BFW injection—traditionally used in Delayed Coking and Visbreaking Units—to Crude Distillation Unit pre-heat trains. The successful implementation of this concept offer a valuable solution for refinery operations aiming to enhance energy efficiency | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-2176-SPE | | **Title:** | Navigating China's Energy Transition: An Analysis Based On Regional Development Characteristics And Sources Of Differences | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Energy Transition | | **Keyword2:** | Energy Security | | **Keyword3:** | Energy Efficiency | | **Authors:** | L. WU, Natural Gas Economics Research Institute, PetroChina Southwest Oil & Gas Field Company | | **Abstract:** | **Objectives/Scope:** China is undergoing a comprehensive energy transition marked by significant regional disparities. Differences in resource endowments, industrial structures, policy directions, and technological capabilities have created diverse structural development opportunities for energy companies. This study seeks to precisely pinpoint these opportunities by examining the regional characteristics and underlying sources of divergence in China's energy transition, offering strategic insights that enable energy companies to capitalize on emerging growth avenues. **Methods, Procedures, Process:** Anchored in China's strategic goals of achieving a clean, low-carbon, safe, and efficient energy transition, this study constructs a multi-dimensional evaluation system for assessing regional energy transition performance, structured across 3 dimensions—energy supply and consumption structure, energy security, and transition efficiency—and encompassing 8 primary factors and 17 secondary indicators. Utilizing 4,800 piece of data and 300 government reports from 30 provinces (2014-2023), the study employs the entropy-weighted TOPSIS method to measure the energy China’s transition levels and applies the Dagum Gini coefficient and its decomposition to investigate the sources of China’s regional disparities. Moreover, the spatiotemporal evolution trends in China are characterized using Kernel density estimation and Markov chain analysis. **Results, Observations, Conclusions:** To facilitate the analysis of regional disparities, this study further divides the 30 provinces in China into 8 comprehensive economic zones: Northeast, Northern Coastal, Eastern Coastal, Southern Coastal, Middle Reaches of the Yellow River, Middle Reaches of the Yangtze River, Southwest, and Northwest. This study identifies structural development opportunities that can serve as strategic levers for energy companies to optimize their regional deployment, enhance competitive positioning, and capture first-mover advantages in China's evolving energy landscape. The results show: The northwest region maintains a leading transition position, supported by abundant renewable resources and favorable policy incentives. In contrast, the eastern and southern coastal regions, despite their early advantages in energy transition, are experiencing diminishing marginal benefits due to the exhaustion of technology spillovers. The northern coastal areas lag behind in substituting coal, while the middle reaches of the Yellow River exhibit substantial volatility in their transition processes. The southwest region, driven by hydropower resources, has achieved rapid early-stage progress, whereas the northeast region demonstrates the weakest performance, largely constrained by broader industrial restructuring challenges. **Novel/Additive Information:** The study identifies structural development opportunities in China for energy companies, including fostering frontier new energy technologies along the coastal regions; promoting coal-to-electricity and coal-to-gas initiatives in the north and Yellow River middle reaches; optimizing energy industry chains in the middle reaches of the Yangtze River in alignment with policy directions; advancing the development of non-hydropower renewables in the southwest; and facilitating the retrofit of traditional energy equipment for new energy applications in the northeast. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-2215-SPE | | **Title:** | Energy Balance In The Oil Sector: Innovation And Sustainability | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Energy | | **Keyword2:** | ODS | | **Keyword3:** | ISO 50000 | | **Keyword4:** | SCADA | | **Keyword5:** | Forecast | | **Authors:** | L. Tilleria, SLB | | **Abstract:** | **Objectives/Scope:** The objective of this paper is to present a digital energy balance system designed to optimize energy consumption, reduce operational losses, and minimize CO₂ emissions in oilfield operations. The scope covers both interconnected and isolated power systems used in the Ecuadorian oil sector, focusing on real-time monitoring, forecasting, and performance analysis. **Methods, Procedures, Process:** The proposed approach integrates the Industrial Internet of Things (IIoT) with digital platforms like Avocet and Agora for real-time data acquisition and analysis. The Energy Balance platform serves as a centralized tool to monitor electrical variables, detect bottlenecks, and simulate future load scenarios. Key performance indicators (e.g., kW/BFPD) are calculated to identify inefficient wells and prioritize improvements. CO₂ emissions monitoring is incorporated based on fuel type and energy matrix, while modeling and forecasting tools assess energy trends and infrastructure capacity. This combination supports proactive decision-making and aligns with sustainable operational goals. **Results, Observations, Conclusions:** The deployment of the platform by Shaya Ecuador S.A., an SLB company, resulted in notable benefits: a reduction of 6,700 barrels per year in production losses, a 3,500 metric ton annual decrease in CO₂ emissions, and savings of 260 man-hours annually due to automated monitoring and reduced field mobilizations. The categorization of wells by energy efficiency enabled targeted corrective actions, increasing system reliability and lowering energy waste. Additionally, the tool’s predictive simulations allow for better planning of generation schemes and operational adjustments, ensuring continuous performance improvement. This initiative not only improves technical and economic performance but also reinforces environmental responsibility, aligning with the Sustainable Development Goals (SDGs) 7, 9, and 13. Plans for the next phase include the integration of RAM simulations, mobile accessibility, and real-time georeferenced alerts to further increase operational resilience. **Novel/Additive Information:** This paper introduces a scalable, real-time digital energy management approach tailored to oilfield operations. Unlike traditional energy audits, the proposed system continuously integrates energy, environmental, and reliability metrics. It offers a novel framework for practicing petroleum engineers to enhance operational efficiency while meeting sustainability targets, contributing meaningful innovation to the digital transformation of the energy sector. [[A screenshot of a computer  Description automatically generated](https://files.abstractsonline.com/CTRL/1F/B/A3F/A4C/F6F/41D/6AF/73F/4F3/499/8FF/2D/g2215_1.jpg)](https://files.abstractsonline.com/CTRL/1F/B/A3F/A4C/F6F/41D/6AF/73F/4F3/499/8FF/2D/g2215_1.jpg) | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-2363-SPE | | **Title:** | Enhancing Pipeline Performance-economic Impact Of Utilizing Drag Reducing Agents (dra) In Crude Oil Pipelines | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Pipeline Losses | | **Keyword2:** | Pipeline economics | | **Keyword3:** | Drag Reducing Agents | | **Keyword4:** | Energy Saving | | **Keyword5:** | Sustainability | | **Authors:** | H.M. Meshry, ADNOC Onshore | | **Abstract:** | **Objectives/Scope:** Frictional pressure drop across crude oil transportation pipelines is one of the main contributors of the energy loss in the export pumping systems, particularly at higher flow rates. Utilizing Liquid Drag Reducing Agents (DRA) provides more flow with the same energy or lower pressure drop for the same flow rate and hence, increases the pipeline throughput and saves the pumping energy. This paper demonstrates the economic impact of DRA utilization in export pipelines. **Methods, Procedures, Process:** There are mainly two types of flow, either laminar or turbulent flow. In most petroleum pipelines the flow is turbulent whereby the fluid molecules move randomly in a turbulent flow regime, wasting most of their energy as eddy currents and other indiscriminate mobility. The resistance experienced by flowing fluid in contact with the pipe wall causes frictional pressure drop or drag. Drag Reducers are long-chain hydrocarbon polymers which reduce friction near the pipeline wall and turbulent core, decreasing the energy loss and increasing the pipeline capacity. **Results, Observations, Conclusions:** Adnoc Onshore Asab crude export systems include 4x MOL (Main Online) pumps running in series to push the crude oil for a distance of 92KM to a common collection manifold, before exporting the crude to its final destination. The network back pressure at the Asab station battery limits dictates the number of pumps that need to operate in series to achieve the required export discharge pressure at the desired production flow rate. The average pressure drop due to pipeline friction loss is 30 Barg, which consumes approximately 4.8 KW of power—nearly the full power of one MOL pump.The successful implementation of DRA utilization in the Asab export system has led to a significant decrease in network back pressure by reducing pipeline friction loss. Specifically, there has been an average reduction of 8.6 Barg with an average DRA injection rate of 4 PPM. This proven reduction in back pressure has allowed the field to achieve the technical flow rate using only two pumps instead of three. It is very important to thoroughly evaluate where, how much and how often DRA should be applied in the pipelines to make sure the result is delivering a positive return on the investment. **Novel/Additive Information:** Pressure drop in pipelines due to friction loss in turbulent flow is inevitable. However, with the use of DRAs, it can be significantly reduced to acceptable levels, leading to substantial energy savings, enhanced pipeline efficiency, and lower operating costs. Conducting a thorough hydraulic analysis is essential to determine the optimal DRA injection rate for the required flow rate, thereby achieving the best balance between additional costs and increased profitability. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-2629-SPE | | **Title:** | Integrating Solutions: Using Pmm And Power Regenerative Systems On Long Stroke Pumping Units To Get Up To 41% Energy Efficiency And Safety Enhancement In North Dakota | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Energy Efficiency | | **Keyword2:** | Enhanced safety | | **Keyword3:** | Decarbonization | | **Keyword4:** | Power reduction system | | **Keyword5:** | Permanent magnet motor | | **Authors:** | F. Harte, Weatherford; M. Arefeen, Weatherford International Inc.; R. Ranganathan, E. Jackson, Weatherford International Inc; M. Lebaron, KODA Resources LLC | | **Abstract:** | **Objectives/Scope:** In today's energy landscape, companies are increasingly focused on enhancing operational efficiency, reducing their environmental impact and increasing safety to operators and equipment. As part of this global push towards sustainability, this paper aims to showcase how Weatherford and Koda resources embarked on a strategic collaboration with the objective of improving energy efficiency and safety within the oilfield operation in the Bakken basin, North Dakota, USA. **Methods, Procedures, Process:** The collaboration between these industry leaders is centered on equipping existing long stroke pumping units with Weatherford high-efficiency permanent magnet motors (PMM) and Foresite PRSi Power Regenerative systems, a move designed to significantly reduce energy consumption, improve overall system performance and increase safety. The primary objective of this technical paper is to demonstrate how the integration of PMM technology and PRSi can enhance the performance of existing artificial lift systems, by offering superior efficiency compared to conventional induction motors. **Results, Observations, Conclusions:** This technology enabled improved operational control, reduced energy waste, increased safety and led to lower overall operations costs for the end user. The operation of the pumping unit produces regenerative energy during the de-acceleration phase of the operation. The acceleration phase during the down stroke also creates energy as the mechanical frequency becomes higher than the electrical frequency and the motor starts acting like a generator. Most of the conventional variable speed drives mitigate this regenerative energy by burning off as heat across a resistor module. In this paper, the data is presented where the regenerative energy is collected by the PRSi using a set of ultra-capacitors and released to the system when needed, achieving energy consumption reduction of 41% and decreasing yearly carbon emissions by 106,230 kg per year. **Novel/Additive Information:** This collaboration highlights the commitment of the involved companies to not only enhance production efficiency but also to support broader industry efforts in energy conservation, environmental responsibility and keeping employees outside the line of fire. Through this collaboration, the companies aim to demonstrate how retrofitting existing equipment with energy-efficient PMMs and PRSi can yield significant benefits in performance, sustainability and safety. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-2727-SPE | | **Title:** | Improving Gas Turbine Preference During The Compression Phase | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Gas Turbine Optimization | | **Keyword2:** | Compression Phase Efficiency | | **Keyword3:** | Aerodynamic Design | | **Keyword4:** | Computational Fluid Dynamics | | **Keyword5:** | Energy Optimization | | **Authors:** | S. Benhassir, M. Adouane, university of batna 2 | | **Abstract:** | **Objectives/Scope:** The goal of this study is to optimize the compression phase's aerodynamic behavior to improve gas turbine performance. Reducing energy losses and increasing pressure efficiency in axial compressors essential parts of propulsion and power production systems, is the main goal. Analyzing baseline compressor performance, locating aerodynamic inefficiencies, and applying geometry-based enhancements through simulation tools are all included in the scope. The study intends to offer workable ideas for lowering operating costs and improving thermal efficiency in energy applications, especially in gas and petroleum power systems. **Methods, Procedures, Process:** The methodology is based on numerical simulation with ANSYS Fluent to model the flow inside the gas turbine compressor, a steady-state analysis with a turbulence model (k-ε) to investigate velocity profiles, pressure gradients, and vortex formation, parameterization of the compressor blades, testing of various geometric modifications such as profile refinement and blade angle adjustments, and optimization and validation of mesh quality through sensitivity analysis to ensure computational accuracy. Simulations were conducted across various configurations to observe variations in performance and determine ideal design conditions. **Results, Observations, Conclusions:** In the initial assessment of the baseline compressor, issues like flow separation at the blade trailing edges and high turbulence near the hub were identified, both of which were contributing to considerable aerodynamic losses. To address these, adjustments were made to the blade stagger angle and the curvature of the trailing edges. These relatively modest changes led to a noticeable improvement: the overall pressure ratio increased by 4.3%, and total pressure losses dropped by 5.9%. The updated design also brought better flow stability and a more uniform distribution across the stages. Streamline analysis of the optimized configuration showed that the boundary layer separated later and swirl intensity decreased, helping reduce mechanical stress on downstream components. This study indicates that meaningful gains in turbine performance can be achieved without overhauling the entire system just by making smart, simulation-guided refinements. These improvements are especially valuable for energy producers working in oil and gas, where systems often face load fluctuations and high operational demands. **Novel/Additive Information:** This study brings a fresh angle by concentrating solely on improving the compression phase of gas turbines, a part of the cycle that’s often underexplored, with more attention typically given to combustion and turbine stages. By applying CFD as an efficient and affordable design tool, the research provides practical guidance for engineers looking to boost performance. These findings are especially valuable for energy systems focused on cutting fuel consumption and lowering emissions. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-2748-SPE | | **Title:** | From Bottlenecks To Breakthroughs: Process Modifications For Enhanced Throughput And Uptime In Butadiene Extraction Unit | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Butadiene Extraction Unit | | **Keyword2:** | Process Optimization | | **Keyword3:** | Oxygen Ingress Prevention | | **Keyword4:** | Operational Reliability in Petrochemicals | | **Keyword5:** | Bottleneck Identification | | **Authors:** | H. Malviya, S. Kamal, S. Bijay, Indian Oil Corporation Limited | | **Abstract:** | **Objectives/Scope:** The objective of this study is to enhance operational efficiency, maximize throughput, and minimize shutdown frequency in a Butadiene Extraction Unit (BDEU). Historically, the unit operated at 12 TPH, falling short of its design capacity of 17.1 TPH due to several process limitations. This study addresses these challenges through strategic modifications focused on improving pressure control, heat integration, energy optimization, and system reliability—aiming to prevent oxygen ingress, a key contributor to unplanned shutdowns. **Methods, Procedures, Process:** A comprehensive root cause analysis revealed four major bottlenecks. First, the Butadiene (BD) column pressure reached 4 kg/cm², constraining throughput and destabilizing operations. Second, excessive flow to the degasser reboiler caused thermal inefficiencies and increased steam consumption. Third, Recycle Gas Compressor (RGC) discharge temperatures remained high at 101°C, nearing the tripping point of 104°C, thereby compromising reliability. Lastly, frequent shutdowns were caused by popcorn formation in the column, traced to oxygen ingress through manholes and flanges—a critical risk due to the polymerization of 1,3-butadiene. To address these, several modifications were made in phases. A booster cooling water pump was installed to enhance condenser performance and bring BD column pressure down to its design level of 3.51 kg/cm². A new solvent heat exchanger was introduced to improve internal heat integration and enhance partial degassing within the rectifier, reducing the load on the degasser reboiler and lowering steam demand. These thermal and hydraulic optimizations brought RGC discharge temperatures down to a safe 99°C, improving compressor reliability. To combat oxygen ingress and popcorn formation, a nitrogen purging ring was installed around each column manhole for continuous oxygen displacement, while flanges were sealed using aluminum wrap to restrict diffusion—both designed and implemented in-house, effectively addressing the root cause of these shutdowns. **Results, Observations, Conclusions:** These interventions resulted in a significant increase in production, with the unit achieving a 42.5% increase in throughput and peaking at 18 TPH under optimized conditions. BD column pressure was stabilized at 3.51 kg/cm², improving separation efficiency. The solvent heat exchanger improved energy use and offloaded the degasser reboiler, reducing steam consumption by 19.05%, from 31.5 TPH to 25.5 TPH. RGC temperatures dropped below critical limits, ensuring reliable performance. Most importantly, oxygen control measures eliminated popcorn-related shutdowns, greatly improving uptime. These improvements were implemented with minimal disruption, significantly enhancing the unit’s thermal, hydraulic, and mechanical performance. **Novel/Additive Information:** This paper presents a novel integration of enhanced heat recovery, partial rectifier degassing, and proactive oxygen ingress prevention as an effective strategy for optimizing BDEU operations. The changes not only restored design throughput but also offer a scalable, cost-effective model for improving energy efficiency and reliability, while significantly reducing unplanned outages. These findings contribute valuable insights to process optimization in the petrochemical and energy sectors. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-2808-SPE | | **Title:** | Real Time Energy Monitoring And Optimization Of A Cryogenic Asu Supplying Methanol: An Industrial Data Driven Framework | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | energy optimization | | **Keyword2:** | cryogenic ASU | | **Keyword3:** | operational data analytic | | **Keyword4:** | specific energy consumption | | **Keyword5:** | predictive model | | **Authors:** | K. Alizadeh, Bushehr petrochemical company | | **Abstract:** | **Objectives/Scope:** This study aims to improve the energy efficiency of a cryogenic Air Separation Unit (ASU) dedicated to a methanol production complex by implementing a data-driven operational monitoring framework. Leveraging automated extraction of over 100 process variables from the DCS, a multivariable regression-based SEC model and sensitivity analysis are applied to identify dominant factors affecting energy performance, enabling plant operators to maintain the ASU in a consistently optimized energy state. **Methods, Procedures, Process:** The operational data, automatically extracted daily from the plant’s DCS, formed the basis for developing a predictive multivariate linear regression model. Leveraging over 10 years of expertise in ASU and energy systems, data extraction was optimized to ensure high-quality input. The data was cleaned by eliminating outliers and checking for internal dependencies using correlation analysis. Ten independent variables were selected based on their significance, and a regression model was built. The model’s validity was confirmed through statistical metrics (R², t-statistics, F-statistics, and p-values). Sensitivity analysis, using a 20% variation in variables within their practical range, was conducted to identify key drivers of SEC. **Results, Observations, Conclusions:** Over a span of 18 months, more than 54000 daily operational records were automatically extracted from the plant’s DCS, forming a statistically robust dataset. Correlation analysis confirmed that all input variables had mutual correlations below 0.8, justifying their inclusion in multivariate modeling. Ten operational variables were selected based on engineering relevance and statistical independence: temperature of cooling water supply, inlet steam, inlet air to compressor, chilled water; pressure of surface condenser, compressor outlet ; flow of steam, air to cold box, air to expander; and MAC anti-surge valve opening. A multivariate linear regression model was developed with strong performance metrics (R² = 0.81; p-values < 0.06; t-statistics > 2), indicating high predictive accuracy. Sensitivity analysis was conducted by varying each variable ±20% within its operational range. The MAC anti-surge valve opening had the most significant impact, influencing SEC by approximately 7%. In contrast, inlet air temperature had the least effect, with a 0.62% change in SEC. Notably, a 1% reduction in SEC under constant production conditions corresponds to an estimated daily energy saving of approximately 21 MWh, underscoring the high economic impact of energy performance optimization in the ASU. **Novel/Additive Information:** This study stems from over a decade of hands-on experience operating and optimizing ASU systems, combined with 18 months of continuous data collection from a live cryogenic plant. Unlike purely theoretical work, it delivers a practical, data-driven model for real-time SEC monitoring. The approach not only empowers operators with actionable insights but also demonstrates that a 1% SEC improvement can save up to 21 MWh of energy per day—an impact rooted in real operations | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-2968-SPE | | **Title:** | Bridging The Gap: Aligning Digital Transformation With Operational Efficiency In The Petroleum Industry | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Autonomous | | **Keyword2:** | Remote | | **Keyword3:** | Digital | | **Keyword4:** | Transformation | | **Authors:** | J. Blue, Baker Hughes | | **Abstract:** | **Objectives/Scope:** This abstract examines the intersection of digital transformation and operational efficiency in the petroleum industry. It focuses on identifying both the benefits and key barriers that prevent digital initiatives, such as AI, advanced analytics, and automation, from scaling beyond pilot phases. The objective is to explore how aligning digital strategies with operational goals can unlock measurable performance improvements and long-term value across operations. **Methods, Procedures, Process:** This abstract uses a qualitative, case-based approach, drawing insights from industry interviews, digital project assessments, and operational performance reviews. It analyzes the implementation of digital tools such as real-time analytics platforms. The methodology includes mapping digital maturity against operational KPIs, identifying common failure points in scaling efforts, and evaluating organizational readiness. The study also considers change management practices, cross-functional collaboration models, and governance structures that support sustainable digital adoption in complex petroleum environments. **Results, Observations, Conclusions:** The findings reveal that while digital technologies offer significant potential to enhance operational efficiency—such as reducing downtime, optimizing asset utilization, and improving safety—many initiatives fail to scale due to misalignment between digital strategies and operational priorities. Common barriers include siloed data systems, poor integration with legacy infrastructure, unclear ownership of digital initiatives, and limited workforce engagement. Case studies demonstrate that successful scaling occurs when digital solutions are embedded into core operational workflows, supported by agile implementation models and clearly defined business outcomes. For instance, one offshore operator achieved a 25% reduction in maintenance costs by integrating AI-driven insights into its maintenance planning process. The paper concludes that digital transformation must be approached as a strategic operational initiative rather than a standalone technology upgrade. It emphasizes the importance of leadership commitment, cross-functional collaboration, and continuous feedback loops to ensure that digital tools deliver sustained, measurable value across the organization. **Novel/Additive Information:** This abstract contributes new insights by linking digital transformation to operational efficiency in petroleum operations. It presents a practical framework for scaling digital solutions beyond pilot phases. By addressing real-world implementation challenges and success factors, the paper adds valuable knowledge to the industry’s evolving digital strategy. It offers guidance for achieving measurable, sustainable improvements in complex, asset-intensive environments. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-3113-SPE | | **Title:** | A Breakthrough In The Welding Technology For Heavy Wall Pressure Equipment | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | reliability | | **Keyword2:** | innovative | | **Keyword3:** | sustainability | | **Keyword4:** | productivity | | **Keyword5:** | efficiency | | **Authors:** | F. Fusari, S. Alberini, Belleli Energy CPE | | **Abstract:** | **Objectives/Scope:** The fabrication of heavy-walled pressure vessels necessitates attention , particularly in the crucial process of welding the thick sections together. For decades, the standard industrial practice for these critical welds has been based on the narrow gap welding technique, typically employing a 'two beads per layer’ sequence with the Submerged Arc Welding (SAW) process. However, the pursuit of enhanced efficiency, improved material properties, and more consistent weld quality remains a driving force in welding technology. **Methods, Procedures, Process:** This paper delves into an innovative welding technology poised to challenge the conventional ‘two beads per layer’ method approach. This novel technique centers around the implementation of a 'single bead per layer ‘strategy, facilitated by a specifically designed, even narrower welding groove and a complementary welding torch. This paradigm shift promises to address also certain limitations associated with the ‘two beads per layer’ method, particularly concerning weld metal homogeneity and low-temperature toughness, especially in crucial low alloy steels. **Results, Observations, Conclusions:** This fundamental change in welding strategy offers several compelling advantages. The inherent uniformity of a single weld bead deposition per layer promises a more consistent weld metal micro structure throughout the entire weld volume. This uniform deposition directly translates to a more predictable and beneficial multipass tempering effect. As each subsequent weld pass reheats and refines the preceding layer, the consistent application of a single bead ensures a more homogeneous thermal cycle across the entire weld cross-section, leading to improved and more consistent mechanical properties. The research demonstrates a significant reduction in the total number of weld passes required to complete a joint compared to the conventional ‘two beads per layer’ method. This reduction in passes translates directly into a shorter welding cycle, leading to increased productivity, and shorter overall fabrication schedules. Moreover, the decreased welding time inherently lowers energy consumption and, in applications requiring preheating, significantly reduces the consumption of preheating gases, contributing to a more sustainable and fabrication process. **Novel/Additive Information:** This innovative welding technology aligns with the growing emphasis on sustainability and efficiency in the Oil & Gas and Gas monetization sectors, further contributing to a smaller environmental footprint. The detailed findings and analyses presented in this paper offer a valuable contribution to the field of welding engineering and provide a strong impetus for the wider adoption of this innovative technique. The future of high-pressure vessel fabrication may very well be shaped by the principles and successes of this single-bead-per-layer revolution. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-3379-SPE | | **Title:** | Techno-economic Modeling Of Geothermal Energy For Power Generation In Pakistan Using Matlab | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Techno-Economic Modeling | | **Keyword2:** | Power Generation | | **Keyword3:** | Geothermal Energy | | **Keyword4:** | Pakistan | | **Keyword5:** | MATLAB | | **Authors:** | A. Soomro, Mehran University of Engineering & Technology, Jamshoro; U. Ansari, Mehran University of Engr & Tech Jamshoro; S. Almani, Mehran University of Engineering & Technology, Jamshoro | | **Abstract:** | **Objectives/Scope:** Pakistan is facing an energy crisis and weak energy management but rich with geothermal energy (as illustrated in Figure 1). Therefore, this study is proposed to find ways to tap into the heat from oil and gas reservoirs to improve Pakistan’s energy mix. This research deep dives into how technically possible, cost-effective, and environmentally friendly this approach is (as mentioned in figure 2). By practicing this, it is expected to offer a sustainable and innovative energy source that lessens our dependence on traditional fossil fuels and helps make Pakistan’s energy supply more diverse and stable. **Methods, Procedures, Process:** The methodology of this study included lab experiments using a PVT analyzer mentioned in Figure 3 to measure the heat potential extractable from hot oil and gas reservoirs. A mathematical equation was developed through the curve fitting method to evaluate the amount of heat that can be converted into electrical energy. Additionally, a MATLAB-based simulation model was developed to estimate the enhancement in Pakistan’s energy mix. The combination of experimental data, mathematical modeling, and simulation provided a comprehensive analysis of the feasibility and impact of proposed energy solution. **Results, Observations, Conclusions:** The outcomes of this suggest that from a 130°C hot reservoir producing 1500 barrels of hot water daily, approximately 10.5x107kJ of heat energy can be extracted each day. When converted to electricity with a typical efficiency of 10%, this equates to around 10.5x107kJ kJ or 2,918 kWh of electrical energy daily. Given that the average household in Pakistan consumes about 150 kWh of electricity per month (5 kWh per day), this setup could power approximately 583 households. .Assuming an average household size of five people, approximately 2,915 individuals will enjoy this. This method, which is novel and very important because it allows significant amounts of electricity to be generated from a resource that had not been tapped into before, also assists in easing the energy crisis in Pakistan. By reducing dependency on conventional fossil fuels and filling-up the energy mix with sustainable sources, this approach provides a significant increase in energy security and accessibility thus benefiting thousands of people. **Novel/Additive Information:** The importance and originality of this work lie in its innovative approach to using heat from oil and gas reservoirs as a source of energy for Pakistan (an undeveloped area). By combining laboratory experiments, mathematical modeling and MATLAB simulations, this research provides an extensive assessment on technical feasibility, economic potential and environmental consequences of such a kind of technology which might serve as a sustainable solution to the country’s power shortage. [[A map of india with black and white labels  Description automatically generated](https://files.abstractsonline.com/CTRL/13/A/BF5/BD8/6F2/418/A9C/37E/BF6/03C/D51/A5/g3379_1.png)](https://files.abstractsonline.com/CTRL/13/A/BF5/BD8/6F2/418/A9C/37E/BF6/03C/D51/A5/g3379_1.png) | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-3513-SPE | | **Title:** | Optimizing Esp Motors: A Path To Energy Savings And Sustainable Operational Excellence | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | ESP | | **Keyword2:** | Motor | | **Keyword3:** | Optimization | | **Keyword4:** | Energy | | **Keyword5:** | Sustainability | | **Authors:** | J. Cardozo Padron, F. AlZeyoudi, A. AlBlooshi, S. Murthy, F.H. Alhosani, M. Selvarasu, ADNOC; S. Ali, Baker Hughes | | **Abstract:** | **Objectives/Scope:** **Objective:**To enhance operational excellence by optimizing ESP motor performance, achieving reduction in energy consumption, and promoting sustainability. **Scope:**This includes regular performance reviews and the implementation of de-rating procedures to improve energy efficiency, reduce carbon footprint, and ensure sustainable operations. Additionally, it involves monitoring motor performance metrics, identifying optimization opportunities, and implementing best practices to enhance overall system reliability and sustainability. This comprehensive approach ensures long-term operational excellence and environmental responsibility. **Methods, Procedures, Process:** **Overall Approach:** To optimize ESP motors for energy savings and sustainability, we will:   1. Conduct Regular Performance Reviews: Monitor motor performance metrics to identify inefficiencies. 2. Implement De-Rating Procedures: Adjust motor ratings to match operational demands, reducing energy consumption. 3. Optimize Operational Practices: Apply best practices for motor maintenance and operation. 4. Monitor and Analyze Data: Use data analytics to track performance improvements and energy savings. 5. Continuous Improvement: Regularly update procedures based on performance data and technological advancements.   This approach ensures a reduction in energy use, enhanced operational excellence, and a lower carbon footprint. **Results, Observations, Conclusions:** **Results:** By optimizing ESP motor performance, we achieved a significant reduction in energy consumption. This optimization not only improved the efficiency of the motors but also enhanced their reliability, leading to an extended operational lifespan. Additionally, the reduction in energy usage contributed to a lower carbon footprint, aligning with our sustainability goals and promoting environmental responsibility. **Observations:** Through regular performance reviews, we were able to identify key inefficiencies and areas for optimization. These reviews highlighted the importance of continuous monitoring and proactive maintenance. The implementation of de-rating procedures proved effective in matching motor capacity with actual operational demands, thereby enhancing energy efficiency. Furthermore, the use of data analytics provided valuable insights into performance trends, enabling us to pinpoint specific areas for improvement and track the impact of our optimization efforts. **Conclusion:** Optimizing ESP motors through regular reviews and de-rating procedures has significantly enhanced operational excellence. This approach not only achieves substantial energy savings but also supports sustainability by reducing the carbon footprint. Continuous monitoring and improvement ensure long-term benefits, aligning our operations with environmental goals and promoting a culture of efficiency and responsibility. This comprehensive strategy demonstrates the value of proactive maintenance and data-driven decision-making in achieving operational objectives. **Novel/Additive Information:** **Additional Information:** This paper introduces a novel approach by integrating regular performance reviews and de-rating procedures to optimize ESP motors, achieving a energy savings. It adds to the existing literature by providing empirical evidence on the effectiveness of these methods in reducing carbon footprints and enhancing operational excellence. The findings offer valuable insights for the energy industry, promoting sustainable practices and advancing knowledge on energy-efficient motor management. | |

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| |  |  | | --- | --- | | **Control Number:** | 25ADIP-P-3774-SPE | | **Title:** | “Successful Rare Case Studies Leading To Energy Conservation, Efficient Operation And Achieving Operation Excellence At Our p&U, Nrl, Assam, India” | | **Category:** | +8.10 Energy Optimisation and Transition Challenges, Technologies, and Innovative Practices | | **Keyword1:** | Rare Problems Analysis | | **Keyword2:** | Troubleshooting | | **Keyword3:** | Innovative Means | | **Keyword4:** | Energy Conservation | | **Keyword5:** | Achieved Operation Excellence | | **Authors:** | D. BRAHMA, Numaligarh Refinery Limited | | **Abstract:** | **Objectives/Scope:** In our day-to-day plant operations, we come across various problems, issues & mysterious cases which compel us to brainstorm ourselves to come out with befitting solutions and solve them and once again make our plants smooth and trouble free. In line with that, our P&U, NRL we have encountered numerous such problems, difficulties, issues, etc., leading to disturbances in the smooth operations of the plants, reducing the reliability and flexibility of the operations, loss in energy and money, ⋯⋯ reduction in the overall productivity & efficiency of the running plants. **Methods, Procedures, Process:** 1. Successful Case Study of GTG-1 Chronic Issue of High LO Temperature by using Thermography Methodology2. Case study of GTG Liquid Fuel Frequent Unsuccessful Firing Troubles3. Success story of UB FGR Fans persisting issues since UB commissioning.4. UB tripping on SCAF pr. low-low trip alarm actuation during Total Power Failure scenario (Blackout conditions)5. Heavy hammering & vibrations problems of our CPP De-aerator since commissioning6. Interesting, peculiar and mysterious observations ...... of STG CT H2SO4 acid overhead dosing tank7. A New Learning Experience in GTG - Case Study of Blackout Conditions Due to Tripping of GTG and the Necessary Corrective Actions to Prevent the Reoccurrence8. A Complete Package for quick and safe start-up of Co-Generation Plant after blackout and emergency conditions with minimum manpower **Results, Observations, Conclusions:** 1. The most chronic issues of the GTG high LO temperature problem persisting for the 3 long years is successfully troubleshooted.2. About 80% to 90% of GTG Liquid Fuel problems solved.3. UB FGR fans couldn't be run since commissioning. Now successfully solved.4. Root cause of UB tripping identified and solved.5. Root cause of the De-aerator heavy hammering & vibrations identified and solutions planned.6. Interesting, peculiar and mysterious observations ...... of STG CT H2SO4 troubleshooted. 7. Root causes of the Back-to-back tripping of the GTGs. 8. Discovered innovative solutions for successful start-up after Total Refinery Blackout conditions without any EMDG Power.   |  | | --- | |  |   **Novel/Additive Information:** 1. Improved reliability, reduced the GTG Cooling Water & Chemical consumptions, reduced downtime & maintenance cost.2. Improved the reliability & success rate of the Liquid Fuel Firing of the GTG.3. Energy savings & reduction in UB Stack NOx.4. Improved the safe shutdown & reliability of the sustenance of the UB during Total Blackout.5. Improved the overall safety aspects of the De-aerator.6. Cleared the confusions of the mysterious observations of the H2SO4 level dip. 7. Improved Reliability, Redundancy & Confidence of the GTGs operations.8. A Complete Package for a quick and safe start-up after blackout without burning any extra Fossil fuels and with Zero emission. No or almost 0% chance of Power Failure inside our NRL. | |