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# ADIPEC 2024

## Navigating Energy Challenges





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**Yokogawa spurs industrial automation**  
The company's innovative AI-driven technologies enhance plant control, boost productivity, and support sustainability, positioning it as a leader in autonomy – Page 10



**Sulzer leads in carbon capture**  
Sulzer's advancements in carbon capture and process solutions position it as a leader in the GCC's sustainable energy transition – Page 32



**Ocean light pollution has been invisible**  
Scientists understand the damage done by artificial light and action is needed now, says Thomas Davies of the Global Ocean Artificial Light at Night Network – Page 49

# ADIPEC: LEADERS SET TO TAKE ON TOUGH CHALLENGES

By **ABDULAZIZ KHATTAK**

**MANAMA:** As the 40th edition of ADIPEC draws near, anticipation mounts for its groundbreaking focus on the interplay between artificial intelligence (AI) and the energy sector.

This year's conference promises to be a transformative gathering, uniting leaders and innovators to explore how AI can fundamentally reshape energy economies while ensuring a fair and inclusive transition for all.

Under the patronage of His Highness Sheikh Mohamed Bin Zayed Al Nahyan, President of the UAE, and hosted by Adnoc, ADIPEC 2024 will take place from November 4-7 at the AD-NEC Centre in Abu Dhabi.

With expectations of over 184,000 attendees, the event will feature more than 1,800 experts and pioneers across various disciplines, engaging in over 370 conference sessions, including the newly introduced Finance and Investment Conference and the Digitalisation and Technology Conference.

At the heart of this year's agenda is the critical role of leadership in leveraging AI to promote sustainable energy practices.

The inaugural EnergyAI exhibition will highlight cutting-edge technologies that demonstrate AI's potential to enhance the energy value chain.

By tackling the pressing need for innovative solutions, the conference will pave the way for leaders to collaboratively develop a strategic roadmap for integrating AI into the energy landscape.

The AI Conference within EnergyAI will gather a diverse group of leaders from governmental representatives to industry stalwarts tasked with envisioning the future of energy in a rapidly evolving digital environment.

This collaborative endeavour emphasises the



World energy leaders at a panel at Adipeec 2023

importance of visionary leadership in advancing the energy transition, aligning technological progress with environmental responsibility and social equity.

Another pivotal element of ADIPEC 2024 is the Finance and Investment Conference, which serves as a platform for high-level discussions about the financial frameworks essential for supporting a just energy transition.

The conference will focus on four key themes: Mobilising sustainable investment, navigating geopolitical uncertainties, ensuring the bankability of clean energy projects, and addressing the urgent energy requirements of developing nations.

Prominent figures such as Charlie Tan, CEO of the Global Impact Coalition, and Mazin Khan, CFO of Masdar, will lead conversations aimed at bridging the funding gap between developed and emerging markets.

The conference seeks to illuminate how finance can act as a catalyst for significant ad-

vancements in decarbonisation, highlighting the responsibility of financial leaders to take decisive action.

In the broader context, ADIPEC 2024 stands as a vital platform for leaders, innovators, and stakeholders to engage in essential dialogues about the future of energy.

With a comprehensive exhibition featuring over 2,200 exhibitors and a range of specialised industry areas, the event aims to showcase breakthroughs in decarbonisation, digitalisation, and AI technologies.

As ADIPEC 2024 approaches, it becomes clear that this gathering will be a pivotal moment for transformative leadership, setting the stage for a collective commitment to an equitable and sustainable energy future. The convergence of AI and energy, coupled with innovative financial strategies and inclusive dialogue, marks a significant step forward for the global energy landscape.

*Extended report on Page 2*

## Nasser wants Transition Plan 2.0 for Global South



**DHAHRAN:** Amin Nasser, Aramco President & CEO, has called for a new energy transition plan that considers the needs of all countries, specifically those in Asia and the broader Global South.

In a keynote speech at the Singapore International Energy Week, he said a "Transition Plan 2.0" was necessary to account for the Asian continent's crucial role on the global stage, its resources and its future outlook.

"This may be Asia's century. But Asia's voice and priorities, like those of the broader Global South, are hard to see in current transition planning, and the whole world is feeling the consequences. Transition progress is far slower, far less equitable, and far more complicated than many expected... Our main focus should be on the levers available now," Nasser said.

Calling transition expensive, he said an estimated between \$100 and \$200 trillion was required globally by 2050 for it, while developing countries would need almost \$6 trillion each year. Moreover, he said, transition required "staggering" amounts of front-end capital investment, and that "the cost of capital is more than twice as high in developing countries where the need is greater".

## EV uptake to slash oil demand

**MANAMA:** Despite near-term challenges in some markets, the uptake of electric vehicles (EVs) globally remains strong. Last year, about 20 per cent of new cars sold worldwide were electric – and that share is expected to continue to rise, the International Energy Agency said.

Based on current policy settings by governments around the world, EVs' market share is set to grow nearer to 50 per cent by 2030 and beyond it soon after.

The growth of electric mobility has been particularly dynamic in China, where the majority of electric cars sold in 2023 were already less expensive than their conventional equivalents. The electrification of road transport – along with a vast high-speed rail network that competes with air travel and the use of LNG for trucks – is putting the brakes on increases in oil demand in China, which has long been the driving force of global growth in oil consumption, accounting for more than 60 per cent of it over the past decade. Globally, the adoption of electric vehicles is set to reduce oil demand by about 6 million barrels per day by 2030 and 13 million barrels per day by 2035. This is a key reason that a peak in global oil demand is currently projected by the end of this decade.



## Clean energy growing at an unprecedented rate

**MANAMA:** The Demand for energy services is rising rapidly, led by emerging and developing economies, but the continued progress of transitions means that, by the end of the decade, the global economy can continue to grow without using additional amounts of oil, natural gas or coal, say an analysis by the International Energy Agency (IEA).

The next phase in the journey to a safer and more sustainable energy system is set to take place in a new energy market context, marked by continued geopolitical hazards but also by



Clean energy deployment is rising rapidly

relatively abundant supply of multiple fuels and technologies. IEA's analysis shows clean technology costs are coming down, but maintaining and accelerating momentum behind their deployment in a lower fuel-price world is a different proposition.

Accordingly, clean energy is entering the energy system at an unprecedented rate, including more than 560 gigawatts (GW) of new renewables capacity added in 2023, but deployment is far from uniform across technologies and countries.

Investment flows to clean energy projects are approaching \$2 trillion each year, almost double the combined amount spent on new oil, gas and coal supply – and costs for most clean technologies are resuming a downward trend after rising in the aftermath of the Covid-19 pandemic.

This helps renewable power generation capacity rise from 4 250 GW today to nearly 10,000 GW in 2030.

Together with nuclear power, low emissions sources are set to generate more than half of the world's electricity before 2030.

# EXPLORING ROLE OF FINANCE, AI IN ENERGY TRANSITION

The spotlight at this year's event will be AI's transformative role in achieving a just energy transition, alongside discussions on the disparity between capital flows and the investment necessary for a fair and equitable transition

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Visitors at a previous ADIPEC event

By **ABDULAZIZ KHATTAK**

**T**HE focus at this year's ADIPEC, the world's largest energy event, will be the AI-energy nexus.

Global leaders and innovators will come together to discuss AI's potential to transform economies and industries, particularly its role in accelerating a just, orderly and equitable energy transition.

The inaugural exhibition called Energy<sup>ai</sup> (Energy to the power of AI) will be one of several new additions, including three new conferences, to the 40th milestone edition.

This expo will explore the impact AI on the energy value chain, while also revealing AI's impending demand on global energy systems.

Within Energy<sup>ai</sup>, an AI Conference will gather leaders from the energy, technology and government sectors to develop a strategic roadmap for integrating AI into the energy landscape.

ADIPEC 2024 is being held under the patronage of His Highness Sheikh Mohamed Bin Zayed Al Nahyan, UAE President, and hosted by Adnoc. It will take place at the ADNEC Centre in Abu Dhabi on November 4-7 2024.

More than 184,000 attendees are expected, with more than 1,800 leading innovators, experts and visionaries from energy, AI and other technologies to speak at more than 370 conference sessions across 10 conferences, including Strategic, Technical, and Leadership Roundtables.

#### DIGITALISATION & TECHNOLOGY CONFERENCE

At ADIPEC 2024, the newly-introduced Digitalisation and Technology Conference will explore how next-generation technologies, including AI, can unlock decarbonisation and efficiency opportunities presented by Industry 4.0.

The agenda will showcase progress in new materials, the Industrial Internet of Things (IIoT) and carbon capture, utilisation

and storage (CCUS), while also addressing how technologies can be scaled up in a sustainable and equitable manner.

The Digitalisation and Technology Conference will focus on four key themes:

- Digitalisation of the energy sector.
- Digitalisation next generation technologies with the energy systems of today
- Building secure, resilient supply chains for limited critical minerals and rare earths in a competitive global market.
- Ensuring a human-centric digital revolution.

#### FINANCE & INVESTMENT CONFERENCE

This new addition to ADIPEC 2024 gives leaders from government, finance and energy a platform to discuss the disparity between capital flows and the investment necessary for a fair and equitable transition.

The three-day Finance and Investment Conference at ADIPEC has four main themes: Mobilising investment for a sustainable future; Navigating uncertain geopolitical factors to secure energy transition investment; Ensuring bankability of clean energy projects and technologies; and Meeting the growing demand for resilient and clean energy in developing countries.

In alignment with these themes, the conference will feature sessions led by global experts to activate investment needed to fast-track the global energy transition, including navigating macroeconomic volatility, unlocking capital for emerging markets, and developing regulatory frameworks that support decarbonisation technologies.

Key speakers will include Charlie Tan, CEO, Global Impact Coalition; Mazin Khan, CFO, Masdar; Julian Mylchrest, Executive Vice Chairman, Bank of America; Lina Osman, Managing Director & Head, Sustainable Finance - Africa and MENAP, Standard Chartered; Semih

Ozkan, Executive Director, EMEA Energy, Power, Renewables, Metals & Mining, J.P. Morgan; and Zoe Knight, Group Head, Centre of Sustainable Finance, Head of Climate Change MENAT, HSBC, who will jointly discuss solutions to the financing challenges faced by developing economies in their energy transition efforts.

Hudson said: "One of the most significant barriers to achieving an equitable energy transition is the gap in clean energy finance and investment between the Global North and South. Developed nations have more financial resources while emerging markets need help to secure capital for large clean energy projects, slowing the transition and deepening regional inequalities.

"Addressing the finance gap between the Global North and South is one of the key focus areas of our new Finance and Investment Conference. Discussions held at ADIPEC 2024 will set the stage for how finance can play a transformative role in ensuring that we meet our decarbonisation goals while continuing to drive sustainable economic growth for generations to come and advance an equitable energy transition for all."

According to the International Renewable Energy Agency (Irena), \$35 trillion is being required by 2030 to facilitate a fair and systemic energy transition, creating challenges for governments, energy companies, and financial institutions in providing the necessary funding.

#### VOICES OF TOMORROW

ADIPEC actively bridges the gap between current and future energy leaders, and between the geographical, cultural, and economic divides between the Global North and South.

The inaugural Voices of Tomorrow Conference fosters a collaborative environment, prioritising diversity, equity, and inclusion to ensure that voices from across the world can unite around the shared

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# Summits will unite leaders to find sustainable solutions

**T**HE ADIPEC Conferences seek to advance tangible action and demonstrate collaborative industry progress, emphasising the need for an economy-wide transformation for people, planet, and our collective prosperity.

The conference programme aims to catalyse this shift by connecting the ideas, ambition, technology, and capital necessary to foster innovative solutions and drive actionable outcomes.

Spanning over 10 conferences and 370 sessions, ADIPEC will provide an inclusive stage for more than 1,800 speakers to address the most urgent global energy challenges.

These leaders and innovators will offer diverse perspectives and approaches, sharing impactful insights from across the energy, finance, technology, manufacturing, transport and construction sectors.

Welcoming more than 16,500 delegates, the conferences will encourage cross-sector collaboration and explore pivotal strategies and innovations essential to accelerating the transition to a cleaner, more secure energy future.

The conferences include Strategic, Decarbonisation, Hydrogen, and Maritime & Logistics, and three new additions, namely Finance and Investment, Digitalisation and Technology, and Voices of Tomorrow.

**Strategic Conference:** Taking place one week before COP29, ADIPEC 2024 will facilitate a meeting of minds across diverse sectors and geographies, forging the alliances and collaborations necessary to enable the actions needed to accelerate the transition away from fossil fuels, in a multi-decade re-engineering of the global energy system.

Driving momentum on commitments and actions, the Strategic Conference will harvest insights on the latest thinking, trends and solutions around emissions, energy efficiencies and disruptive technology from those at the forefront of delivering the strategies, business models and technology innovations. Diverse perspectives and insights will strengthen companies' resilience and ability to deliver enhanced shareholder value, while meeting their climate responsibilities.

The ADIPEC 2024 Strategic Conference will focus on the critical changes the industry is undergoing, focusing on four themes:

- A new era of climate action in a complex energy system.
- Investing in the future: finance, skills and economic inclusivity.
- The role of cross-sector partnerships in decarbonising the energy sector and heavy-emitting industries.
- Technological innovation to fast track the energy transition.

**Decarbonisation Conference:** ADIPEC seeks to address an era-defining challenge: balancing the need for equitable global economic development and prosperity with the urgent need to cut global GHG emissions.

Achieving decarbonisation requires a comprehensive, global approach that addresses energy production and consumption across diverse sectors such as buildings, transportation, industry and power systems.

The UAE Consensus drives countries to accelerate decarbonisation by transitioning away from fossil fuels, tripling their renewable capacity and doubling energy efficiency by 2030. Leading countries in decarbonisation have made significant progress by decreasing energy intensity, shifting to electricity from fossil fuels and adopting zero-carbon technologies for electricity generation.

The Decarbonisation Conference will offer an inclusive forum dedicated to finding credible solutions that can deliver the energy



The conferences will encourage cross-sector collaboration and explore pivotal strategies

system of the future, while rapidly decarbonising the energy systems of today. Sessions

will also explore innovation, international collaboration and digitalisation as key enablers of progress, accelerated through robust policies and the adoption of high-impact technologies.

The Decarbonisation Conference will focus on three key themes:

- Maximising international collaboration to increase decarbonisation.
- Strengthening policy and fiscal frameworks to drive investment in clean energy.
- Supporting new technology and innovation to enable low-carbon energy solutions.

**Hydrogen Conference:** Hydrogen holds a critical role in the energy transition, acknowledged as a key player in decarbonising heavy emitting sectors. The substantial growth in electrolyser capacity reflects global strides in infrastructure development, spring boarding the development of a global hydrogen economy. To secure offtake agreements within the private sector, fostering international cooperation and policy support are vital for stimulating hydrogen demand.

The Hydrogen Conference seeks to advance critical conversations between industry executives, technical experts and policymakers, prioritising a clear blueprint that will move the industry past proof of concept on to widespread adoption of clean hydrogen solutions.

The Hydrogen Conference will focus on four key themes:

- Regulatory frameworks shaping the future of hydrogen.
- Materialising offtake agreements and stimulating hydrogen demand.
- Hydrogen for people and planet: accelerating a just and equitable energy transition.

- Regional hydrogen progress to deliver the new clean hydrogen economy.

**Maritime & Logistics Conference:** The maritime and logistics industries play crucial roles in enabling everyday lives and livelihoods. But as carbon intensive sectors, finding decarbonisation solutions that can accelerate industry-wide transformation is a critical step in delivering a clean energy future while maintaining equitable economic growth.

As the sector confronts the divide between conventional and future fuels, all stakeholders must adopt actionable cross-sector strategies to release bottlenecks and secure offtake agreements. Maritime and shipping experts are prioritising ramping up energy efficiency and integrating technologies to lower demand and improve fuel cleanliness.

Meanwhile, the readiness of ports for an alternative energy future will be a pivotal part of the maritime decarbonisation journey, balancing the urgency of infrastructure developments with the availability of new fuels.

ADIPEC's Maritime & Logistics Conference will convene pioneers, executives and regulators from the shipping world and beyond to engage in the pragmatic and transparent cross-industry dialogues that will establish cohesive global approaches to decarbonise the maritime sector, drive progress towards net-zero and shape the future of global supply chains.

The Maritime & Logistics Conference will focus on three key themes:

- Building cross-industry partnerships to secure demand for green fuels.
- The role of technology in decarbonising and transforming maritime operations.
- Resilience and adaptability in global shipping.

## Exploring role of finance, AI in energy transition

*Continued from page 2*

mission of delivering a fair and balanced transition.

The conference will feature four individual streams to tackle the most pertinent agendas supporting the UAE Consensus and the important opportunities for the wider community to work multilaterally on commitments to deliver a just energy transition.

Topics include bridging the gap between the Global North and the Global South, strengthening global alliances through inter-governmental and non-governmental organisations, ensuring equal representation from underrepresented groups, and fortifying the leaders of tomorrow.

The Voices of Tomorrow conference will focus on four critical agendas: Global South; NGOs & IGOs; Diversity, Equity & Inclusion; and Future Leaders.

Commenting on this year's event, Tayba Al Hashemi, Chair of ADIPEC 2024 and CEO of Adnoc Offshore, said: "AI needs energy and energy needs AI. This AI-energy nexus will be a major focus of ADIPEC's milestone 40th edition. Bringing global leaders and innovators together, we will discuss AI's potential to transform economies and industries, particularly its role in accelerating a

just, orderly and equitable energy transition."

Christopher Hudson, President of dmg events, said: "Marking 40 years since its inception, ADIPEC 2024 will be the most ambitious edition yet. The international community and global energy ecosystem will unite there around the need for decisive action to secure net zero. Featuring innovative technologies, valuable insights and influential voices, the event will deliver a renewed global commitment to creating a secure, equitable and sustainable energy future for all."

The three new conferences are part of the ADIPEC Strategic Conference programme, which will see global energy ministers, C-suite executives, and policymakers share diverse views on the biggest topics in energy today, with a view to accelerating innovation and action in the transition to a secure, equitable and sustainable energy future for all.

Topics include the energy transition and its implications on our lives and economies, the surge of AI and its implications on energy systems and industries, and the impact of the rise of emerging nations on global trade, policy and geopolitics.

Separately, the ADIPEC Leadership Roundtables will also include a focus on AI. The exclusive, invitation-only closed-door

discussions will explore the critical relationship between AI and energy, focusing on how AI can accelerate the development of a future-ready energy system.

Complementing the conferences, the ADIPEC Exhibition will span 16 halls and bring more than 2,200 exhibitors from the full spectrum of the global energy ecosystem together to showcase the latest breakthroughs shaping the future of energy.

This includes 54 NOCs, IOCs, NECs and IECs, 30 dedicated country pavilions and four specialised industry areas focused on decarbonisation, digitalisation, maritime and logistics and AI.

The upcoming ADIPEC Golf Day promises to blend business with pleasure, inviting industry leaders to network on the stunning golfing greens of Abu Dhabi.

Set to take place at the prestigious Abu Dhabi Golf Club, the event will gather over 125 key players from the sector, creating a unique opportunity for collaboration in a relaxed social environment ahead of the official opening day of ADIPEC.

The day will commence with a warm-up session, followed by teams of four competing across the 18 holes, culminating in a dinner and prize distribution ceremony to celebrate the day's achievements.

# Building on a 40-year legacy of energy leadership

As the energy industry looks to the future, the challenge will be to harness the potential of emerging technologies while addressing the pressing need for decarbonisation; and ADIPEC provides an opportunity for industry leaders to explore these themes and collaborate on solutions

As the world prepares for ADIPEC 2024, the significance of this year's event cannot be overstated. This year, ADIPEC will focus on collaborative actions to accelerate the energy transition while ensuring energy security.

Building on a 40-year legacy, ADIPEC is set to unite global energy leaders, policymakers, and innovators in a pivotal dialogue about the future of energy.

In an interview with Energy Connects, Suhail Al Mazrouei, the UAE Minister of Energy and Infrastructure, emphasised the country's commitment to shaping a sustainable future in a complex global energy landscape.

The UAE has been proactive in implementing strategies for energy diversification and security, a mission that has gained urgency given recent global events.

"Our pivotal role in ensuring stable energy supplies worldwide has assumed even greater significance," Al Mazrouei stated.

Highlighting the success of COP28, he reaffirmed the necessity for swift action in sustainability initiatives.

The UAE has pioneered significant advancements over the past 15 years, such as establishing Masdar, the Abu Dhabi Renewable Energy Company, in 2006.

It was also the first nation in the Mena region to launch a Net-Zero by 2050 Strategic Initiative, aiming to deploy 100 GW of clean energy by 2035 through the UAE-US Partnership for Accelerating Clean Energy (PACE).

This forward-thinking approach is encapsulated in the updated UAE Energy Strategy 2050, which aims to increase the share of clean energy in the national energy mix while achieving net-zero emissions.

Al Mazrouei emphasised: "Our endeavour is to build a balanced energy system that is both cost-effective and reduces emissions."

The commitment to sustainability positions the UAE as a global leader in energy innovation and a model for other nations.

## BALANCING ENERGY SECURITY WITH TRANSITION

The UAE's strategy not only focuses on decarbonisation but also addresses the critical need for energy security amid rising global demand.

By enhancing its hydrocarbons sector, the UAE aims to ensure stable supplies while transitioning towards lower carbon energy sources.

ADNOC, a UAE state oil company, is already a global leader



Suhail Al Mazrouei

in producing low-carbon oil and gas. With a recent production milestone of 4.85 million barrels per day, ADNOC's flagship Murban oil has a carbon intensity less than half the global industry average.

Furthermore, the updated energy strategy includes ambitious targets for 2030, such as tripling the contribution of renewable energy and achieving a grid emission factor of 0.27 kg CO<sub>2</sub>/kWh.

Through these measures, the UAE demonstrates a balanced approach to energy security while spearheading a global energy transition.

## ADIPEC 2024: A PLATFORM FOR GLOBAL DIALOGUE

As the world's largest energy conference, ADIPEC 2024 will serve as a critical platform for showcasing innovations that advance the energy transition.

The event is set to take place in November, just a week before COP29, providing a timely opportunity for leaders to discuss actionable solutions for sustainable energy systems.

Al Mazrouei anticipates that ADIPEC will highlight the energy sector's commitment to decarbonisation and investment in cleaner technologies.

The conference will gather thought leaders from various sectors to engage in discussions about how energy can drive economic transformation while prioritising environmental sustainability. Topics will range from renewable energy technologies to carbon capture and storage solutions, as well as policy frameworks that can support these transitions. Industry participants will have the opportunity to showcase their latest innovations, share best practices, and form partnerships that can lead to tangible outcomes in the quest for a sustainable energy future.

## THREE TRANSFORMATIVE FORCES

Echoing similar sentiments, Tayba Al Hashemi, CEO of ADNOC Offshore and Chair of ADIPEC 2024, underscored the transformative role of artificial intelligence (AI) in reshaping energy systems.

"The next decade will be defined by three transformative forces: the transformation of the global energy system, new growth economies, and the rapid development of AI," she stated.

AI's potential to optimise supply chains and improve energy efficiency presents an exciting frontier in energy management.

However, Al Hashemi also acknowledged the challenges posed by AI, particularly regarding its energy consumption.

The demand for energy from data centres is expected to triple by 2030, underscoring the need for a sustainable approach to technology integration in energy systems.

Addressing this issue will require innovation not only in energy production but also in energy consumption, ensuring that advancements in AI do not exacerbate existing environmental challenges.

## LOOKING AHEAD: A COLLABORATIVE FUTURE

ADIPEC 2024 aims to build on the momentum generated in previous years. The last conference set records in attendance and deal-making, but more importantly, it galvanised the energy sector to commit to urgent action.

The theme "Decarbonising. Faster. Together." resonated throughout the discussions, encouraging a collaborative approach to tackling the energy trilemma of sustainability, security, and accessibility.

As the event celebrates its 40th year, Al Hashemi emphasises the importance of showcasing tangible results from the commitments made in past gatherings.

"ADIPEC 2024 will be a place where we show progress and lay out clear action plans for the future," she remarked.

This forward-looking agenda includes initiatives aimed at enhancing cross-border collaboration in energy supply chains and sharing technology that can facilitate faster transitions to cleaner energy sources.

In a rapidly evolving energy landscape, the convergence of policy, technology, and collaboration will be crucial for ensuring a sustainable energy future.

With global leaders converging in Abu Dhabi this November, ADIPEC 2024 is poised to become a defining moment for the energy sector, fostering partnerships that drive innovation and economic growth.

As the energy industry looks to the future, the challenge will be to harness the potential of emerging technologies while addressing the pressing need for decarbonisation.

ADIPEC 2024 will provide an opportunity for industry leaders to not only explore these themes but to collaborate on solutions that ensure a resilient and prosperous energy future for all.

By combining efforts across nations and sectors, the conference aims to foster a unified approach to the energy challenges that lie ahead, setting the stage for a sustainable and secure global energy landscape.



Tayba Al Hashemi

# Record 5,977 technical submissions received

The two submission categories that saw the biggest increases were Energy Transition and Decarbonisation, and AI and Digital Transformation, with 38 per cent and 32 per cent jumps, respectively

By ABDULAZIZ KHATTAK

THE ADIPEC 2024 Technical Conference has received a record 5,977 submissions, a 16 per cent increase over last year, with major submission growth seen in the AI and Digital Transformation and Energy Transition and Decarbonisation categories, and increased submissions from African and Arab states.

The ADIPEC Technical Conference is a key part of ADIPEC. Organised by SPE, the Technical Conference this year will feature 159 sessions across 12 categories, for which energy experts and engineers from around the world submit their work to be considered for presentation.

"As chairman of the ADIPEC Technical Conference, I am immensely proud to announce a historic milestone of 5,977 technical submissions received this year. This unprecedented volume of contributions underscores ADIPEC's vital role as a premier forum for innovative dialogue and exchange within the global energy sector. I extend my heartfelt thanks to all authors – the pioneering experts that continue to drive our industry forward, fostering the advancements and collaborative spirit necessary to meet the evolving demands of our world," said Dr Khaled Abdul Monem Al Kindi, Senior Vice-President, Upper Zakum, ADNOC Offshore and ADIPEC 2024 Technical Conference Programme Chair.

Continuing its 40-year legacy of energy leadership and innovation, ADIPEC 2024 aims to be a driving force for accelerated energy action.

This year, the event sets out a renewed vision, gathering diverse voices from communities, nations, and industries to find collective solutions that can deliver affordable, secure, and sustainable energy for all.

The ADIPEC Technical Conference brings together the brightest minds and technical experts from across the energy value chain – the changemakers at the forefront of engineering, technology and industry innovation.

The two submission categories that saw the biggest increases were Energy Transition and Decarbonisation and AI and Digital Transformation, with 38 per cent and 32 per cent jumps, respectively.

These increases reveal the energy industry's growing focus on emerging digital technologies and efforts to decarbonise in sup-



The Technical Conference brings together experts from across the energy value chain

port of the energy transition, which are a major focus of ADIPEC this year, reflected across its dynamic conference and exhibition agenda.

A significant increase was also recorded in the number of submissions from Arab and African countries over last year, rising 50 per cent and 28 per cent, respectively.

Double-digit growth was also recorded in submissions from the Asia and Pacific Region, North America, and the Middle East.

The ADIPEC Technical Conference also saw experts from 25 per cent more companies submit their work for presentation.

Christopher Hudson, President of dmg events, the organiser of ADIPEC, said: "Decarbonisation presents many challenges and opportunities for all sectors. ADIPEC's focus on platforming low-carbon energy innovations to power industry, empower lives,

and accelerate global prosperity makes its Technical Conference a critical forum to advance a sustainable, secure and equitable energy future. This year's record number of submissions, along with the substantial increases in geographical and category-specific contributions, highlights the alignment of our agenda with the industry's needs and the global commitment to be part of the solution."

Also part of the overarching Technical Conferences programme is the Downstream Technical Conference. This key segment will accelerate collaboration and partnerships, offering opportunities to gain insights into the transformative strategies and advancements in low-carbon solutions, digital transformation, advanced manufacturing, alternative fuels, project excellence and the wider downstream value chain.

## ADIPEC 'offsets' carbon emissions of 2023 edition

ADIPEC has moved forward on its sustainability journey by reporting its 2023 carbon emissions to the United Nations Framework Convention on Climate Change (UNFCCC) and offsetting some of its 2023 edition emissions through the UNFCCC Carbon Offset Platform.

As part of ADIPEC's commitment to reducing its carbon emissions, carbon credits equivalent to a set portion of the emissions produced by ADIPEC 2023 were purchased through the UNFCCC Carbon Offset Platform for credits in two projects in India.

The projects, one in the city of Hazira and the other in the village of Jegurupadu, work to support the global transition from coal reliance to less emissions-intensive natural gas, as part of the 'fossil fuel switch' that the energy transition requires.

The projects help in the conservation of depleting fossil fuels while also avoiding the intense carbon emissions of coal-fuelled power plants.

"As a global company committed to excellence, dmg events embraces the importance of sustainable practices. ADIPEC, our flagship event, has started to demonstrate our growing commitment to achieving net zero. We recognise that the journey toward sustainability is both long and complex, and we are dedicated to continuing our efforts to reduce the carbon footprints of our events," said Christopher Hudson, President of dmg events, ADIPEC's organiser.



ADIPEC began its emissions reduction journey in 2021 when dmg events signed the Net Zero Carbon Events pledge, a joint commitment across the events and meetings industry to achieve the targets laid out in the Paris Climate Accord.

In 2023, ADIPEC furthered its obligation to sustainability when it became a signatory of the Climate Neutral Now Pledge from the UNFCCC, through which ADIPEC is committed to report its emissions footprint annually.

In 2023, ADIPEC announced details of its carbon footprint reduction strategy, which included the following measures:

- Development of the ADIPEC Carbon Management Plan to monitor, report, and offset emissions.
- Development and use of a carbon tracking tool for ADIPEC vendors/suppliers.
- Development of a detailed Exhibitor Manual and Guidelines in alignment with the UN Sustainable Development Goals, to encourage our more than 2,200 exhibitors to adopt environmentally responsible behaviours and practices.
- Hosting carbon workshops with stakeholders in the run-up to ADIPEC to ensure there was



Christopher Hudson

- understanding, commitment, and collaboration towards achieving a carbon-neutral event.
- Maximising reuse of materials on site, including temporary structures, equipment, and signage.
- Integrating waste segregation and recycling facilities, resulting in 6.58 tonnes of cardboard and paper recycling.
- Use of solar energy to partially power external tent structures.

# Yokogawa's AI solutions spur industrial automation

The company's innovative AI-driven technologies enhance plant control, boost productivity, and support sustainability, positioning it as a leader in the transition toward industrial autonomy across various sectors, Norinao Sato tells **OGN**

By **ABDULAZIZ KHATTAK**

**Y**OKOGAWA Electric Corporation is making waves in the industrial sector with its cutting-edge AI-based solutions designed to enhance plant control and operational efficiency.

The company's innovations harness deep learning algorithms to continuously adapt and optimise processes in real time. This shift not only boosts safety and reliability but also leads to significant cost reductions, marking a transformative step towards autonomous industrial operations.

In an exclusive interview with *OGN* energy magazine, Norinao Sato, CEO of Yokogawa Middle East & Africa, says the company is expanding its AI capabilities, particularly within the oil, gas, and chemicals industries, and it is poised to significantly enhance productivity while ensuring compliance with stringent safety standards.

Below are excerpts from the interview:

• **Yokogawa has rolled out several AI-based solutions to improve plant control. Could you elaborate on how these innovations differ from traditional automation systems and their impact on safety, reliability, and cost reduction?**

Unlike traditional automation systems that are reactive and rely on predefined control parameters, Yokogawa's AI-based solutions use deep learning algorithms to continuously learn and more proactively adjust processes to prevent deviations, even in highly complex systems.

These AI systems are more adaptive and able to optimise operations beyond human capabilities, and significantly enhance process safety and reliability.

The shift towards AI-driven autonomous control reduces human intervention, thereby minimising errors and downtime, and cutting operational costs.

• **With Yokogawa's expanding AI capabilities, particularly in sectors like oil, gas, and chemicals, how are these solutions enhancing productivity and compliance with stringent safety standards?**

Yokogawa's AI solutions are designed to reduce manual work, minimise downtime, and improve quality control on complex operations.

By improving monitoring, risk detection, compliance, and overall safety management, it enhances the supply chain operation and enhances decision-making faster. This helps companies to focus more on amplifying productivity gains.

For example, Yokogawa's AI-driven systems can predict equipment failure, ensuring compliance with safety standards while reducing the risk of unplanned outages.

• **Yokogawa's Autonomous Control AI (FKDPP) is a major innovation in reinforcement learning for industrial processes. How has this AI technology transformed real-time operations in complex plants, and what measurable efficiency gains have clients reported?**

Yokogawa's FKDPP is transforming real-time operations by implementing AI reinforcement learning to optimise complex plant processes autonomously.

Clients have reported a more stable process control that leads to yield improvement, reduced energy consumption, and autonomous handling that leads to significant production cost savings.

One of the many potential areas is the Off-shore platform, generally remote and under



Norinao Sato

harsh environments, whereby this application can operate autonomously.

The strength of AI is that the system can be designed to adapt to dynamic changes and learn from process conditions to make real-time decisions, improving the agility and resilience of plant operations.

• **How has this success impacted your vision for Industrial Automation to Industrial Autonomy (IA2IA), and what role do you foresee AI playing in transforming operations across various industries in the near future?**

This success strengthens Yokogawa's vision for Industrial Autonomy (IA2IA), wherein plants move from basic automation to full autonomy.

AI autonomous control plays a critical role in self-optimising, self-healing, and self-regulating systems across industries like oil and gas, chemicals, and energy, further enhancing the

capabilities for fully autonomous operations in the future.

• **Yokogawa's e-RT3 Plus Industrial AI Platform integrates AI for edge computing and real-time operations. How is this platform shaping the future of predictive maintenance and operational efficiency for industrial clients, especially in energy-intensive sectors?**

Yokogawa's e-RT3 Plus platform is designed to handle edge computing. Integrating AI allows real-time data processing and predictive analysis that significantly reduces latency and improves operational efficiency almost instantaneously.

In energy-intensive sectors like petrochemicals and power, this platform enables early fault detection and reduces unplanned downtime.

Clients benefit from predictive insights, which optimise asset performance with condition-based Monitoring, leading to reduced operational costs and enhanced productivity.

• **Yokogawa has been actively involved in projects across the MEA region. Could you share details on significant recent projects and how your AI and digitalisation strategies are tailored to meet the unique demands of these markets?**

In the MEA region, Yokogawa has successfully implemented several AI-driven projects that cater to the unique challenges of energy-intensive industries in the area.

Projects such as the optimisation of refinery and upstream operations using AI-powered analytics have demonstrated measurable improvements in energy efficiency and operational reliability.

Digitalisation strategies focus on integrating AI to meet local market demands, such as enhancing process safety in the oil and gas sector

or boosting productivity in large-scale manufacturing facilities.

Looking ahead, Yokogawa Gen AI will focus on leveraging large language models (LLMs) and operational technology (OT) operational assistance.

• **In what ways are Yokogawa's AI-driven solutions helping industries achieve their sustainability targets, particularly in the areas of energy consumption reduction and carbon neutrality?**

Yokogawa's AI-driven solutions are helping industries reduce energy consumption and achieve carbon neutrality by optimising plant operations.

AI tools like FKDPP, which I mentioned earlier, help minimise energy wastage by ensuring process efficiency and identifying opportunities to reduce emissions.

Furthermore, Yokogawa supports the deployment of carbon capture technologies and enhances energy efficiency in high-demand sectors, directly contributing to client sustainability goals.

• **As industries transition toward green energy, how is Yokogawa assisting clients in integrating renewable energy sources (RE) into their operations, and what role does AI play in optimising the use of these resources?**

As industries transition towards green energy, Yokogawa assists clients by integrating renewable energy sources (RE) like solar, wind, and hydrogen into their operations.

AI helps optimise the energy mix by forecasting energy demand and supply, ensuring optimal use of renewables.

Yokogawa's sustainable solutions (such as BaxEnergy, GridBeyond) are integrated with AI to balance loads between traditional energy sources and renewable resources, enhancing efficiency and stability in the energy grid and transaction.

• **Hydrogen is rapidly emerging as a key component of future energy systems. How is Yokogawa positioning itself in the hydrogen sector, and what specific technologies are you developing to support the safe and efficient production and usage of hydrogen?**

Hydrogen is a strategic focus for Yokogawa as part of its commitment to a sustainable future. The company is developing technologies to support the safe production, storage, and transportation of hydrogen.

Yokogawa's AI-driven solutions for process control in hydrogen production ensure efficiency and safety, while their monitoring tools provide real-time insights into hydrogen usage across various applications, from industrial plants to transportation systems.

• **Yokogawa's vision for Industrial Autonomy (IA2IA) highlights the transition from automation to full autonomy. What are the next major technological advancements Yokogawa foresees in achieving true industrial autonomy, and how will AI facilitate this shift?**

Yokogawa envisions AI and machine learning as the core enablers for the next phase of industrial autonomy.

Technologies such as autonomous control systems, AI-powered analytics for predictive maintenance, and digital twins will be the foundation for achieving full autonomy.

The future lies in systems that not only react to real-time conditions but also anticipate and adapt autonomously, reducing human involvement.



Yokogawa's vision for industrial autonomy sees plants move from basic automation to full autonomy

The company is targeting strategic partnerships to enhance energy efficiency and sustainability in the Middle East, aiming for significant investments in the energy sector, Dr Meritxell Vila-Fontes tells **OGN**

# MERYT invests big in GCC's sustainable energy future

By ABDULAZIZ KHATTAK

**I**N an ambitious move that underscores its commitment to sustainability, MERYT Catalysts and Innovation has announced significant investments in the Middle East energy sector for 2024.

By forging strategic partnerships, the company aims to align its goals with those of the GCC countries, paving the way for a cleaner and more efficient energy landscape.

In an exclusive interview with **OGN** energy magazine, Dr Meritxell Vila-Fontes, the company's Director, talks about how the establishment of a state-of-the-art catalyst production plant, in collaboration with a prominent local partner, marks a pivotal step in reducing reliance on imports and fostering local industrial growth.

MERYT's innovative catalyst technologies promise not only to enhance energy efficiency but also to support the region's transition towards a circular economy, setting the stage for a greener future.

Below are excerpts from the interview:

**MERYT Catalysts and Innovation has announced plans for significant investments in the Middle East energy sector in 2024. Can you elaborate on the strategic partnerships you are forging and how they align with GCC countries goals?**

We are in advanced discussions to establish a joint venture with a key regional partner to develop a world-class catalyst manufacturing plant.

This initiative aligns closely with the GCC's focus on industrial growth, self-reliance, and sustainable development.

By manufacturing catalysts locally, we aim to reduce import dependency, enhance regional supply chains, and contribute to the creation of high-quality jobs.

Although we are a growing company, this step will position us as a key supplier of advanced catalysts for refineries, petrochemical plants, and chemical producers in the region, and we welcome collaboration opportunities to accelerate this growth.

**In what specific ways does MERYT's technology contribute to enhancing clean and efficient energy sources in the GCC region?**

Catalysts are the primary energy savers in industrial processes, and any improvement in catalyst technology directly results in significant energy savings, which in turn reduces emissions.

At MERYT, our advanced catalysts optimise refining and petrochemical processes, minimising energy consumption while lowering carbon emissions across the GCC region.

In the near future, we plan to manufacture catalysts that convert captured CO<sub>2</sub> into methanol and other valuable products, supporting the circular economy.

This not only helps to reduce emissions but also provides an efficient pathway for creating sustainable chemical products, further supporting the region's shift towards cleaner energy and circular economy.

**What are the key challenges MERYT faces in deploying its innovative solutions for the energy industry across the GCC, and how are you addressing these challenges?**

As a smaller company entering a competitive space, one of our primary challenges will be building a skilled workforce to support our manufacturing operations.

As the sector continues to evolve, having top



MERYT drives sustainability through advanced catalyst technology



Dr Meritxell Vila-Fontes, Director, MERYT Catalysts and Innovation

talent is essential for driving innovation and maintaining operational excellence.

We are planning to launch comprehensive training programmes in collaboration with local universities and institutions to ensure a strong pipeline of qualified engineers and technicians who can support the region's en-

ergy future and MERYT's growth.

Additionally, we remain committed to staying at the cutting edge of technological advancements, ensuring our solutions meet the highest industry standards and drive progress in energy efficiency and sustainability.

**Considering MERYT's commitment to sustainability, how do your innovations in catalyst technology address personnel training needs within the industry?**

At MERYT, we understand that the successful use of advanced catalyst technology goes hand-in-hand with proper training and support.

Our future training programmes will be aimed at enhancing the skills of catalytic unit operators at refineries and chemical plants, helping them not only to optimise the performance of our solutions but also to troubleshoot any operational issues they may encounter.

Technical support is a cornerstone of our approach, as we've been working with catalysts long before the founding of MERYT.

This deep experience allows us to provide practical, hands-on training that empowers plant operators to maintain efficiency, reduce downtime, and uphold sustainability goals by lowering energy consumption and emissions.

**With the global shift towards renewable**

**energy sources, how is MERYT Catalysts & Innovation adapting its R&D efforts to support this transition?**

MERYT is adapting its R&D strategy to support the global energy transition by focusing on the development of cutting-edge catalysts and adsorbents that address critical sustainability challenges.

We are working on advanced catalysts for CO<sub>2</sub> conversion into methanol and other valuable chemicals, as well as catalysts for steam reforming at lower temperatures and dry reforming. We also work with improvements in the production of biofuels.

These innovations aim to reduce carbon emissions while improving energy efficiency in key industrial processes.

Meanwhile, in the adsorbents area, we are developing new adsorbents for the purification of pyrolysis oil derived from plastic and waste residues.

This aligns with our broader efforts to contribute to cleaner industrial processes and reduce emissions.

Additionally, we are investing in Metal-Organic Frameworks (MOFs) as efficient adsorbents for gas separation, carbon capture, and other clean energy applications.

These initiatives reflect our commitment to driving innovation and providing solutions that meet the demands of a more sustainable energy future.

**Can you share details about any ongoing R&D projects aimed at developing catalysts for the conversion of CO<sub>2</sub> into valuable products and their potential impact on carbon emissions reduction?**

At MERYT Catalysts and Innovation, one of our key R&D projects is centered on developing advanced catalysts that convert captured CO<sub>2</sub> into valuable chemicals like methanol.

These catalysts are designed to operate under optimised conditions, ensuring high conversion efficiency and selectivity.

We are also exploring catalysts that convert CO<sub>2</sub> into other valuable products, such as olefins or syngas, which can be reintegrated into industrial processes.

By turning CO<sub>2</sub> into useful raw materials, we are actively contributing to the circular economy, where waste is transformed into valuable inputs.

This approach not only helps industries reduce their carbon emissions but also creates a sustainable loop where CO<sub>2</sub> becomes a resource for further production, enhancing both economic and environmental outcomes.

**How does MERYT Catalysts and Innovation envision its role evolving in the next five years, particularly in the context of global energy transitions and technological advancements?**

Over the next five years, MERYT aims to become one of the leading suppliers of catalysts and adsorbents in the GCC region.

Our objective is to support the autonomy of these countries by contributing to their industrial growth and helping to increase local value creation.

By offering high-quality, locally-sourced products, we help reduce dependence on imports and enhance local production capabilities.

We are committed to partnering with regional industries to drive economic development, foster innovation, and ensure that the GCC strengthens its position as a key player in the global energy market.



# Hybrid digital solutions: The best of both worlds

Digital transformation in downstream energy is essential for operational efficiency and market adaptability, requiring Lummus Digital's hybrid approach that combines industry expertise with advanced data science to overcome legacy challenges and enhance performance, Ujjal Mukherjee, Chief Technology Officer, Lummus Technology, tells **OGN**

**T**HE downstream energy industry, like all other sectors of the energy value chain, is faced with pressure to improve operational efficiency, enhance decision-making, navigate market volatility, and meet evolving regulatory demands all while contributing to the energy transition.

"In this environment, digital transformation has become essential for downstream operators and producers to stay competitive," Ujjal Mukherjee, Chief Technology Officer, Lummus Technology, tells **OGN** energy magazine.

However, he says, implementing digital solutions presents unique challenges.

Legacy systems, fragmented data, and the complexity of refineries and petrochemical plants make adopting new technologies difficult.

This is where a hybrid approach combining deep technical expertise with advanced data science becomes crucial.

## DESIGNED FOR SUCCESSFUL OUTCOMES

Lummus Digital (LD), a joint venture between TCG Digital and Lummus Technology, offers products designed with three key objectives and outcomes: Delivering quantifiable and measurable value, addressing specific operational challenges, and leveraging deep process knowledge and expertise.

"Our solutions focus on optimising operations by enhancing yields, improving energy efficiency and accelerating response time. They also emphasise reliability by providing critical insights into equipment and performance and improving turnaround planning," says Mukherjee, who counts several benefits of partnering with Lummus Digital:

- Clients get access to Lummus and Chevron Lummus Global's (CLG) a joint venture between Chevron and Lummus proprietary know-how. They get proprietary information imbedded in solutions, and advisory services, tapping into CLG process experts.
- Hybrid models combine the First-principles kinetic model with data science.
- An AI-based data platform (tcgmcube) offers real-time data ingestion and cleansing; scalable, secure, cloud agnostic, on-prem; and low-code analytics for reduced complexity and increased productivity.
- Prebuilt digital solutions provide velocity to value, enabling quick and large returns.

## TAILORED SOLUTIONS FOR COMPLEX OPERATIONS

For downstream companies, generic digital tools often fail to meet the specific needs of their operations.

LD's solutions merge decades of process engineering experience with modern artificial intelligence (AI) and data science.

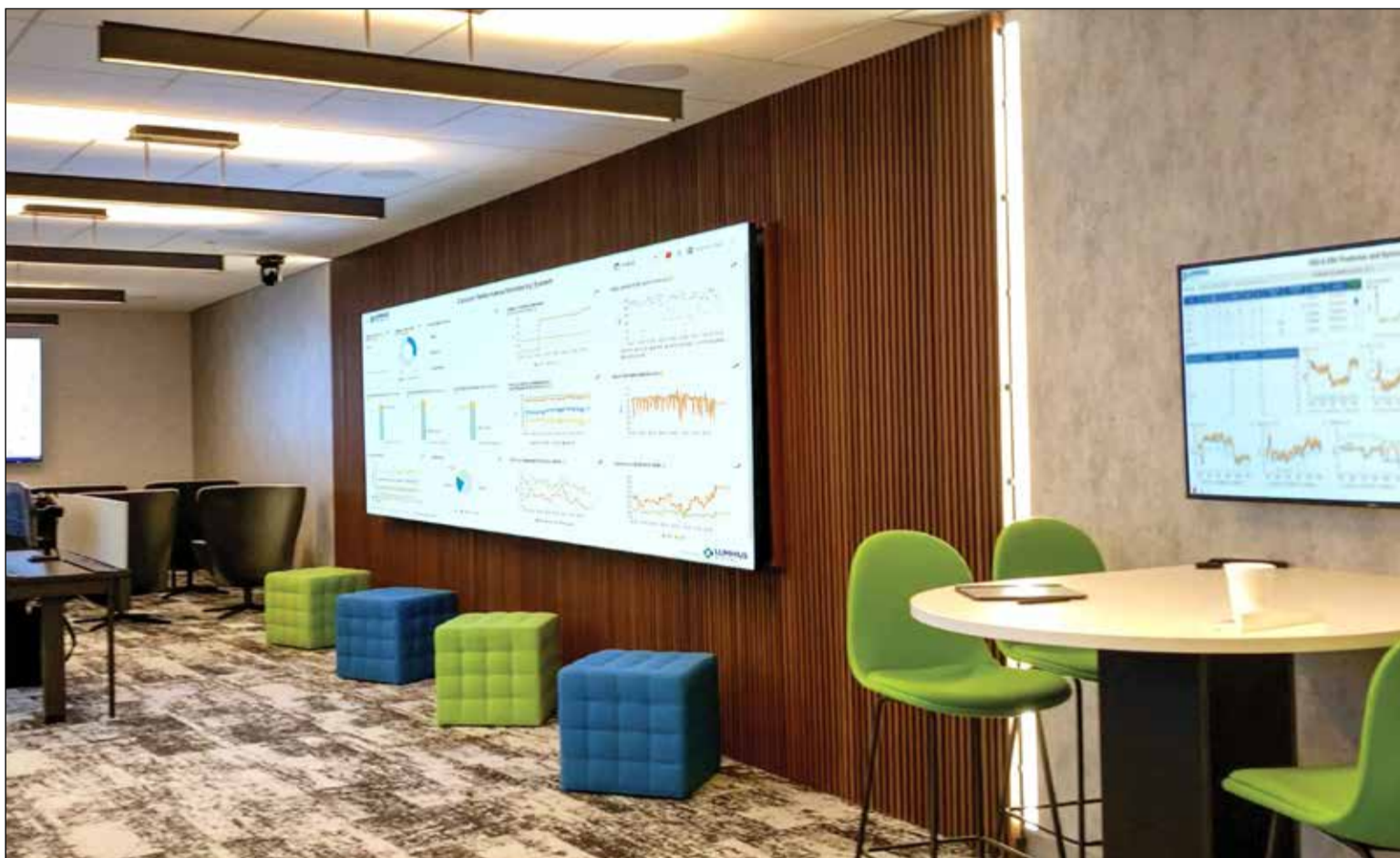
With over 500 process engineers and more than 100 data scientists, LD provides tailored solutions that solve complex challenges while delivering measurable returns on investment (ROI).

LD's hybrid model addresses industry-specific issues, offering solutions designed with clear, measurable goals.

In a sector where efficiency and ROI are critical, this approach helps companies enhance operational performance and reduce downtime.

## TAILORED & COMPREHENSIVE

The digital transformation in downstream operations often faces obstacles such as legacy



Available to Lummus Digital's clients, the Digital Center of Excellence is an advanced technology training centre that facilitates better decision making and more efficient operations



Ujjal Mukherjee

systems and siloed data.

LD addresses these challenges with a customised digital roadmap that integrates seamlessly with existing systems.

This tailored approach ensures digitalisation delivers immediate value, improving asset utilisation, decision-making, and minimising operational disruptions.

At the heart of LD's solutions is a robust big data platform that connects disparate data sources, cleanses information, and makes it accessible for predictive analytics and anomaly detection. LD's modular solutions allow companies to embark on a gradual digitalisation journey, scaling the adoption based on operational needs.

By centralising data, LD's platform provides real-time insights and a unified view of performance, helping decision-makers respond quickly to operational demands. This integra-

tion helps maintain smooth operations while improving responsiveness to potential disruptions.

## EFFECTIVE PROBLEM-SOLVING

LD's collaboration with subject matter experts (SMEs) is a key factor in its success. Each LD product is developed in close partnership with technology and operations SMEs, ensuring solutions are grounded in real-world expertise.

By blending human expertise with advanced data science, LD anticipates problems and creates predictive models that flag potential issues before they escalate, allowing operators to take preventive action.

LD's approach doesn't just solve today's challenges, it also embeds industry expertise into its tools, making critical knowledge accessible to the next generation of engineers.

Visualisation-based systems offer an intuitive interface for real-time operations while serving as valuable training tools for workforce development.

## BRIDGING THE KNOWLEDGE GAP PLUS A MULTIDISCIPLINARY APPROACH

As the downstream workforce undergoes a generational shift, with many experienced engineers retiring, companies face a growing need for effective knowledge transfer.

LD addresses this by embedding essential expertise into its digital tools, ensuring continuity in operations as seasoned professionals exit the workforce.

LD's tools bridge this knowledge gap, offering intuitive systems that enable younger engineers to access critical information while driving innovation.

These solutions not only improve daily operations but also ensure the long-term development of the workforce.

LD's solutions address a broad range of chal-

lenges across different departments and technologies.

By combining core industry principles with cutting-edge technology, LD offers a comprehensive framework for enhancing everything from process control to energy efficiency.

This multidisciplinary approach allows LD's solutions to have a widespread impact, improving overall plant efficiency and helping companies stay competitive in an evolving market.

## LEVERAGING AI FOR FUTURE PERFORMANCE

Looking ahead, LD is embracing the potential of AI to further enhance operational performance. The company's use of Generative AI is creating an internal knowledge base focused on operational excellence, augmented by AI agents capable of complex calculations and predictive analytics.

These AI-driven solutions help companies detect anomalies before they occur, offering detailed insights into how to prevent them.

The result is fewer unplanned shutdowns and reduced operational disruptions. LD's AI tools also quantify the potential economic impact of anomalies, providing companies with the information they need to justify preventive measures and optimise operations.

## COMBINATION FORMS FIT-FOR-PURPOSE SOLUTIONS

As the downstream sector adapts to new technological advancements and market realities, LD is combining industry expertise with advanced AI and data science.

LD helps companies overcome the challenges of modern operations, unlocking new levels of efficiency and profitability.

When combined, these capabilities form a hybrid approach with fit-for-purpose solutions that are critical in the digital transformation.

# Maximising unconventional drilling efforts in Mideast

With growing interest in unconventional wells in the Middle East, eliminating downhole vibrations is crucial for achieving faster drilling speeds and lowering operating costs – which benefits oilfield service companies and operators, Robert Borne tells **OGN**

**T**HE recent joint venture between Adnoc Drilling, SLB and Patterson-UTI not only adds 144 wells to Adnoc's operational portfolio to unlock important energy resources but also marks an important shift in the Middle East's oil and gas production.

This pivotal partnership will quickly expand unconventional drilling practices across the region that will echo the unconventional drilling, production and completion applications that are common in the West.

A focus on unconventional drilling brings new challenges to oilfield service companies and operators alike.

Speed is paramount, as drilling faster enables more unconventional wells to be completed in less time.

However, achieving greater speed requires oilfield service companies to push drilling equipment much harder, and that subjects expensive downhole tools and electronics to costly damage from vibrations.

In many cases, oilfield service companies must cover the costs of damaged downhole components and related nonproductive time (NPT) in the event of downhole failures.

It becomes an operational imperative to neutralise the vibrations that are encountered when drilling speeds increase, and mitigating drilling dysfunctions caused by near-bit vibrations allows weight on bit (WOB) and the rate of penetration (ROP) to increase without incurring drill bit or bottom hole assembly (BHA) damage, Robert Borne, CEO, Neo Oiltools, tells **OGN** energy magazine.

## ELIMINATING VIBRATIONS FOR GREATER DRILLING SPEED & EFFICIENCY

In drilling, many dysfunctions can start at the drill bit. As a formation is drilled, the bit-rock interaction causes vibrations in the drill string.

There are four key types of vibrations that can be created from this interaction that cause drilling dysfunction: axial, lateral, and torsional or radial vibrations.

The latter are typically categorised as stick-slip at low frequencies and High Frequency Torsional Oscillation (HFTO) at higher frequencies.

Each type of vibration must be minimised to achieve efficient drilling at the greatest ROP.

Drilling vibration suppression systems (VSS) minimise the different types of downhole vibrations.

A VSS tool combined with a rotary steerable BHA can dampen the form of vibration a specific VSS is designed to mitigate.

This allows the drill string to perform more optimally, enabling oilfield service companies to drill better and faster wells.

However, not all VSS tools can eliminate every type of vibration a driller will encounter.

Axial shocks start at the end of the drill bit and send vibrations directly through the drill bit and up the drill string through the BHA.

This type of vibration can be produced when drilling through non-homogenous or layered downhole lithologies and hitting rocks of different hardness. An axial shock to a drill string with great enough force can, at a minimum, decrease ROP significantly, and at most damage the drill bit and BHA.

Some VSS tools built with springs act like shock absorbers to dampen axial shocks.

Low-frequency torsional vibration in the drilling process is commonly called stick-slip.



neotork's cable design enables companies to drill faster and achieve their individual goals



Robert Borne

Stick-slip occurs when the drill bit depth of cut is too deep relative to the formation that's drilled.

The drill bit digs into the formation deeply enough to slow it down relative to the rest of the uphole drill string, causing reactive torque.

The difference in revolutions per minute (RPM) of the drill string on the surface and at the bit can be significantly different when stick-slip is experienced.

Depending on the amplitude and frequency, drill string and BHA fatigue can occur, and ROP can slow significantly as the drilling parameters must be adjusted downward to handle the vibration.

A VSS tool designed with an internal helical spline is typically used for stick-slip vibrations.

HFTO is torsional vibration with a resonance frequency higher than stick-slip.

HFTO dysfunction can significantly damage downhole drilling tools and electronics.

VSS tools with a counterforce dampener design can address HFTO, however, they may decrease the energy available to the drill bit.

Lateral vibrations are created by the drill string's interaction with the wellbore and the presence of doglegs or micro-doglegs.

While elastomers can be used to help prevent harm to the BHA, a more prudent approach is to improve wellbore quality by selecting and placing the optimal tool in the BHA design to reduce lateral movement.



Oilfield companies using neotork have reported less downhole BHA failures and fewer trips

## MITIGATING ALL TYPES OF VIBRATIONS SIMULTANEOUSLY TO REDUCE COSTS & DOWNHOLE DAMAGE

Conventional VSS tools achieve limited success as they only address one type of vibration and are unable to impact the drill bit depth of cut or enhance ROP.

Also, adding multiple VSS tools to the BHA to compensate for all vibrations ultimately lengthens the BHA design, creating significant complexity and higher operating costs for oilfield service companies.

Using a patented spring power pack and cable design VSS tool, such as neotork, is a field-proven approach to reduce all four types of vibrations, allowing oilfield service companies to increase drilling speeds to meet operators' goals while protecting the drill bit and downhole BHA from vibration-induced damage.

The tool uses a combination of disc springs and hydraulic force to balance the cable heart assembly, mitigating downhole torque while automatically controlling the drill bit depth of cut.

The fixed-length heart assembly cables are installed at an angle around a near frictionless internal mandrel.

When any torsional force is encountered that exceeds the tool's calibrated setting, the cables wrap around the internal mandrel to contract and shorten its length. This allows drill bit depth of cut to be successfully managed in real time.

The tool's cables are flexible during compression but strong when tense. For example, when an axial shock is encountered, the flexible cables don't resist.

As a result, the tool responds faster to formation changes during drilling for both high and low vibration frequencies which enables PDC cutters to remain engaged with the formation.

## BREAKING DRILLING SPEED STANDARDS BENEFITS OPERATORS & OILFIELD SERVICE COMPANIES

The neotork tool is field-proven to reduce vibrations downhole in unconventional drilling operations.

One operator typically required several trips downhole to achieve the well trajectory and experienced NPT due to failed downhole components in the BHA.

The operator sought to minimise drilling vibrations in order to drill a vertical-curve-lateral well in one run with a single BHA on multiple wells before service was necessary.

This goal was accomplished with neotork's unique design, and allowed drilling speeds to increase substantially to drill more wells in a shorter amount of time.

The operator now benefits from running a single BHA on three consecutive wells.

Additionally, this approach has increased ROP so substantially that the only limitation encountered currently is cleaning the drill cuttings from the wells quickly enough.

Companies using the cable design VSS tool have reported fewer downhole BHA failures, ROP increases up to 20 per cent, and the ability to drill vertical-curve-lateral wells in one run much more consistently.

Fewer trips downhole combined with greater ROP and downhole tool integrity empowers Middle East oilfield service companies to reduce operating costs while meeting operators' goals.

## POSITIONING THE MIDDLE EAST FOR UNCONVENTIONAL SUCCESS

It's unavoidable that oilfield drilling creates near-bit vibration dysfunction downhole. Answering operators' calls to drill faster requires oilfield service companies to increase weight on bit, and that typically increases vibrations.

The intensity of those vibrations amplifies the risk of catastrophic damage to the BHA and drill bit failure as well as reduces drilling efficiency and performance.

Mitigating the four types of near-bit vibrations simultaneously with one VSS tool allows oilfield service companies to increase drilling speeds and performance to drill more unconventional wells faster.

The ability to augment drilling parameters without harming downhole components can create significant ROP cost savings and production benefits.

As interest in unconventional wells grows in the Middle East, faster drilling speeds will be a priority for operators.

Eliminating vibrations downhole empowers oilfield services companies to meet operators' goals while lowering operating costs.

*\* Robert Borne is Neo Oiltools' CEO. He brings more than 20 years of experience in the oil and gas sector to his role along with a proven track record of leadership and success. He has built an extensive base of knowledge of the industry through roles spanning engineering, operations, sales, business development and digital transformation.*

# Effective PPE, detection can help reduce risks in O&G

Enhancing safety in the oil and gas industry requires strategic investments in PPE, hazard detection, and employee training to mitigate risks and improve workplace productivity and safety outcomes, according to MSA Safety

It is hardly necessary to remind anyone that the oil and gas industry is hazardous, but what actions can be taken to address these risks?

MSA Safety emphasises the crucial role that personal protective equipment (PPE) and hazard detection play in mitigating the inherent dangers of this sector.

With the right attitude, careful planning, and informed equipment choices, companies can significantly enhance their efforts to create a safer workplace.

The human tragedy of death at work is brought home powerfully through individual incident descriptions gathered by IOGP (International Association of Oil and Gas Producers).

Published in June 2024, IOGP's 'Fatal incident reports' document covers 26 fatalities worldwide that occurred in 2023.

Of these, seven workers were victims of violent crime rather than industrial accidents. Five others lost their lives during road transport.

While working, four were drowned, three were burned, two were poisoned by gas, two were struck by a moving object, one was crushed, one was electrocuted, and one fell from height.

In some cases, businesses may have a duty to help protect their workers. Many choose to go above and beyond simply complying with the minimum legal standards.

In fact, they view worker safety as a profitable investment, resulting in a more productive workforce, greater operational continuity and less accident-related expense.

## TOP HAZARDS

To see where investing in worker safety will count most, we should explore the main risks and challenges.

The US' Occupational Safety and Health Administration (OSHA) gives a useful summary of safety hazards associated with oil and gas extraction activities. This includes extensive lists of links to further information in each case.

According to OSHA, three out of every five on-site fatalities result from being struck by, caught in, or caught between something. This could be a falling item, a vehicle, or some other piece of moving equipment.

Blowouts in high-pressure lines are amongst the more specific hazards mentioned by OSHA.

PPE, including protective headgear, footwear and gloves, can be an important line of defence in some of these instances.

A related hazard category is electrical and other hazardous energy, including mechanical and hydraulic.

PPE may be relevant here, too, although procedures such as lockout and tagout may also be



A worker wearing the V-Gard-950 protective cap and holding a ALTAIR-io4 portable gas detector

used when appropriate to help minimise exposure to these risks.

OSHA also highlights explosion and fire risks due to ignition of volatile and flammable vapours or gases.

Gas and flame detectors can be an important tool to help mitigate or avoid such disasters.

A further threat which we would like to highlight is the toxicity of some gases and chemicals. PPE, such as breathing apparatus, along with portable gas detection equipment, may in certain circumstance help to reduce this threat.

Across industries, falls from height are a leading cause of death. In the UK, for example, falls accounted for 50 out of 138 worker fatalities (36 per cent) in 2023/24.

Fall protection PPE can play a significant role here.

The OSHA hazard summary includes a category on confined spaces, such as storage tanks, pits, pipes and shafts.

Fall protection devices are amongst the PPE used to help keep works safe during confined space entry.

Other hazards in these environments include head bumps, strikes from falling objects, asphyxiation, toxic gases, fires and explosions – each presenting unique considerations for selecting the appropriate PPE.

## INVEST IN SAFETY

From the above, one may conclude that there are three key areas in which increased safety investment can have especially strong impacts:

- **Gas and flame detectors:** Checking for harmful, flammable or explosive gases and vapours is an important first step in workplaces where these hazards are present.

For the ultimate in productivity and safety, an employer may choose portable, digitalised and connected gas detectors.

These link workers and managers to each other and to a cloud-based software programme, via wireless connectivity.

Their many advantages include prompt device location, quick assignment to users, automatic record-keeping without reliance on the user, and remote monitoring of equipment compliance, condition, and proper use.

The Connected Work Platform driven by ALTAIR io™ 4 Gas Detection Wearable is designed to meet all these needs and more.

Fixed flame detectors can provide another important layer of safety confidence. A difficulty with some flame detectors is their susceptibility to interference from various environmental factors, which can lead to false alarms.

This not only disrupts work but risks desensitising workers to alerts. Today's most advanced flame detectors use technologies including artificial neural networks (ANNs) to distinguish between real flames and sources of interference.

These technologies, as used in MSA Safety's latest-generation FL5000 Multi-Spectrum Infra-red (MSIR) Flame Detectors, can result in fewer false alarms.

- **Headgear:** In certain situations, protecting the worker's vulnerable head and brain is a signifi-

cant priority. Head protection, such as hard hats, must meet the appropriate legal standards for the specific type of work and environment involved.

When buying head protection or other PPE, you may wish to consider more than just the price.

Higher-quality PPE, while often not the lowest-cost alternative, may well exceed the minimum legal standards, perform better, last longer, require less maintenance, and reduce the whole-life cost of the equipment.

Specific head protection considerations may include choice of non-vented designs for chemical, hot liquid and electric shock hazards, insulated materials for work near electrical equipment, and compact shape for work in confined spaces.

Accessories such as chin straps, liners, eye and face protection, and ear defenders, should be compatible with the selected head protection and should be tested in combination with it.

As with all PPE, comfort and good fit are essential. Uncomfortable, ill-fitting equipment may distract the user, may limit his or her performance, and may be less likely to be consistently worn.

Good suspension, balance and adjustability can be particularly important considerations for head protection.

And don't forget that the 'look' of a hard hat and other PPE may also affect workers' willingness to wear them. The V-Gard® range of safety helmets is a good place to start your search.

- **Fall protection:** If collective fall protection, using barriers for instance, is not possible, fall restraint PPE may be the next approach.

This aims to stop a worker from reaching a position where a fall could happen. If this is not feasible, fall arrest PPE may be appropriate to 'catch' the worker if he or she falls.

In both cases, this usually entails use of a full-body harness connected via a lifeline – often known as a lanyard – to an anchor point.

Again, equipment should be selected that is appropriate for the specific circumstances.

When choosing any PPE, employers often consult with their workers and take their feelings into account. Issues like ease of use, comfort, fit and styling matter to workers.

Good choices include V-FORM safety harness and V-TEC® Self-Retracting Lifeline (SRL).

Employers often provide training, demonstrations, clear instructions and timely reminders to help reinforce proper use of the equipment. In the case of confined space entry, specific fall protection kits may be appropriate to arrest falls and to rescue fallen or injured colleagues.

A well-established and rehearsed rescue plan can also help increase worker safety.



Industrial application ... the V-Gard C1 hard hat and V-Flex safety harness



Working offshore at height using the V-FIT harness, V-Gard 500 mounted hearing protection

# Can cellular glass insulation solve common LNG challenges?

While identifying challenges early in LNG facility design enhances safety and longevity, cellular glass insulation effectively reduces fire risks, moisture, and noise while supporting storage tanks without compromising thermal performance

**D**EMAND for LNG is rising as the world shifts toward lower-carbon energy systems, prompting the planning and announcement of new terminals to meet this need.

Facility designers, engineers, and contractors encounter a range of challenges related to location, layout, and operational temperatures.

This article explores several common challenges in insulating LNG facilities and demonstrates how cellular glass insulation helps engineers and facility managers address these issues while enhancing safety, minimizing maintenance and labour, and improving the workplace environment.

## THERMAL PERFORMANCE

LNG facilities require insulation systems to address thermal performance at extreme temperatures. Equipment throughout these sites can operate at -162 deg C and this means reliable and long-lasting insulation is needed to keep pipes and storage tanks at temperature without warping.

When insulation is subject to extreme temperatures, there can be a rate of thermal expansion or contraction.

Organic-based insulations tend to have a larger coefficient of thermal expansion than insulation types that are non-organic.

Some organic materials – like plastic foams – can have coefficients that are five to ten times larger than those presented by metal materials.

This difference can lead to open joints and allow for unwanted heat gain – reducing the overall thermal efficiency of the system. The movement also may allow entry points for moisture or water vapour.

However, using FOAMGLAS® cellular glass insulation, which can function in temperatures ranging from -265 deg C to 430 deg C, provides a minimal coefficient of thermal contraction similar to that seen with carbon or stainless steel and concrete.

Unlike polyisocyanurate, use of cellular glass insulation in situations where extreme temperatures occur can help protect joint seals and keep moisture from entering an insulated system during temperature cycling.

## MOISTURE PROTECTION

Despite the cold temperature of the pipes, LNG facilities may face a particular challenge from moisture and corrosion as many are located in locations with humid, or warm and humid climates.

Pipes or vessels may function at temperatures reaching down to -162 deg C, but they can be located in areas where the ambient temperature remains 30 deg C or higher with high humidity.

As moisture seeks to move from hot conditions to cold ones, the combination of cold pipes or tanks and warm outside temperature drives moisture to insulation.

Adding permeable or absorptive insulation to a cold pipe can create a dew point where moisture can collect and potentially freeze within the insulation even if it does not reach the pipe.

According to information from ASHRAE, about 98 per cent of insulation failures are linked to moisture. The collection of ice within insulation also can add weight to the pipe and reduce the lifespan of equipment.

Cellular glass insulation is long-lasting, impermeable and can help protect LNG systems



Cellular glass insulation can help protect joint seals and keep out moisture in LNG facilities

from invasion by moisture or water vapor.

## COMPRESSIVE STRENGTH & EQUIPMENT SUPPORT

The need for comprehensive strength can be an overlooked piece when insulation is selected for an LNG facility.

However, it remains a necessary element in insulation choice – especially when working with tank bases, piping or vessels.

The failure of insulation materials from compression can hasten deterioration of the insulation system and result in mechanical system or equipment damage.

When insulation is used on pipe supports and hangers, providing a material with a high compression strength allows for supports to be used on the outside of an insulation system – which helps prevent thermal breaks in the system.



FOAMGLAS can reduce toxic smoke generation and help improve the safety of an LNG facility

If an insulated pipe fails, it can alter how a load is distributed. When that occurs, the entire system may surpass its stress tolerance.

Damage, including increased leak or rupture risk, is particularly possible at sensitive areas such as nozzles, flanges and fittings following a system imbalance.

When insulation is used on storage tank bases – a compressible insulation could cause a drop in thermal insulation performance or unwanted settlement of the structure.

If not stopped, these situations could continue to degrade leading to ground heaving or even system failure from ruptures in the bottom of tanks as foundation temperatures exceed limits.

There also needs to be an awareness of how insulation functions with extreme temperatures. Long-term creep can occur when extreme temperatures are applied to insulation or the accessories used with insulation.

Compression creep may start when a solid material deforms or moves after a mechanical load is applied.

The compressive properties of FOAMGLAS® insulation are consistent over time and across a wide range of service temperatures. It has been tested against ASTM C165, EN 826, ASTM C552-17 and EN 14305.3

Cellular glass insulation is capable of supporting heavier loads than many other insulating materials.

FOAMGLAS® insulation tolerates a range of compression and has declared compressive strengths of 800 kPa to 2,400 kPa.

Its compressive strength and dimensional stability cut the need for additional treatment at pipe supports and allows it to be used under storage tanks.

Cellular glass insulation provides a stable base for heavy storage tanks and can be used with cryogenic tanks to limit heat gain and preserve system lifespan.

## FIRE PROTECTION & SUPPRESSION

Because LNG is a mixture of low-molecular-

weight hydrocarbons risk of fire on site is a consideration. As site locations shrink and move toward populated areas – there is increased interest in developing new ways to mitigate fire risks. Insulation systems can contribute to fire protection by providing heat absorption and thermal protection to reduce the rate of temperature rise towards the item being protected. When specifying insulation systems for passive fire protection of structural steel, equipment, piping and hydrocarbon storage tanks, engineers should consider relevant material properties, the process environment and the required level of fire protection.

Materials properties such as combustibility, absorbability, smoke development and possible loss of mass in case of a fire can help determine which products would be most suited for a set of design considerations and environmental conditions.

Selection of a non-combustible insulation and one that does not wick or absorb flammable liquid – like FOAMGLAS® – can reduce the opportunity for toxic smoke generation and help improve the safety of an LNG facility.

## NOISE

LNG facilities can be loud – especially when liquification and regasification occur – and employees may need hearing protection to meet 85db regulations and facility location and zoning requirements.

But selecting the right types of insulation can help with noise mitigation as it remains easier to treat the problem at its source than remediate it.

A combination of cellular glass insulation and mineral wool can insulate cold and cryogenic pipes and meet class C and D acoustic compliance using less material than is needed in other systems.

The reduced amount of mass and cladding can help with ease of installation and handling, potentially lowering labour costs. Additionally, the thinner amount of material needed drops the amount of weight added to piping.

The application overfits a base layer of cellular glass insulation with mineral wool to provide additional acoustic performance.

Mineral wool insulation provides a fibrous layer to help sites meet ISO 15665 compliance.

Owens Corning® mineral wool insulation pipe insulation is water-repellant and non-combustible; however, it should be used with appropriate vapor barrier jacketing, mass-loaded vinyl and recommended accessories.

## CONCLUSION

Although LNG facilities face numerous challenges to operations and safety, starting the design process with them identified can help protect the functioning and longevity of the site while protecting employee safety.

While several kinds of insulation can provide pieces to the puzzle that is LNG facility safety and design, cellular glass insulation completes the picture by addressing multiple challenges at one time.

The insulation can play more than one role by reducing fire risks, repelling moisture from insulated systems and reducing the amount of noise generated while providing support for storage tanks without compressing or losing thermal performance.

# Advancing circular economy: Characterising pyrolysis oils

Innovative recycling solutions are essential for effectively addressing plastic waste challenges and enhancing the quality of pyrolysis oil for sustainable ethylene production, Deepak Sharma tells **OGN**

**I**N an era where sustainability is at the forefront of global discourse, addressing plastic waste has become crucial for the health of our planet.

Plastics provide benefits to nearly every aspect of life, but the resulting high demand has led to increased production, generating a significant amount of plastic waste.

As the global economy and population expand, plastics demand is expected to grow from 350 million tonnes in 2020 to 950 million tonnes in 2050.

With only approximately 10-12 per cent of that plastic being recycled, millions of tonnes of plastic are incinerated, disposed of in landfills or end up collecting in oceans and other waterways leading far-reaching consequences.

Plastic waste has become an alarming global problem, with its impact on the environment and human health steadily increasing.

Banning single-use plastics might not eliminate plastic waste challenges completely, but strengthening waste management practices can return plastic waste to a circular economy.

"As public opinion has moved toward a greater emphasis on sustainability concerns, the response to plastics has turned towards increasing the level of circularity," Deepak Sharma, Senior Marketing Manager, Nalco Water, an Ecolab company, tells *OGN* energy magazine

## ACHIEVING CIRCULARITY

Mechanical recycling traditionally involves grinding, melting, extruding, and cutting plastics into pellets without altering their chemical structure. This method primarily works with three grades of plastic: PET, HDPE, and polypropylene.

However, repeated recycling degrades the polymer quality, and sorting incompatible plastics is labour-intensive.

To broaden the range of recyclable materials, chemical recycling, which alters the chemical structure of plastics, is being explored as a promising alternative.

There are two main methods for chemical recycling: Depolymerisation (also known as re-monomerisation or monomer recycling), where the polymer is broken down into its monomer building blocks; plastics-to-feedstock, which uses heat in an oxygen-free or low-oxygen environment to break down plastics into material commonly called pyrolysis.

• **Pyrolysis oils (pyoils) as an ethylene feedstock:** As chemical manufacturers have started looking towards pyoils and similar feedstocks produced from recycled plastics, there has been considerable interest in the impact these feeds would have on production and processing within the ethylene plant

• **Characterising pyoils:** Because these pyoils are still new to the ethylene industry and not much is known about their properties, the Nalco Water Research, Development, and Engineering (RD&E) group began analysing pyoils from various chemical recyclers and developed a battery of tests, using both ASTM methods and in-house proprietary tests.

Over 200 pyoil samples have been tested in our lab with established ASTM pyoil test methods (Table 1).



Deepak Sharma, Senior Marketing Manager

## PYOIL FEEDSTOCK CHALLENGES

• **Product stability:** Pyoils can be highly olefinic in nature, breaking down to form films or gums. This is often, but not always, due to oxidation.

Film formation can cause plugging of equipment, fouling heat exchangers and build-up of solids in storage equipment. Fouling in the convection section of a pyrolysis furnace is a particular concern.

Using a proprietary oxidative stability test, researchers found that treating pyoil with an antioxidant can increase its stability and reduce/eliminate film formation.

Table 2 shows the dose-response of pyoil stability using antioxidant, and Figure 1 shows an example of film formation of untreated versus treated pyoil.

• **Flow properties:** Many of the pyoil samples exhibit undesirable cold flow properties. This can lead to difficult pumpability and require expensive capital for heated storage and transportation facilities.

The use of a pour point depressant (PPD) can reduce cost on heated facilities. Table 3 shows the dose-response of pyoil using Nalco pour point chemistry.

• **Heavy components and variability:** Pyrolysis processes producing pyoil generate heavy components ranging from a coke, tar like heavy oil to wax which can cause issues during further processing. In some conditions, higher-value, lighter pyoil may be downgraded as "cutter stock" for heavy material.

In those cases, lab testing has shown that the use of a pour point chemistry can allow manufacturers to use less cutter stock, thus producing more higher value pyoil. Analysis of pyoil samples have shown that they tend to vary widely not only from producer to producer, but even batch to batch.

As chemical recyclers expand in scale from pilot

Antioxidant Dosages	Induction Period (hrs)
Blank	2.28
250	3.91
500	6.60
1000	12.60

Table 2

Concern Areas	Test	Method
Cold Flow	Pour Point	ASTM D5950
Corrosion	NACE	TM 0172
	TAN	ASTM D664
	Organic Chloride	ASTM D4929
Gum Formation & Fouling	Thermo-Oxidative Stability	Nalco Water Propriety Method
	Total Sediment	ASTM D4870
	Fouling Potential	Nalco Water Propriety Method

Table 1



Plastic waste has become an alarming global problem

to commercial operation, an increasing volume of waste feedstock is required.

PPD Dosages	Pour Point (deg C)
Blank	6
200	-3
400	-6
600	-21

Table 3

Sorting out known contaminant sources is often done manually, making it both labour-intensive, subject to human error. Variable contaminant levels can cause process reliability issues.

Presence of reactive components and their varying concentration can impact fouling risk, along with varying amounts of saturates that can impact ethylene yield across the furnaces.

In benchmarking testing, researchers found that pyoils derived from catalytic processes had significantly higher concentrations of aromatics than thermal processes. The variability tends to impact in three principal areas: Film formation (oxidative and non-oxidative); corrosivity; and feedstock contaminants.

A chemical recycler sent two different sets of pyoil samples: one from March 2021, and the other from November 2022. Benchmarking (Figure 2) shows that film formation and fouling propensity were observed for samples contain a high concentration of N, O-containing compounds such as caprolactam, imidazolines, etc.

Additionally, it was observed that when the film was filtered out, it re-formed in the samples. Testing showed that dispersants were effective at keeping the film solubilised in the pyoil and was even able to disperse deposits already formed.

• **Contaminants:** Feedstock contaminants are a significant concern to ethylene manufacturers, dealing with contaminants in pyrolysis feedstocks and multiple technologies have been introduced or repurposed to deal with contaminants.

Known potential contaminants in pyoil and

their potential impact in the ethylene plant include:

1. Oxygenates can produce organic acids in the ethylene furnace increasing corrosive potential, or peroxides and carbonyls that increase fouling severity and downgrade crude C4 value. The most common source of oxygenates is PET.
2. Chlorides damage cracking furnaces and form HCl. The most common source of chlorides is PVC.
3. Nitrogen can form ammonia in the furnace, and any N-O bonds present can form NOx being sourced from nylons, caprolactam, imidazolines, and other compounds.

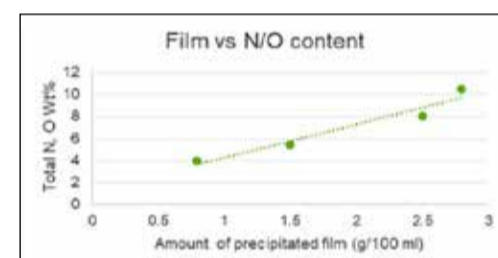
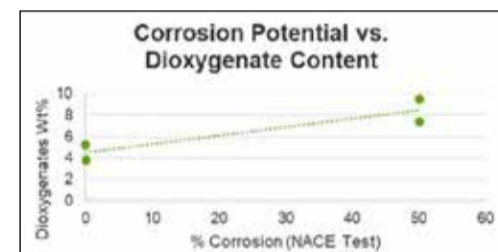


Figure 2

4. Phosphorous & Si can be a catalyst poison.

To reduce the potential negative impacts of contaminants in the ethylene production process, manufacturers are diluting pyrolysis oil with other liquid feed. Several approaches are being proposed in the marketplace, including adsorbents, hydro processing and use of extraction solvents.

Nalco went in with proprietary extraction techniques utilising various chemistries to successfully remove 70 per cent of chlorides.

## CONCLUSION

Advanced recycling is an emerging technology that can complement traditional recycling to help promote plastics circularity. There are, however, significant challenges to manufacturers seeking to use pyrolysis oil as feedstocks in their processes.

Solvent stability, flow properties, heavy material, variability, and contaminants are among the challenges faced with the pyoils themselves, as well as additional challenges like to be discovered as the impacts of cracking this material on ethylene unit operations are documented.

Through extensive research of a variety of pyoils, Nalco Water research has shown that various chemical additives can address these challenges, providing pyoil that is more stable, less prone to fouling, and lower in contaminants.



Figure 1 ... Film formation in untreated (left) versus treated (right) samples

# Adaptive gas lift system boosts oil production, optimisation

The Adaptive Gas Lift System (AGLS), developed by Interwell and Emerson, adapts to changing production conditions, maximising production while minimising lifting costs, with innovative, retrievable technology

**I**N the ever-evolving landscape of oil production, efficiency is paramount. The Adaptive Gas Lift System (AGLS) is here to transform the way gas lift operations are approached, leveraging cutting-edge technology to enhance production while addressing the challenges of traditional systems.

Introducing the world's first electric gas lift system qualified to international standards, Interwell and Emerson through the AGLS combines proven methodologies with advanced digital solutions.

This innovative system is designed to adapt to fluctuating reservoir conditions, ensuring optimal performance and cost-effectiveness throughout the life of a well.

The AGLS is a retrievable digital gas lift system that primarily utilises field-proven technology.

AGLS is the world's first electric gas lift system qualified to internationally recognised standards.

It is based on industry-leading Interwell and Emerson gas-lift technology and Emerson's Roxar Integrated Downhole Network and sensor technology.

## THE CHALLENGE

Conventional gas lift systems are designed to optimise the initial production phase when tubing pressure is high.

However, as production conditions change over time, adjustments to the orifice size and injection depth are required to maintain efficiency.

Closing each injection pressure operated (IPO) valve requires a drop in casing pressure, which can limit the injection depth and potentially reduce additional production.

Manipulating casing pressure and dealing with IPO temperature uncertainties often leads to multi-pointing, resulting in ineffective gas lift and loss of production.

Well interventions are expensive and can be particularly challenging if the well has flow assurance issues.

These issues can complicate valve retrieval, leading to additional downtime and increased operating expenses (opex).

## SOLUTION

The AGLS offers the ability to adjust port size and change the injection depth to deliver opti-

mal injection rates as well conditions change.

This adaptability addresses future uncertainties in modeled reservoir conditions. Deeper injection is possible as the valves can be closed without reduction of casing pressure.

Continuous online optimisation throughout the life of the field maximises production and reduces project payback time.

Furthermore, AGLS reduces the instability associated with conventional gas-lift systems by optimising the injection rate and port size.

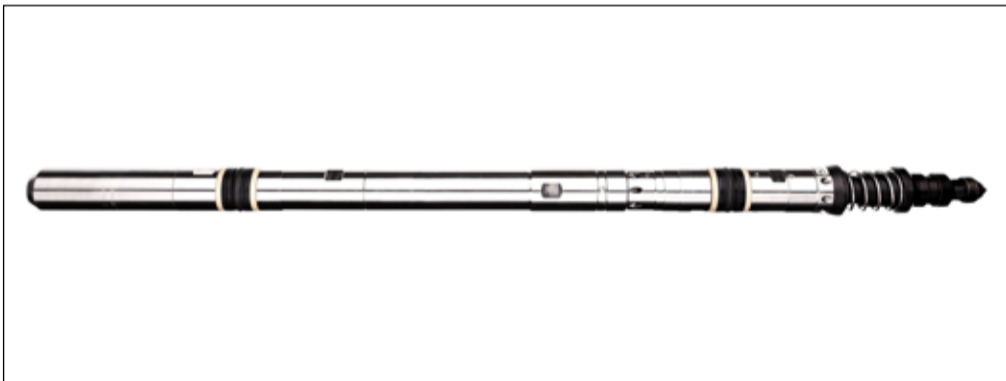
AGLS is compatible with e-field and i-field technologies, offering the potential for autonomous production optimisation.

## SYSTEM SPECIFICATIONS

- Designed and qualified to API 19G1 (V1),

19G2 (V0) and AWES 3362-36.

- Set and retrieved using conventional wire-line methods.
- Run on a single TEC line, up to 32 nodes on an Emerson Electric network.
- The Side Pocket Mandrels accept both electric and conventional gas lift valves (1.5 inches).
- 4.5-inch and 5.5-inch mandrels in 9-5/8-inch casing (other sizes can be made available upon request).
- Temperature range: 4-150 deg C.
- Valve working pressure: 10,000 psi, 15,000 psi absolute.
- Adjustable variable choke allows fractional port size variation from 10/64 inches to 32/64 inches.



The Adaptive Gas Lift System can adjust port size and change the injection depth to deliver optimal injection rates



The AGLS utilises field-proven technology

# New deal to optimise AI asset ops, maintenance at Adnoc

**G**ECKO Robotics and Al Masaood Energy have signed a multi-year contract with Adnoc Gas that will see the latter deploy Gecko's industry-leading robots and AI-powered data platform across Adnoc Gas sites.

The deal worth \$30 million will facilitate predictive maintenance to increase efficiencies, reduce downtime and CO2 emissions at Adnoc Gas, while also maintaining HSE best practice for the safety of its employees and contractors.

"Adnoc and the UAE are at the forefront of using Industry 4.0 tools to boost efficiency and decrease their carbon footprint - and the world is noticing," said Jake Loosarian, co-founder and CEO of Gecko Robotics.

Gecko's wall-climbing robots use specially designed sensor payloads that build sophisticated digital maps of critical assets.

Gecko software platform, Cantilever, takes that data and combines it with operational data to allow for precision repairs and preventive maintenance.

Many companies and government agencies use Gecko's software to extend the lifespan and efficiency of critical infrastructure, including power plants, oil refineries, manufacturing facilities, and other assets.

"The partnership between Gecko and Al Masaood Energy serves as a compelling demonstration of how cutting-edge technologies can be instrumental in realizing the nation's ambitious



Gecko's wall-climbing robots use specially designed sensor payloads to build sophisticated digital maps of assets

net zero objectives," said Ahmad El Tannir, General Manager of Al Masaood Energy.

The work also includes a new model for predictive maintenance that allows for inspections of some critical assets to happen while they are on-line.

During the initial pilot phase of the partnership, studies indicated that Gecko's solutions were found to increase coverage of assets by 99.6 per cent and increase efficiency by more than 93 per cent over manual processes.

The lack of scaffolding, a key part of the manual inspection process, was also projected to reduce Lost Time Injury (LTI) rates by 33 per cent.

Gecko's advanced data collection and analysis capabilities have also been shown to decrease carbon emissions in partnership with customers.

A recent third-party study carried out by Rho Impact, found that the increased digitization of assets across the oil and gas industry could reduce carbon emissions by 556 million metric tonnes per year - the equivalent of twice the annual CO2 emissions of the United Arab Emirates.

The partnership with Adnoc Gas and Al Masaood Energy comes after Gecko Robotics announced the opening of its new international headquarters in the UAE under the Ministry of Economy's NextGenFDI program which was launched to attract innovative solutions providers in the technology space to establish and scale operations within the UAE.

# Vital tech trends optimising wellsite ops in Middle East

A suite of technologies tailored for the region brings forward automated solutions for the wellsite and clean tunnel perforating systems that can significantly reduce opex, Patrick McKeever and John Creighton tell **OGN**

**O**il and gas remain a critical part of the global energy mix, with the Middle East region home to some of the world's top energy producers.

According to the International Energy Agency (IEA), energy investment in the Middle East is expected to reach approximately \$175 billion in 2024, with traditional energy supplies dominating the region's exploration and production (E&P) activities.

As Middle East operators pursue more complex, deeper reservoirs to access untapped energy resources in exploited fields, downhole perforating and completions technologies will be vital in securing the region's energy future and meeting global demand.

A suite of new and existing technologies tailored for the Saudi land market and Middle East operations brings forward automated solutions for the wellsite and clean tunnel perforating systems that can significantly reduce opex in an era of capital discipline.

Three innovative technologies in particular are helping oilfield companies overcome complex well challenges to optimise completions.

## REDUCING RIG TIME & CLEANUP COSTS

Perforating technologies have a major impact on efficient production operations. Technologies such as GEODynamics' Connex® can help oilfield companies in the Middle East tackle tighter, more complex conventional sandstone formations and make wells more productive for greater return on investment.

It's able to remove the perforation skin to restore a perforation tunnel to near virgin porosity and permeability.

This technological approach works by clearing out the compaction zone in a perforating zone.

A patented charge liner material is deposited along the tunnel, cleaning exothermically when introduced to heat and pressure.

This cleaning action creates significant pressure within and around the tunnel, breaking up and expelling the crushed zone compacted debris back into the well bore.

In sufficiently competent rock, fractures are also formed at the tunnel tip. Improved perforation cleanup delivers clear, open tunnels independent of rock type, promoting optimal flow paths between the reservoir and wellbore.

Using a proprietary flow laboratory, GEODynamics characterises shaped charges to meet an operator's specific requirements based on formation properties.

This engineered solution provides a solid understanding of the well performance expectations to help derisk projects.

Connex technology is currently used onshore in Oman and Saudi Arabia where new drilling techniques are targeting deeper reservoirs up to 25,000 ft, compared to the 2,000–3,000-ft depth of previously pursued reservoirs.

However, the more complex the well operation, the more time consuming it is to clean up perforation tunnels.

Eliminating the need to use the well stimulation tools that conventional perforating tools require effectively reduces rig time – saving as much as up to 48 hours in the EMEA region – and cleanup costs.

## STREAMLINING WIRELINE OPERATIONS

Saudi oil and gas operations are especially challenging, as companies must currently rig down and remove isolation equipment to accommodate wireline operations, increasing non-pro-



Saudi personnel implement Oil States' StageFrac isolation tool, demonstrating the company's increasing local content

ductive time (NPT) and costs in between stages.

Wellhead isolation enables operators to run wireline tools, perforating guns, plugs and other downhole operations without removing isolation equipment when switching between frac and wireline operations.

With a large bore tool such as Oil States' StageFrac™, operators can save three hours per stage of rig up/rig down time of their equipment, which equates to a full 24 hours of time-savings over eight stages. Fewer equipment moves also decreases safety risks for wellsite personnel.

In addition to substantial time savings, operators can enjoy greater adaptability to different styles of completions.

This provides increased operational flexibility across various types of wells.

The technology's simplicity also allows hydraulic setting tools to remain in place throughout wireline operations as well as frac operations, streamlining the entire process.

This can produce significant operational efficiencies, allowing operators to complete more stages while minimising NPT and increasing safety on site.

The Oil States Active Seat Gate Valve is often paired with StageFrac for Saudi operations, which provides a patented sealing mechanism that is technologically advanced compared to traditional gate valves due to its ability to exclude debris from the valve cavity while reducing the amount of grease required or lost during valve operations.

This reduces valve grease contamination and can cut costly valve repairs significantly while extending valve life.

Over a six-month period of standard operation, it's estimated that less than one pound of grease is lost per valve which not only eliminates typical greasing requirements during operations but also reduces maintenance downtime and prevents unwanted

grease downhole that could inhibit oil production.

## REMOTE WELLSITE MONITORING & CONTROL

Automation marks the next major evolution at the wellsite, freeing up personnel to work on higher-value tasks while also improving safety factors.

Wireless capabilities also eliminate the need for cumbersome cables or hydraulics, which helps reduce points of failure to streamline operations and reduce NPT.

Most important, automating wellsite operations can significantly reduce exposure to hazards that result in injuries or an industrial accident.

Remote operation proves even more valuable in difficult or remote environments where wellsite access may be limited.

ACTIVEHub™ is an automated digital platform that helps operators improve stage completion efficiency through remote monitoring, removing personnel from the red zone.

This advanced communication and control system employs ACTIVELatch™ technology, the industry's first battery-operated wireline latch enabling oilfield companies to remotely make and break wireline connections.

The ability to capture real-time information and control the latching process up to 75 ft away is an innovative way to automate wellsites in remote Middle East operations.

Additionally, downtime can be reduced by saving 20 to 25 minutes per swap from frac to wireline as compared to conventional methods of making wireline connections.

For complex, remote land operations in the Middle East, automation delivers significant benefits to enable safety and remote operation, efficient and continuous monitoring, and intelligent data collection and predictive maintenance.

## LOCAL CAPABILITY, GLOBAL ENERGY SECURITY

Oil and gas production remains a vital contributor to global energy security, even as the energy mix diversifies. The dynamics of today's production efforts require new solutions to help ensure the full oil and gas potential of the Middle East is realised.

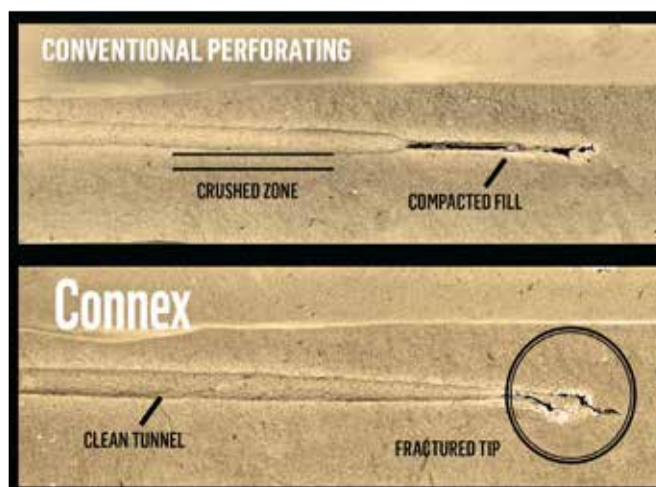
Minimising NPT and rig time while increasing safety and operational efficiency are paramount for the region as the industry evolves. Cost-effectively tapping into the region's unconventional reservoirs in addition to conventional oil and gas resources ensures continuity of production goals.

\* Patrick McKeever is the Business Development Manager for Oil States Energy Services. Over his 20-year career with the company, he's focused on optimising wellsite operations.

John Creighton is the Director of International Business Development and New Technologies for GEODynamics. Creighton's oil and gas industry experience spans more than 20 years, concentrated on Middle East production.



ACTIVELatch's remote capabilities promote greater site safety and reduced downtime



Rig time can be reduced by up to 48 hours with Connex

# Nabors at ADIPEC: Showcasing Mideast drilling transformation

Nabors is transforming drilling operations in the Middle East with solutions that digitalise, automate and lower the carbon footprint of drilling operations

At this year's ADIPEC in Abu Dhabi, Nabors Industries will be showcasing how its technology deployments are driving safer, more responsible, and consistently high performance for its customers.

Nabors continues to lead the global drilling industry by focusing on technological innovation, operational excellence, and safety.

With decades of experience and a strong international footprint, Nabors has been a key player in advancing the energy landscape, particularly in the Middle East.

Nabors is well-positioned and eager to continue supporting the region's energy ambitions, ensuring that operations are efficient, safer and environmentally responsible.

## RECENT WINS: GROWTH THROUGH STRATEGIC RELATIONSHIPS, NEW CONTRACTS & SIGNIFICANT ACQUISITIONS

Nabors recently announced an agreement to acquire Parker Wellbore, significantly expanding its Nabors Drilling Solutions business and solidifying the geographical footprint of its international drilling rig business.

The transaction, estimated to be completed in early 2025, will add a large-scale, high-performance tubular rental and repairs services operations to the Nabors portfolio.

Additionally, Parker's casing running business complements Nabors' own tubular services and affords the opportunity to migrate Nabors' integrated casing model.

Aside from the recent acquisition, Nabors has also secured a series of wins across its eastern hemisphere drilling operations, strengthening its position in multiple key markets and expanding its global footprint.

Among their most significant milestones is securing a major contract with the Kuwait Oil Company (KOC) for three ultra-deep 3,000 HP land drilling rigs.

Nabors has deep roots in Kuwait, with over a decade of successful operations in the country. This history has enabled the company to build a strong, trust-based partnership with the customer.

Equally notable is the re-engagement with Sonatrach in Algeria, where Nabors was recently awarded a four-rig contract with Sonatrach Division Forage.

This campaign marks a proud reunion as the two companies resume operations after a decades-long history of working together prior to the Covid-19 pandemic.

With the restart of the Algerian operation, Nabors has been able to support local businesses, provide job opportunities, and deliver training and know-how to the Algerian workforce.

Operations began in the first quarter of 2024, with the fourth rig starting work in the third quarter of 2024.

In the UAE, Nabors secured a contract extension with a major operator, supporting international growth momentum.

Through a recent drilling campaign for the customer, Nabors successfully delivered across performance objectives, including safety, efficiency, and efforts to lower emissions.

Nabors, through its Joint Venture with KazMunayGas (KMG) in the formation of KMG Nabors Drilling Company (KNDC), recently secured a five-year contract extension for its 700-series MAAC (Minimum Area AC) rig, which has been a cornerstone of operations in the region.

The rig achieved zero non-productive time (NPT) during the third quarter of 2024, an



Nabors rig in operation in UAE



Nabors' SmartROS® rig automation system elevating drilling operations

impressive accomplishment made possible through Nabors' advanced drilling technologies and commitment to operational excellence.

Nabors also re-entered the Libyan market through a partnership with a local oilfield service company, deploying its technology and solutions on multiple rigs. Operations began in the third quarter of 2024, with further deployments planned into 2025.

Beyond the Middle East, Nabors' Rig in Papua New Guinea continues to set new standards for drilling performance.

Following the successful completion of two challenging wells, this rig is now mobilised to one of the most complex wells in the customer's global portfolio.

Positioned 2,800 m above sea level, the upcoming well presents significant geological and wellbore challenges, requiring state-of-the-art drilling capabilities.

Upgraded with the SmartROS® automation technology and RigCLOUD® digital platform,

this 700-series MAAC rig is changing the way wells are drilled in this region, showcasing the next generation of rig automation and drilling technology.

## DRIVING AUTOMATION & DIGITALISATION IN DRILLING OPERATIONS

Nabors' SmartROS® rig automation system and the RigCLOUD® digital platform are further advancing drilling operations by providing real-time data insights and automation capabilities.

These advanced technologies can be scaled on any AC rig, not just Nabors rigs, and boost operational efficiency, reduce downtime, and ensure precise drilling performance, allowing drilling operations to achieve minimum to zero NPT.

Earlier this year, Nabors opened the doors to its new Saudi Arabia headquarters, which hosts a Rigline 24/7™ Center to provide best-in-class customer service and remote operations support for Nabors technology.

As importantly, Nabors was recently awarded a rig automation contract from Saudi Aramco to deploy drilling automation technology and related services.

The contract is significant as it marks the first rig automation project in this market.

## EXPANDING EQUIPMENT DEPLOYMENTS IN STRATEGIC MARKETS

Canrig, a division of Nabors, continues to expand its drilling equipment footprint in key markets like Kuwait, Oman, and Turkey by deploying cutting-edge equipment and technology.

This expansion includes a growing presence in offshore drilling operations, showcasing Canrig's commitment to providing best-in-class solutions across both onshore and offshore environments.

## DECARBONISING DRILLING OPERATIONS

Nabors portfolio also includes technologies to lower the carbon intensity of drilling operations.

One such solution is Canrig's ILLUMIC™ Lighting System which has enabled substantial savings in carbon emissions in the Middle East and Asia.

This approach aligns with the region's broader goals for sustainability and lower carbon footprints in energy production.

## SHOWCASING EXCELLENCE AT ADIPEC 2024

At ADIPEC 2024, Nabors will be highlighting these technologies, significant achievements and more.

Visit the company at Stand 6331, Hall 6, to meet with its experts and learn more about the future of drilling in the Middle East.



Nabors rig in operation in Algeria



# Temperature detection in hydrocracking process

Endress+Hauser's temperature solutions offer high-precision monitoring capabilities that help refineries optimise process efficiency, extend catalyst life, and manage operational challenges, Michele Pietroni tells **OGN**

**H**YDROPROCESSING is a fundamental operation in refineries, encompassing two major unit types: Hydrotreaters and hydrocrackers. These units process gas oils of varying boiling points to produce a range of refined products with diverse qualities and performances.

Hydrotreaters are the most common processing units in modern refineries, constituting nearly half of global crude distillation capacity.

The number of hydrotreaters worldwide is almost three times that of distillation columns, and the average annual growth rate (AAGR) for these units is projected at 2.6 per cent until 2027. Hydrocrackers, though less common, are expected to grow at a higher AAGR of 6 per cent in the same period.

Countries like China, the US, India, Russia, and Saudi Arabia account for 56 per cent of global hydrocracking capacity as of 2022.

In Asia, nations including China, India, South Korea, Thailand, and Japan contribute to 90 per cent of the region's hydrocracking capacity, which is anticipated to grow at 8.8 per cent AAGR until 2027.

"These developments are driven by rising fuel demand and increasingly stringent regulations aimed at producing cleaner fuels, including those derived from non-fossil feedstocks," Michele Pietroni, Industry Manager – O&G and Chemical, Endress+Hauser, tells OGN energy magazine.

## HYDROTREATING vs HYDROCRACKING: KEY DIFFERENCES

Although both hydrotreating and hydrocracking involve the use of high-pressure hydrogen and catalysts to remove contaminants from oil fractions, there are significant distinctions between the two processes.

Hydrotreating primarily removes sulphur, nitrogen, and oxygen without breaking carbon-to-carbon bonds, while hydrocracking breaks these bonds to produce lighter products with varied energy content and properties.

Another key difference lies in the oil conversion rates, where hydrocracking achieves lower conversion of feedstock into products.

Reactor design and temperature mapping are essential in both processes to optimise efficiency, but the complexity of hydrocracking demands a more intricate configuration due to the exothermic reactions involved in breaking carbon bonds and to control the heat release distribution from the reactor's design phase to its operation.

## HYDROCRACKING: SPECIFICATIONS & CHALLENGES

Hydrocrackers operate at higher pressures, use more catalysts, and have more complex reactor sections compared to hydrotreaters.

Controlling the heat distribution across the catalyst beds is critical, and precise temperature measurement is key to maintaining reactor performance.

High-density temperature measurement points within the reactor, such as those provided by iTHERM MultiSens TMS02 (capable of measuring between 2 to 16 points), are essential for accurate monitoring.

Because hydrocrackers have a lower conversion rate than desired, products are often recycled through the same or additional reactors to achieve conversion rates of up to 95 per cent. When processing heavier feedstocks containing olefins, aro-



iTHERM TMS02, customised configurations from the same standard product platform

matics, and sulphur, the temperature across the catalyst bed can rise by 70-90 deg C, making multi-bed reactor designs necessary to distribute heat and manage cooling.

In reactors with fixed catalyst bed reactor, achieving conversion rates of 65-70 per cent requires precise thermal mapping, especially considering the thermal stresses that can occur during operations.

The iTHERM ProfileSens TS901, with its multipoint measurement capability, offers a suitable solution for monitoring temperatures in these challenging environments, ensuring both accuracy and minimal interference with fluid streams across the bed with the right density of measurement points.

## CATALYST LIFE: INFLUENCING FACTORS & TEMPERATURE MONITORING

The catalyst plays a vital role in hydroprocessing, driving reactions with high efficiency and quality.

The lifecycle of catalysts, which can last anywhere from 12 to 60 months, is heavily influenced by thermal and mechanical stress.

Maintaining an optimal temperature distribution within the reactor can help extend catalyst life, which has a direct impact on the economics of hydrocrackers.

At the start of a reactor's cycle, temperatures across the catalyst bed are typically between 330 deg C and 350 deg C, with uniform radial temperature distribution and predictable axial gradients.

However, as the catalyst deactivates over time, temperature variations increase, forcing refiners to adjust feeding rates and inlet temperatures to maintain conversion rates.

Monitoring these changes with high-precision thermocouples like those from the iTHERM MultiSens family helps ensure that thermal stress is minimised through perfect instrument integration (thanks to the high level of customisation and engineering), prolonging catalyst life and optimising reactor performance.

## MANAGING CATALYST DEACTIVATION

Catalyst deactivation poses several operational challenges, including the need to increase inlet temperatures and feeding rates to maintain product quality.

Accurate temperature monitoring is essential for managing deactivation rates and ensuring that reactor components are not exposed to temperatures exceeding the maximum allowable structural temperatures, which could damage the reactor's internals.

Temperature sensors, such as iTHERM MultiSens TMS02, play a key role in monitoring critical reactor zones to prevent damage and plan timely maintenance shutdowns.

Additionally, excessive gas production from side reactions during deactivation can strain downstream gas-processing utilities, requiring operators to reduce feed rates or conversion levels.

Accurate temperature monitoring helps balance the trade-off between gas production, cooling hydrogen consumption and the quality of middle distillates. In extreme cases, shutting down the reactor to replace the catalyst may be more economical than continuing to operate at reduced efficiency.

The diagnostic chamber feature of the iTHERM TMS02 allows operators to monitor hydrogen injection effectiveness, providing real-time data on cooling efficiency in the catalyst layers.

It also helps detect early signs of process issues, such as micro-cracks in reactor components caused by sensor vibrations or corrosion from catalyst overheating.

## PRESSURE MANAGEMENT & STRUCTURAL INTEGRITY

As the catalyst bed becomes more fouled over time, pressure drops across the reactor increase, especially in the first catalyst bed, which is highly sensitive to fouling.

If pressure drops become too large, components like quench deck support beams can suffer thermal deformation, potentially affecting reactor performance and integrity of internals.

High-precision temperature sensors installed in critical reactor zones, such as those in the iTHERM MultiSens family, can help monitor and manage these issues, ensuring structural integrity and preventing costly shutdowns.

## FEEDSTOCK QUALITY & POISONING DETECTION

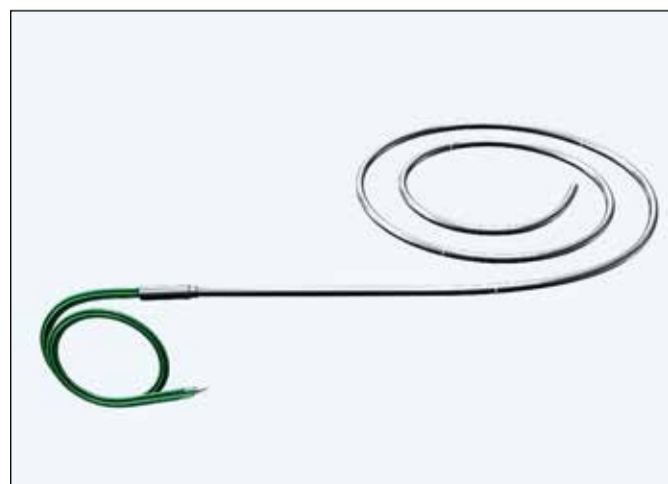
Sudden changes in feedstock quality, such as the introduction of residue that poisons the catalyst, can cause rapid fouling and sintering.

Early detection of these issues is possible through high-density temperature measurement points, enabling operators to take swift corrective action.

By identifying poisoned layers early, operators can remove contaminated catalyst layers and extend the life of the entire catalyst bed, minimising downtime and costs.

In summary, accurate temperature measurement and monitoring are crucial for the effective operation of hydrocrackers and hydrotreaters.

Endress+Hauser's iTHERM MultiSens and ProfileSens temperature solutions offer robust, high-precision monitoring capabilities that help refineries optimise process efficiency, extend catalyst life, and manage operational challenges such as catalyst deactivation and feedstock variations.



ProfileSens TS901 – multipoint cable sensor



Sensors entering in the reactor and running on supporting beams



Sensors routing along internals

# Sulzer leads way in GCC with carbon capture innovations

Sulzer's advancements in carbon capture and process solutions position it as a leader in the GCC's sustainable energy transition, Sunil Srinivasan and Khalil Sharara tell **OGN**

By **ABDULAZIZ KHATTAK**

**T**HE GCC region is embracing a brighter future with Sulzer leading the way in innovative carbon capture technologies, helping to transform its energy landscape for a more sustainable tomorrow.

With projects like a groundbreaking initiative at a major gas processing plant, the company is spearheading efforts to align industrial practices with sustainability goals in the region.

In an exclusive interview with **OGN** energy magazine Sunil Srinivasan, Country Manager UAE and Qatar, and Khalil Sharara, Head of Upstream Process Sulzer Chemtech Middle East, highlight how the UAE and GCC are navigating a crucial crossroads between energy production and environmental stewardship.

In an era where climate action is paramount, Sulzer is redefining the possibilities of carbon capture in the GCC.

Below are excerpts from the interview:

**Sulzer has been a key player in carbon capture projects, including the large-scale carbon capture initiative at a gas processing plant. How do you envision the adoption of carbon capture technologies in the UAE and GCC, especially with the region's reliance on fossil fuels?**

**Sharara:** That's a great question! Given the region's heavy reliance on fossil fuels, carbon capture technology will be crucial in balancing energy needs and sustainability goals. The UAE and GCC are already making strides toward integrating renewables, but fossil fuels will remain a major part of the energy mix for the future.

I am glad to announce that Sulzer is currently executing a large-scale carbon capture project in the Middle East, with a capture rate of 1.5 million tons of CO<sub>2</sub> per annum, making it one of the largest carbon capture projects globally.

Our Mellapak™ CC technology enhances the capacity and efficiency of the project, enabling us to capture larger volumes of CO<sub>2</sub> at a lower cost while maximising performance.

By optimising the capture process, Mellapak™ CC significantly reduces the carbon footprint of existing infrastructure.

By adopting innovative solutions like these, the region can move forward with its environmental objectives while still benefiting from its vast energy resources.

This dual focus on innovation and sustainability ensures that the UAE and GCC will continue to lead in both energy production and climate solutions.

**With the launch of your MellapakEvo™ structured packing, how do you foresee this innovation impacting industries in the GCC, particularly those focused on petrochemicals and refining operations?**

**Sharara:** The launch of MellapakEvo™ marks a significant leap in structured packing technology, and I believe it will have a transformative impact on industries in the GCC.

Our clients are continuously seeking ways to optimise their operations, reduce costs, and improve energy efficiency. MellapakEvo™ offers highly effective interfacial area promoting the mass transfer between the vapor and liquid phase to separate components in a distillation column.

At the same time, the pressure drop is kept to a minimum, thereby extending the useful capacity of the packing.

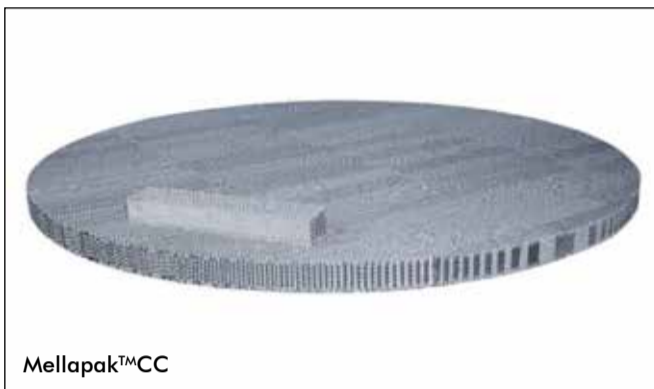
For greenfield projects, this innovation means lower capital expenditure allowing smaller column sizes and reduced overall equipment costs.

For revamp projects, with careful analysis of the existing column configuration and process conditions, MellapakEvo™ enables operators to boost throughput and lower energy consumption without major changes to existing equipment.

In a region where energy efficiency and sustainability are increasingly critical, the potential savings in operational costs and the ability to meet stringent environmental targets make MellapakEvo™ a powerful tool for the future of refining and petrochemical operations in the GCC.

**Sulzer has been instrumental in providing cutting edge mass transfer components such as trays and packings to the oil and gas industry. Are there any recent additions to your product portfolio to enhance your capability as a total process solution provider?**

**Srinivasan:** Indeed, Sulzer has been providing cutting-edge mass transfer components such as trays and packings for years,



Khalil Sharara



Sunil Srinivasan

but we've also expanded our portfolio to offer more comprehensive plug and play skid mounted process solutions.

Sulzer's process plant team has been involved in package business for quite some time, delivering complete, tailor-made solutions for a variety of applications such as solvent recovery, wastewater treatment, food and beverage, biofuels, biochemicals, oleochemicals and many more.

Recently, we've introduced a focus on upstream system technologies, which broadens our capabilities.

This includes skid mounted systems such as inline separation, advanced sand handling systems, and produced water treatment technologies.

Sulzer offers comprehensive support to customers, including feasibility studies, process and mechanical design, basic and detailed engineering, skid assembly, startup, and commissioning assistance, as well as after-sales support for skid-mounted systems.

These additions to our portfolio, position Sulzer as a total process solution provider, addressing challenges in the oil and gas industry.

**Tell us more about your Upstream System Business and about your recent success in the Middle East.**

**Srinivasan:** Sulzer's Upstream System Business focuses on delivering advanced solutions for upstream oil and gas operations, especially for multiphase separation, de-sanding and de-oiling systems, and produced water treatment technologies.

These systems are typically compact, modular units that, depending on size, can be truck mounted. The compactness minimises size, weight, footprint, and costs; particularly beneficial for brownfield and offshore production units, offering maximum mobility, easy installation, flexibility, and reduced risks.



A few of Sulzer's offerings include:

**HiPer™ TwinLine™ Separator and Degasser:** Patented compact inline gas-liquid separators in greenfield and brownfield debottlenecking operations.

**HiPer™ Deoiler Hydrocyclone:** Compact, cyclone-based technology for produced water deoiling, can be retrofitted for increased flow while maintaining acceptable pressure drop. The system complies with stringent environmental regulations, ensuring customer specific oil-in-water concentrations.

**HiPer™ Desander Hydrocyclone:** Compact, cyclone-based technology for produced water desanding. This can be used in conjunction with our HiPer™ Solid Removal Cyclones installed in multiphase separators.

**cMIST™:** licensed from ExxonMobil Upstream Research Company (EMURC) to Sulzer, cMIST™ can find its applications in high pressure compact gas processing systems significantly reducing the capex.

**Success story:** We recently achieved success with two major projects supplying eight skid-mounted sand treatment systems for a major offshore oil and gas producer in the region, utilising our compact HiPer™ Desander cyclone.

These tailored, high-performance solutions meet customer's specific demands and reinforces Sulzer's commitment to support customers with reliable, turnkey systems.

**Within Sulzer, we note that you have capabilities, not only on supplying high-quality engineering services and manufacturing of components, but also providing specialist services at site, can you explain more on this and what advantages this gives to your customers?**

**Srinivasan:** Sulzer has a specialised Tower Field Service team with extensive expertise in vessel and tower internals for both Sulzer and non-Sulzer equipment.

They are very active across the GCC on tower works, such as revamps, retrofits, or corrosion protection, where we can provide a streamlined solution to ensure minimal downtime to our customers.

Our field service expertise enables fast response and additional support for installation and service requirements, including automated weld overlay technology for improved corrosion and high-temperature resistance.

Both the tower field service and customer support teams are based on-site to provide technical advice to customers, address supply chain bottlenecks and ensure timely service.

**At its Capital Markets Day 2024, Sulzer's emphasised growth, excellence, and value creation. What investment plans does Sulzer have specifically for the GCC region, and how do you plan to navigate the unique economic challenges and opportunities in the Middle East?**

**Srinivasan:** Our focus is on providing innovative solutions, and for that, we need talented people. We're rapidly growing and expanding our team in Saudi Arabia, UAE, Bahrain, and other GCC countries, bringing in skilled engineers both local and international.

Specifically in Saudi Arabia, we've recently opened a new office to respond faster to emergency customer needs for service and equipment.

This expansion supports our long-term strategy to enhance local capabilities and meet the region's evolving needs around process solutions and services in wide variety of industries.



Sulzer's compact HiPer™ Deoiling Hydrocyclone skid and (right) compact HiPer™ TwinLine™ separator (inline separation)

# Innovar offers cost-effective, wellbore and BOP cleaning

Innovar Solutions revolutionises wellbore cleaning and fishing operations with advanced magnet technology and innovative tools, significantly reducing costly non-productive time and enhancing operational efficiency for oil and gas operators, Qamar uz Zaman tells **OGN**

**W**ELLBORE debris is blamed for a third of all failed completions runs globally. The effects of debris could result in multiple runs being required to set and test the completion, wireline or coil type mechanical or inflatable bridge plugs.

For the operator, these are costly additional runs, unnecessary NPT resulting in lost revenue.

For fishing operations, conventional fishing techniques require expensive bottom hole assemblies (BHA), the unknown if the fish has been engaged resulting in potentially multiple runs so costly operations, expensive non-productive time (NPT) resulting in lost revenue.

For blowout preventers (BOP) cleaning, conventional techniques utilize a jetting sub, but these have the potential to damage seals and or the seal face from water cutting resulting in the BOP being removed and dismantled so costly repairs and lost revenue.

"Innovar Solutions has an alternative solution for wellbore cleaning, fishing, and BOP cleaning. We provide field-proven, highly successful easy to use magnets for wellbore cleaning and fishing operations to assist our customers increasing up-time and reducing costs," says Qamar uz Zaman, the company's Operations Manager for the Middle East.

"With 25 years' experience in design, development, manufacturing of high-quality products and developed for harsh environments, Innovar Solutions has an alternative solution for wellbore cleaning and fishing," he says.

For BOP cleaning, Innovar Solutions has developed through R&D and experience its WirlTool, which generates a venturi effect when the horizontal flow passes the BOP cavities, sucking out debris from these.

Combined with Innovar's powerful Magnum and Innomag magnets, customers are ensured the most efficient well cleaning assembly available.

The key features of Innovar's aforementioned tools include:

- Laser-focused magnet technology directing the magnetic field towards the fish ensuring all energy used to catch the fish.
- Strongest magnet available on the market means a significantly higher lifting/cleaning force, as well as eliminating the magnetic field causing friction towards the tubing wall when running on wireline.
- Extreme magnet range due to the large magnet mass.



Qamar uz Zaman

- The large magnetic area is covered in stainless steel to make maintenance and cleaning easy.
  - Large fluid bypass.
  - Highest BHT magnet available on the market.
  - Multiple Innomag string magnets can be run together to remove debris in one trip reducing the need for multiple runs.
  - Innovar magnets run deeper, fish heavier objects and can be mobilized by helicopter.
  - The Innovar WirlTool for cleaning BOPs creates a powerful circular flow pattern that establishes a vortex that draws/pulls debris out from the BOP cavities and crevices.
  - The INNOClean scraper/brush combination clean-up tool, compact and cost-efficient dual scraper/brush design is built on well proven wellbore cleaning concepts. The dual brush system secures a full polishing effect of the production packer setting area.
  - CableSafe® is a step change in cable protection. It minimises the risk of costly fishing jobs, and efficiently secures cables, eliminates weak points like hinges and exposed bolts, and allows efficient operation on the rig.
- CableSafe® is fully qualified to required standards and is superior to all known values specified in qualification requirements developed for traditional clamps. It can be installed efficiently and safely to the tubing and prepared for future robotised installation.
- Furthermore, IATA-approved air transportation shields are available for quick mobilisation to reduce time waiting for equipment.
- Innovar is an ISO certified company.

*Innovar Solutions has 25 years of experience in design, development and manufacturing of high-quality products for harsh environments, and offers alternative solutions for wellbore cleaning and fishing*



The WirlTool cleaning tool draws debris from BOP cavities and crevices



A Magnum fishing magnet ... feature laser focus magnet technology



The Innomag string magnet with extreme magnet range

# JCV successfully holds truck solutions expo in Abha



New and pre-owned trucks, trailers, and applications were on display

**J**UFFALI Commercial Vehicles recently celebrated the success of its Truck Solutions Exhibition in Abha.

The event drew a diverse group of professionals, transportation companies, and key stakeholders from the Southern Region.

Industry Prot featured a comprehensive display of new and pre-owned trucks, trailers, and applications, showcasing the latest innovations and solutions that cater to the unique needs of the Saudi market.

Visitors explored a wide range of pre-owned vehicles and specialised applications, highlighting JuffaliTrucks's commitment to offering versatile, reliable, and cost-effective solutions.

The inclusion of pre-owned trucks, trailers, and applications provided attendees with a broader selection of products to meet operational and budgetary requirements.

Attendees expressed strong interest in the diverse offerings, particularly the exclusive promotions available during the event.

JuffaliTrucks's team of experts provided personalised consultations, guiding customers through the features and benefits of both new and pre-owned vehicles and making tailored recommendations for optimising fleet performance.

Heiko Schulze, CEO of Juffali Commercial Vehicles, emphasised the importance of the event.

He said: "This exhibition showcased not only our latest truck solutions but also high-

lighted our commitment to offering a wide range of products such as pre-owned trucks, trailers, and applications. The positive feedback we received reflects the trust our customers place in us, and we are dedicated to providing solutions that enhance their business operations."

Mohammed Alwardat, Director of JuffaliTrucks, added: "Including pre-owned trucks, trailers, and applications was a key aspect of this event, allowing us to meet the varying needs of our customers. We are proud to offer a broad portfolio of high-quality and cost-efficient products, ensuring our clients'



Mohammed Alwardat, Director of JuffaliTrucks



Heiko Schulze, CEO of Juffali Commercial Vehicles

continued success."

The event further solidified JuffaliTrucks' position as a market leader in providing pre-owned commercial vehicle solutions in

Saudi Arabia.

With a focus on innovation, reliability, and customer satisfaction, Juffali continues to raise the bar in the transportation industry.



Visitors exploring a wide range of pre-owned vehicles and specialised applications



Participants at the Truck Solutions Exhibition in Abha

# Steam turbines drive energy efficiency in oil industry shift

The oil and gas industry's challenges are accelerating the adoption of energy-efficient technologies, with steam turbines playing a key role in optimising steam balance and utilisation for enhanced sustainability and reduced emissions

By ABDULAZIZ KHATTAK

**S**TEAM turbines play a crucial role in the oil and gas industry, particularly within petroleum refineries.

These turbines can be classified as backpressure or condensing types, with configurations that include extraction capabilities, depending on the specific design of the plant cycle. In refineries, steam turbines are versatile, serving as mechanical drivers for pumps and compressors, as well as generating power when coupled with alternators.

Additionally, combined cycle systems that incorporate both steam and gas turbines can be tailored for optimal performance, whether for electrical load matching or thermal load matching.

This adaptability allows refineries to enhance their efficiency and meet varying operational demands.

In this context, Triveni Turbines Limited (TTL) is making significant strides in the API segment of the industry.

Recognising the growing need for energy and sustainable technologies amidst a volatile geopolitical landscape, TTL is partnering with leading EPC firms and original equipment manufacturers (OEMs) to deliver high-efficiency steam turbine solutions.

TTL continues to invest in research and development, with recent successes including high-speed, high-power-density models that enhance the compactness of turbine-generator packages.

The company has installed numerous high-speed turbines, operating at speeds of up to 12,000 rpm, which maintain high reliability and efficiency in various installations.

Additional R&D initiatives focus on developing high-efficiency low-pressure (LP) modules tailored to new requirements, improving high-pressure (HP) blading, and introducing innovative sealing technologies, all aimed at advancing the application of steam turbines.

TTL boasts a significant installed base of API steam turbines under 100 MW across petroleum refineries globally, with numerous installations already commissioned and a robust pipeline of projects planned for commissioning in the coming years.

## REFERENCE CASES FOR PETROLEUM REFINING INDUSTRY

1. TTL supplied a project in Kuwait with four



One of TTL's turbine generators for a Kuwaiti NOC

each of 1.5 MW and 2.7 MW back pressure steam turbine generators (STG) for drive applications.

• **Project description:** The contract, for a national oil company and a leading petroleum refining company in Kuwait, included design, supply, and commission an API 612 steam turbine for use in fan drive applications and as per shell design engineering practices (DEP) plus AMEC FW project variations. Each steam turbines power four combustion air blowers and flue gas fans respectively for the world's largest reformer package.

• **Challenge:** These special purpose steam turbines were designed, manufactured and tested as per the project specifications, which includes design for outdoor installation, ensuring a minimum design metal temperature suitable for -30 deg C, and meeting the classification for electrical hazard area Zone 1, IIC, T3.

• **Solution:** The supplied steam turbines have a design life of 30 years and 6 years of continuous operation. The supply scope also encompassed gear units, lube oil systems, unit control panels, and gland steam condensers. The project was commissioned successfully to meet

the specifications.

2. A project in India is driven by TTEs 3.6-MW back pressure STG for drive applications.

• **Project description:** In a contract from a national oil company and a major petroleum refining company in India, TTL designed, supplied, and commissioned an API 612 steam turbine for use in compressor drive applications.

• **Challenge:** The steam turbines were designed to meet the project specifications, featuring instrumentation appropriate for electrical hazard areas and high-humidity environments. The steam turbines, clutch, coupling and driven equipment were mounted on a common base frame that complies with applicable standards.

• **Solution:** The steam turbines were successfully mounted on a common base frame in compliance with API RP 686 standards. They were supplied to the customer with advanced governing and control systems (including the Woodward FT 5009 TMR Governor and MOOG Hydraulic actuator) to drive an induction generator/motor and compressor. Additionally, they feature instrumentation suitable for Zone 1, IIC, T3, and high-

humidity environments.

3. TTL supplied a 3.85-MW extraction condensing STG for drive applications in Australia.

• **Project description:** TTL was awarded a contract by a major chemical and fertiliser company in Australia to design, supply, and commission an API 612 steam turbine for use in boiler feed water (BFW) pump drive applications.

• **Challenge:** The steam turbines were designed to meet project specifications, accommodating necessary variations in extraction flow. Additionally, they will integrate advanced materials designed to withstand seawater as a cooling medium, ensuring adherence to all applicable standards.

• **Solution:** The steam turbines, mounted on a steel structure, were engineered to withstand nozzle loads up to 5.5 times those specified by NEMA SM23. Seawater, with a fouling factor of 0.000172 m<sup>2</sup>K/W, is used as the cooling medium, necessitating the use of titanium for both the condenser tubes and tube sheets. The steam turbines feature an adjustable extraction flow ranging from 0 TPH to 9 TPH to meet the plant's process requirements, all while ensuring full compliance with Australian standards.

4. TTL supplied a 33-MW straight back pressure STG for power generation applications in the UAE.

• **Project description:** TTL secured a major contract from a national oil company and a leading petroleum refining company in the UAE to design, supply, and commission an API 612 steam turbine for a power generation application.

• **Challenge:** The steam turbines were designed to meet the project specifications, which involve designing the turbine to operate at high ambient temperatures of 54 deg C and with an inlet pressure of 38.5 bar, inlet temperature of 398 deg C, exhaust pressure of 6.5 bar. The turbines were also equipped with instrumentation suitable for high hazardous area classification. Amidst strong competition from European turbine manufacturers, TTL provided the necessary support to the customer in meeting the desired technical requirements and emerged as the preferred vendor for this critical project (non-stop equipment package without standby).

• **Solution:** TTL partnered with a reputable Spanish EPC company from the front-end engineering design (FEED) phase through to the EPC bidding stage. The project's design parameters would be met by engineering the turbines to operate under extreme ambient conditions of 54 deg C, utilising a closed air circuit air-cooled (CACA) generator, incorporating lube oil cooling, ensuring compliance with high hazardous area classification, and implementing triple modular redundant (TMR) governor technology.

## CONCLUSION

The global oil and gas industry's current challenges have catalysed a crucial shift towards the adoption of energy-efficient technologies, bringing substantial benefits to petroleum refineries, chemical plants, and petrochemical facilities by significantly lowering their carbon footprint and operational costs.

Achieving global energy efficiency and net-zero emissions will require a concerted effort from policymakers, energy-intensive industries, energy agencies, EPC contractors, process licensors, and OEMs, working in unison to enhance the global energy infrastructure and guide nations toward a more sustainable future.

In this context, steam turbines play a crucial role in achieving these goals, as optimising steam balance and maximising steam utilisation have become critical design considerations.



A 3.6 MW STG ready for dispatch to a client in India

# EIM launches Bestune SUVs for KSA energy professionals

The robust vehicles are tailored for Saudi Arabia's oil and gas professionals, combining durability, performance, and exceptional customer service to meet demanding industry needs

**E**MPIRE International Motors (EIM), an automotive distributor in Saudi Arabia established last year, has introduced Bestune SUVs as tailored mobility solutions for professionals in the oil and gas industry and energy sector.

These rugged and versatile vehicles are designed to excel in demanding work environments, offering a combination of durability, reliability, and performance.

As the official distributor of Bestune, a renowned Chinese automotive brand, EIM offers a diverse range of high-quality vehicles that provide a premium automotive experience, backed by exceptional customer service.

Bestune offers a diverse range of vehicles that cater to the needs of Saudi drivers. From stylish sedans like the B70 to versatile SUVs like the T77, T99, B70S, and the upcoming T90, Bestune's models are designed to provide both comfort and performance.

The vehicles' durability, efficient fuel consumption, and advanced safety features make them well-suited for the challenging conditions of the Kingdom, said EIM.

Bestune SUVs are built to withstand tough conditions, including rough terrain, heavy loads, and extreme weather.

Equipped with advanced four-wheel drive systems and high ground clearance, these vehicles can navigate challenging remote oil and gas sites with ease.

The spacious cabins of Bestune vehicles provide ample room for tools, equipment, and passengers, making them ideal for transporting crews and materials.

Powered by robust engines that deliver the necessary torque and horsepower, Bestune vehicles offer the performance needed to tackle tasks in the energy sector efficiently.

Despite their powerful engines, these vehicles are designed to be fuel-efficient, helping energy professionals reduce operating costs.

Safety is a top priority for EIM, and Bestune vehicles come equipped with a range of advanced safety features to protect drivers and passengers on the job.

EIM ensures that all vehicles sold are covered by comprehensive warranties. Customers also benefit from flexible financial tools, three- or five-year fixed service contracts, insurance options, and attentive after-sales services, providing them peace of mind throughout their purchasing journey.

Aligned with Saudi Vision 2030, EIM said it is committed to fostering economic growth and promoting sustainable mobility solutions.

By introducing advanced and energy-efficient



Bestune offers a diverse range of vehicles

As a member of the Al Haddad Group, which includes Al Haddad Motors that distributes premium brands like Mercedes-Benz in Bahrain, EIM benefits from expertise, trust, and a legacy of excellence in customer service that

includes an in-house training school.

EIM said it is committed to building long-term relationships with its clients by offering innovative automotive solutions and unmatched customer service.

vehicles like Bestune, the company is contributing to the modernisation and sustainability goals outlined in the Kingdom's ambitious development plan.

By choosing Bestune vehicles, oil and gas industry professionals can benefit from a reliable and durable automotive partner that is tailored to meet the demands of their industry.

EIM's commitment to providing exceptional customer service and comprehensive after-sales support further solidifies its position as a trusted choice for oil and gas professionals in Saudi Arabia.

EIM was established last year as part of the Bahrain-based Al Haddad Group. Its state-of-the-art facilities and trained staff ensure that customers receive a high-quality service.

The aftersales team can handle maintenance, repairs, and any other service needs, guaranteeing that customers' vehicles remain in optimal condition.

These facilities in the Eastern Province offer new and used car sales, after-sales services, alongside of trade-in facilities and a fully stocked spare parts department.

The facilities are equipped to provide comprehensive support for customers, ensuring they have access to everything they need for a seamless experience.



EIM is part of the Bahrain-based Al Haddad Group



Bestune is well-suited for KSA's challenging landscape



Bestune vehicles are fuel-efficient despite their powerful engines

# Measurement, standardisation role crucial in green hydrogen

As green hydrogen emerges as a cornerstone for low-carbon energy, precise measurement and standardisation are vital for driving investment, fostering innovation, and achieving global net-zero targets by 2030, Frank Janssens tells **OGN**

**W**ITH sustainability firmly anchored in the Middle East's strategic ambitions and beyond, we are at a crucial juncture where green hydrogen is emerging as a cornerstone in our pursuit of low-carbon energy solutions.

"As we approach 2030, the role of precise measurement and standardisation in this sector is critical—not just for technical accuracy but also for accelerating business impact, investment attraction, and fostering international collaboration," Frank Janssens, Vice-President of Sales and Managing Director of KROHNE Solutions, tells **OGN** energy magazine.

Green hydrogen, produced through the electrolysis of water powered by renewable energy, is inherently free from carbon emissions, making it indispensable to achieving global net-zero targets.

This clean energy source is incredibly versatile, finding applications in transportation, industrial processes, and energy storage.

For the Middle East, aligning these applications with visionary frameworks like Saudi Vision 2030 and the UAE's ambitious clean energy goals is essential in transforming the region into a global hub for sustainable development.

## THE ROLE OF MEASUREMENT & STANDARDISATION

In the evolving landscape of green hydrogen, measurement and standardisation are more than just technical requirements; they are strategic enablers of growth, innovation, and global collaboration.

This focus will be a recurring theme at major industry gatherings, such as ADIPEC 2024, as well as in broader sustainability dialogues under the Alliance for Industry Decarbonisation and campaigns like the United Nations Global Compact's #ForwardFaster initiative.

Safety is paramount when dealing with hydrogen due to its flammability and storage challenges.

Standardised measurement protocols are critical in assessing hydrogen's purity, pressure, and quality, significantly reducing the risks of leaks or accidents.



Frank Janssens

Organisations like the International Organisation for Standardisation (ISO) and the International Electrotechnical Commission (IEC) provide the guidelines that govern these processes.

By ensuring that we adhere to these stringent standards, we foster stakeholder trust and reinforce the credibility of green hydrogen as a safe and reliable energy alternative a message that will resonate strongly at events like ADIPEC and the World Future Energy Summit.

For green hydrogen to achieve its potential as a global commodity, the harmonisation of measurement and certification standards across different regions is essential.

This alignment supports the vision outlined in Saudi Vision 2030, aiming to transform the Kingdom into a leader in renewable energy and clean technologies.

Establishing a unified set of standards not only facilitates international trade but also drives economies of scale, ultimately reducing

production costs and speeding up the adoption of green hydrogen technologies.

This strategic focus on standardisation is a driving force behind the United Nations Global Compact's #ForwardFaster campaign, encouraging industries worldwide to align their decarbonisation efforts with shared global goals.

Standardisation acts as a catalyst for innovation by creating a level playing field where companies can develop and refine their technologies with clear benchmarks.

Consistent measurement protocols allow researchers and industry leaders to validate their findings, accelerating technological advancements in green hydrogen production, storage, and application.

Platforms like the Alliance for Industry Decarbonisation are pivotal in creating these frameworks, enabling businesses to share best practices and collaborate on innovative solutions that are scalable and globally applicable.

## STRATEGIC PATHWAYS TO 2030 & BEYOND

As we navigate toward 2030, our focus on measurement and standardisation will significantly influence the scalability and integration of green hydrogen into mainstream energy markets. But what are some key areas where these principles will drive tangible business impact?

Investment in green hydrogen infrastructure is a fundamental pillar of scaling its adoption. By leveraging standardised metrics such as the levelised cost of hydrogen (LCOH), investors gain clear insights into the performance expectations and economic viability of projects.

This clarity is critical for guiding investments in a way that aligns with the ambitious decarbonisation targets set out in Saudi Vision 2030 and global initiatives like the United Nations Global Compact's #ForwardFaster campaign, which emphasises the urgency of accelerating climate action.

Green hydrogen's potential to revolutionise sectors from transportation to heavy industry is contingent on the consistency and accuracy

of its measurement standards.

For industries aiming to meet their decarbonisation targets, these benchmarks are essential for evaluating progress and making informed decisions about energy transitions.

Landmark sustainability events such as the World Green Economy Summit in Dubai provide a global stage for sharing these achievements, underscoring how measurement technologies can act as catalysts for large-scale industrial transformation.

Effective international collaboration is fundamental for establishing green hydrogen as a globally accepted energy source.

Platforms like the International Renewable Energy Agency (IRENA) and initiatives led by the Alliance for Industry Decarbonisation foster cross-border cooperation, enabling countries to align their policies and technologies with global standards.

By integrating these best practices into regional strategies like Saudi Vision 2030, we create a unified approach that stimulates innovation, attracts investment, and enhances the competitiveness of green hydrogen on a global scale.

While the promise of green hydrogen is substantial, there are several challenges that must be addressed to fully realise its potential.

Diverse regulatory frameworks can pose significant obstacles to the widespread adoption of green hydrogen.

Creating a cohesive set of standards that accommodates local nuances while aligning with global best practices is crucial.

This harmonisation will be a focal point in dialogues at ADIPEC and other industry gatherings, where stakeholders work towards bridging regulatory gaps.

From production efficiency to storage and distribution logistics, technical challenges remain a significant hurdle.

Standardised measurements will provide the foundation for consistent evaluations, enabling breakthroughs in overcoming these obstacles.

Moreover, establishing economic viability through clear cost metrics will be key to attracting sustained investment, ensuring that green hydrogen remains a financially competitive alternative in the evolving energy landscape.

## MEASURING THE FULL POTENTIAL OF GREEN HYDROGEN

As we look toward 2030 and beyond, the green hydrogen sector stands at the forefront of the global energy transition.

Measurement and standardisation are not merely technical requirements; they are strategic imperatives that will determine the sector's growth, innovation potential, and market impact.

The focus on these principles, emphasised through initiatives like the Alliance for Industry Decarbonisation and the United Nations Global Compact's #ForwardFaster campaign, will be crucial in turning ambitious sustainability goals into concrete realities. By investing in robust measurement frameworks, fostering international cooperation, and aligning our regional strategies with global standards, we can unlock the full potential of green hydrogen.

"Here at KROHNE, we firmly believe that our collective commitment to these principles will shape a more sustainable, economically resilient future for the region, positioning the Middle East as one of the changemakers and global leaders in the green hydrogen revolution," Janssens concludes.



Measurement and standardisation will significantly influence the scalability of green hydrogen

# Using commercial diplomacy to drive decarbonisation

By addressing the regulatory, technological, financial, and societal aspects of methane emissions, stakeholders can move toward meaningful progress in decarbonisation and a more sustainable future, Aida Araissi tells **OGN**

By **ABDULAZIZ KHATTAK**

As the world grapples with the pressing challenges of climate change, it has become increasingly clear that addressing these issues requires robust international collaboration and a comprehensive strategy that strengthens connections among all players in the global ecosystem.

“We are witnessing a profound shift in the global energy landscape, driven by climate change, technological advancements, and geopolitical uncertainties. While we are transitioning to more sustainable energy sources, emissions continue to rise alongside the development of global economies,” says Aida Araissi, the CEO and Founder of the Bilateral Chamber of Commerce, tells *OGN* energy magazine.

These challenges have led to a convergence of agendas, prompting businesses to rethink their strategies and adopt new approaches to remain relevant and resilient.

The complexities of methane emissions arising from diverse sources such as oil and gas operations, agriculture, and landfills exemplify the need for coordinated action across sectors.

Methane is not the only concern.

Issues like flaring, carbon capture, utilisation, and storage (CCUS), and the broader decarbonisation of energy systems necessitate system-wide collaboration.

Araissi emphasises that tackling these challenges effectively demands an approach that unites stakeholders whose goals may be mutually exclusive or even contradictory, and who do not engage with one another directly, at least not often from governments to industry leaders and local communities.

The “wicked problem” concept aptly describes the energy transition, involving various factors that require input from sectors historically sidelined in energy discussions.

## THE IMPORTANCE OF ECOSYSTEM-WIDE COLLABORATION

Bridging traditional and emerging energy domains is crucial for addressing systemic emission issues. The Bilateral Chamber of Commerce has been at the forefront of facilitating these collaborations for over 25 years.

By leveraging its extensive network, the Chamber helps bridge the gaps among various sectors, forging partnerships that can lead to effective solutions for the energy transformation.

These connections are essential at every level



Aida Araissi

not only top-down through large-scale government investments but also bottom-up, forged between the individuals working in the industry and those supporting them.

Initiatives like the Methane Abatement Reverse Trade Missions illustrate how collaborative approaches can introduce cutting-edge technologies to countries facing these challenges, encouraging the implementation of best practices.

Through its collaboration with the US Trade and Development Agency (USTDA), the Bilateral Chamber’s mandate spans 15 countries across five global regions, including Mena, Latam, the Indo-Pacific, Central Asia, and Sub-Saharan Africa.

The goal is to introduce the latest technologies, financial resources, and services for methane emission reduction, encompassing flare gas utilisation solutions, waste-to-energy (WTE) technologies, and biogas and biomethane solutions.

## ADDRESSING THE COMPLEXITY OF METHANE EMISSIONS

Methane emissions are a global challenge that transcends borders, necessitating coordinated action on an international scale.

Effectively tackling these emissions demands a multifaceted approach that combines technological innovation, robust regulatory frameworks, and the active involvement of stakeholders at all levels.

New regulations establishing clear emission targets and mandate reporting can enhance transparency and accountability, empowering stake-

holders to monitor progress and hold companies accountable for their environmental impact.

These regulations do more than ensure compliance; they also stimulate innovation and investment in low-carbon technologies, solutions, and practices.

By creating a regulatory environment that rewards emissions reductions and incentivises clean energy investments, effective regulations drive meaningful progress in the transition to a sustainable future.

However, as Araissi emphasises, regulations and technological advancements alone are insufficient.

There is an urgent need for collaboration across the entire ecosystem, fostering partnerships among governments, businesses, research institutions, and civil society organisations.

In particular, understanding societal concerns is vital; these extend beyond health and safety to include environmental protection, habitat preservation, and the safeguarding of local biodiversity.

Recognising that there are no one-size-fits-all solutions is crucial, as community well-being is interpreted differently around the world and shaped by distinct socio-cultural values and priorities.

These diverse perspectives must be acknowledged and respected in any approach to emissions reduction and environmental initiatives.

Engaging with local communities directly affected by methane emissions can not only yield valuable insights but also cultivate a sense of ownership and accountability over mitigation efforts.

Furthermore, societal stakeholders provide essential knowledge and context, enriching the dialogue around these critical issues.

## OVERCOMING BARRIERS TO ADOPTION

While significant progress has been achieved in developing and deploying new technologies aimed at reducing emissions, there is an increasing awareness that the current pace of deployment may fall short of meeting ambitious climate goals.

Many emerging technologies remain unready or unscalable, necessitating further validation before they can be implemented on a larger scale.

Additionally, market adoption is often hindered by regulatory frameworks and investment incentives that do not sufficiently support innovation.

High upfront costs and perceived risks associated with these new technologies can deter potential investments and slow deployment efforts.

To drive investment in clean energy technologies and effectively address these barriers, financial incentives, and funding mechanisms are crucial.

Overcoming these challenges will require collaboration among governments, businesses, and civil society organisations to foster an environment that promotes innovation and facilitates deployment.

A comprehensive strategy that addresses regulatory, technological, financial, and societal dimensions is essential to unlocking further opportunities for emissions reduction.

## LOOKING FORWARD

“The future of methane abatement and other emission reduction technologies hinges on our ability to expand collaborative initiatives across industry sectors and various global regions,” says Araissi.

Introducing advanced technologies for methane reduction such as flare gas utilisation solutions and biogas technologies can empower countries to manage their emissions more effectively.

Araissi stresses that the bridges need to be built across these different groups by facilitating dialogues, fostering collaboration, and advocating for methane reduction efforts among diverse stakeholders to build consensus around methane abatement strategies.

Continued investment in research and development is vital to identifying and refining innovative gas capture and emission reduction technologies.

The Bilateral Chamber’s role in facilitating dialogue among diverse stakeholders positions it as a valuable partner in these efforts.

By fostering partnerships that bridge different sectors, the Chamber aims to help create more effective solutions benefiting not just the energy industry but also local communities and the environment.

Engaging with community leaders and conducting outreach programs empowers stakeholders at all levels, fostering a sense of accountability and shared responsibility in methane reduction efforts.

“By addressing the regulatory, technological, financial, and societal aspects of this challenge, stakeholders can move toward meaningful progress in decarbonisation and a more sustainable future,” concludes Araissi.



ExxonMobil subsidiary XTO Energy field personnel provided Mena delegates with a demonstration of the advanced optical gas imaging (OGI) cameras that ExxonMobil has deployed in the Permian Basin to detect methane leaks



In the Permian Basin, Chevron field personnel provided Mena delegates from Algeria, Egypt, and Libya with a hands-on demonstration of methane leak detection and monitoring stations deployed at tank batteries and well sites



Prioritising both immediate operational needs and long-term environmental responsibilities can help pave the way toward a resilient, sustainable energy future, says Johan Helberg, Head of Sales, Aggreko, Africa

# Key to sustainability: Adapt fast, innovate constantly

**I**N the intricate realm of global energy dynamics, the concept of the energy trilemma has emerged as a guiding principle.

This framework encapsulates the complex balance between three critical components: Energy security, environmental sustainability, and energy equity.

Striking a harmonious balance among these elements is paramount for achieving a resilient and sustainable energy future.

The challenges and opportunities inherent in this trilemma are particularly pronounced in high-demand industries such as mining and oil and gas, where the quest for innovative, reliable energy solutions is both urgent and indispensable.

## THE ENERGY TRILEMMA: A COMPLEX BALANCING ACT

- **Energy security:** For industries like mining and oil and gas, energy security is crucial. These sectors demand a stable and continuous supply of energy to maintain operational efficiency and productivity.

Interruptions in energy supply can lead to significant financial and operational setbacks. Thus, ensuring a resilient infrastructure capable of adapting to demand fluctuations and supply chain disruptions is vital.

- **Environmental sustainability:** Industries are under increasing pressure to reduce their environmental footprint. The mining and oil and gas sectors are particularly scrutinised due to their traditionally high emissions and ecological impacts.

Innovative solutions that reduce carbon emissions and operate more sustainably can simultaneously address environmental concerns and enhance industry reputation and compliance with regulatory standards.

- **Energy equity:** Providing equitable access to energy resources ensures that operational benefits are widespread, extending beyond immediate economic gains to include community well-being and regional stability. Equitable access is vital for fostering positive relationships with local communities and stakeholders, particularly in regions where resource extraction occurs. Balancing the energy trilemma within industries such as mining and oil and gas requires targeted solutions reflecting each sector's unique demands and constraints:

- **Hybrid energy solutions:** Both oil and gas and min-

ing operations, often situated in remote areas, face unique challenges regarding energy security and cost.

Hybrid systems that integrate solar power with traditional diesel or gas generators offer a robust solution, reducing reliance on costly and carbon-intensive diesel fuel while ensuring consistent energy supply.

Solar arrays can be deployed alongside existing infrastructure, providing an immediate sustainability boost without compromising operational reliability.

- **Efficiency and flare reduction in oil and gas:** The oil and gas industry, a significant contributor to greenhouse gas emissions through activities like flaring, can benefit from technologies that convert waste gases into usable energy.

By implementing flare-to-power solutions, companies can significantly reduce their emissions, turning environmental liabilities into operational assets.

This not only enhances sustainability but also provides economic benefits through reduced costs and improved energy efficiency.

- **Decentralised energy systems:** Both mining and oil and gas sectors can leverage decentralised energy systems to improve energy equity.

By generating power locally, these industries can reduce dependency on long-distance energy transmission, enhancing reliability and bolstering community access to energy.

This local generation capability can also pave the way for better emergency energy resilience and support regional energy needs, aligning industrial operations with community goals.

- **Investment in clean technologies:** Investing in clean and advanced technologies such as battery storage and smart grids ensures both sustainability and reliability. For instance, incorporating advanced energy storage solutions can help stabilise grid connections and accommodate renewable energy inputs, balancing supply and demand intricacies while maintaining operational efficiency.

Confronting the challenges of the energy trilemma is not just a necessity but also an opportunity for industries to foster innovation and strategic growth.

By embracing solutions that align these three critical dimensions, industries can prepare for a future where energy systems are resilient, sustainable, and inclusive.



The oil and gas industry can benefit from technologies that convert waste gases into usable energy



## COMPLETE SOLUTIONS FOR THE OIL AND GAS INDUSTRY

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The FLIR G-Series are innovative Optical Gas Imaging (OGI) cameras designed to detect hydrocarbons, methane (CH<sub>4</sub>), and other Volatile Organic Compound (VOC) emissions from multiple stages of the oil and gas supply chain, as well as other industrial markets.

With up to 640 × 480 (307,200 pixels) thermal resolution, FLIR G-Series cameras have innovative gas quantification analytics that measure leak type and severity inside the camera, eliminating the need for a secondary device. While all models are OOOOa certified, the FLIR Gx320 and Gx620 are ATEX compliant, making these camera models ideal for detecting gas emissions in complex systems including refineries, petrochemical facilities, natural gas well pads, compression stations, and power generation plants.



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# Role of robotics in improving construction site safety in O&G

Saudi Aramco researchers Rashid Alrashid, Mahmoud Elzayat, Abdulazez Alshammari explore the use of three robotic machineries in the construction of onshore and offshore hydrocarbon facilities

THE construction of an onshore and offshore hydrocarbon facilities is highly complex and comprise significant safety challenges that must be effectively managed. Thus, the industry has adopted the concept of process automa-

**By ABDULAZIZ KHATTAK**  
tion, which replaces manual tasks with faster and more precise automated systems.

Human-robot interaction theory underlines how important is the dynamic working relationship between humans and robots to enhance both safety and efficiency.



Abdulazez Alshammari

Research shows that automated construction technologies are advancing rapidly, and that robots can be more accurate and efficient than humans in repetitive tasks.

Robotics and machineries are proven to enhance safety in the industry of construction when compared to humans.

They not only can work in hazardous environments to prevent humans from direct exposure to hazard but can also reduce project schedule and cost.

Integrating process automation usually begins during early stage of project particularly in the planning and design phases, where specific construction activities are selected for automation.

Saudi Aramco executives Rashid Alrashid, Senior Project Engineer, Mahmoud Elzayat, Supervisor Project Engineer, and Abdulazez Alshammari, Project Engineer, in their paper focus on how to inte-



Rashid Alrashid



Mahmoud Elzayat

grate the use of three robotic machineries in the construction of oil and gas facilities, namely robotic welding system, drones and underwater robots.

They also emphasise how their utilisation can improve efficiency and safety compared to conventional methods.

## ROBOTIC WELDING SYSTEM

Robotic welding systems have transformed how welding is performed, particularly in large-scale manufacturing and construction.

These systems ensure precision and consistency that would be hard to maintain manually.

Their ability to work without needing rest means they deliver reliable welds according to stringent standards every time.

Advanced features like multi-axis motion and AI-based controls help the system make real-time adjustments, ensuring a high level of quality.

However, despite their impressive efficiency, robotic welders do face limitations. They are great at performing the same task repeatedly but lack the flexibility that humans bring to the table.

Robots can't replicate the intuition or problem-solving skills that a skilled welder might apply to unusual situations.

## DRONES

Drones are widely used in site supervision, mapping, and inspection due to their advanced features.

Equipped with high-definition cameras and sophisticated navigation systems, they can access hard-to-



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Robotic welding systems have transformed welding in large-scale manufacturing and construction



Drones make site monitoring efficient and precise



ROUVs can effectively perform inspections and manipulations in aquatic environments

reach areas and provide real-time site information.

Their self-navigation, obstacle avoidance, GPS, and auto flight control systems make site monitoring efficient and precise.

However, like other technologies, drones have limitations. They have restricted travel distances and operating times, and their performance can be affected by adverse weather conditions.

**UNDERWATER ROBOTS**

Remotely operated underwater vehicles (ROUVs) are primarily used for underwater inspections in offshore construction projects.

These robots are equipped with cameras, sonar systems, and manipulator arms, allowing them to effectively perform inspections and manipulations in aquatic environments.

However, the use of ROUVs comes with certain challenges. Industries are working to address limitations such as restricted operational depth and the reliance on umbilical cables, which can hinder the robots' mobility.

**CONCLUSION**

The utilisation of robotics and autonomous machineries is very beneficial in the construction of oil and gas facility. The research concludes that the integration of robotics reduces project timeline and cost in addition to enhancing safety.

But despite the benefits of these technologies, their utilisation arises some challenges such as limited flexibility in robotic systems, short operational time for drones, and restricted mobility for underwater robots. Thus, further research is recommended to evaluate and overcome challenges when adoption these technologies. It is also suggested to scrutiny broader applications of these technologies across various construction projects in the industry to exploit further potential benefits.

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# O&G operators encouraged to adopt AI to curb rising costs

Even short periods of downtime can be expensive, with the cost of an hour's downtime in the oil and gas industry more than doubling in just two years, to almost \$500,000

**O**PERATORS of offshore, refinery and pipeline equipment are being encouraged to adopt new AI technology, which can help reduce time and cost in the general inspection of critical plant and equipment, such as valves, shafts, bearings,

pipes, and more.

The callout comes from Element Materials Technology (Element) and its digital engineering division in Singapore, with unplanned downtime now costing companies up to 11 per cent of

their yearly turnover.

Even short periods of downtime can be expensive, with the cost of an hour's downtime in the oil and gas industry more than doubling in just two years, to almost \$500,000.

Element is now urging those who look after the maintenance of plant and equipment on offshore platforms, within oil refineries, and in petroleum pipelines, to explore the potential of AI technology to help reduce downtime.

Under its suite of Asset Integrity Management Services (AIMS), the world leader in testing, inspection, and certification (TIC) is using advanced digital cameras and AI to help with facility mapping, layout development for aging plants, and inspection reports on the severity of damaged equipment.

*The leveraging of data, mathematics, and digital tools means Element is now able to support*

- *oil and gas operators with structural integrity assessments while utilising CAD geometry and materials testing data*

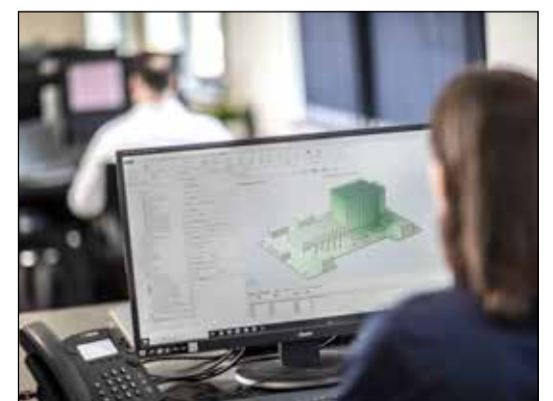
Element's AIMS suite also provides failure analysis, mathematical modelling, and damage simulation to equipment and structures.

Dr Basab Bhattacharya, Technical Lead for Energy, MEAP at Element Materials Technology, says: "Singapore is among the most important oil and gas refining hubs in Southeast Asia, and we are committed to supporting businesses throughout the supply chain."

He says: "The costs of unscheduled downtime can be extremely damaging, however AIMS technology can not only reduce this, but also streamline the entire maintenance process. Our selection of asset integrity management services supports our wider testing and inspection services and enables us to ensure that plant and machinery remains in the optimum operating condition. Any damage or potential failures can be spotted quickly before assets become critically damaged."

The leveraging of data, mathematics, and digital tools means Element is now able to support oil and gas operators with structural integrity assessments while utilising CAD geometry and materials testing data to deliver high-quality technical insights.

"We are also providing consultations on why components may have failed prematurely. Our experts in our state-of-the-art laboratories and digital engineering teams can interpret the reasons for failures and offer advice on how to prevent the issue from occurring again," concludes Dr Bhattacharya.



Element exploring AI to help reduce downtime



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As technology evolves, the potential to meet circular economy goals becomes more attainable, but widespread adoption and collaboration across all sectors will be key to realising a sustainable future, JD Ambati tells **OGN**

# AI can bridge circular economy & environmental responsibility

By **ABDULAZIZ KHATTAK**

**T**HE world has a waste crisis; humans generate over 2 billion tonnes of municipal solid waste annually, which is responsible for 20 percent of the world's human-related methane emissions.

While these statistics are grim, this is a fixable problem.

Currently, the world views and handles waste in a linear fashion. In other words, you buy a product, use it, and then throw it away.

"This produces a huge amount of trash, with a majority ending up in landfills or our environment. Instead of this 'throw-away economy', we need to transition to a truly circular economy, one that encourages reuse and recycling of materials," JD Ambati, Founder & CEO of Everest-Labs, tells *OGN* energy magazine.

A circular economy is a system where materials never become waste and are constantly remanufactured into new products.

Not only does a circular economy fix our waste problem, but it also tackles other global challenges like climate change, biodiversity loss, and reducing greenhouse gas emissions.

By continually remanufacturing materials into new products, this system minimises waste and the environmental impact associated with extraction and production.

There is a lot of work that needs to be done to achieve an efficient and successful circular economy.

It will require the involvement of all stakeholders, including government bodies, consumers, packaging manufacturers, brands, and organisations in the recycling industry, to move from a linear to a circular economy.

Technology, especially AI-powered robotics, is also a crucial enabler in this transition. AI technology can play a pivotal role in specifically supporting two key stakeholders in this transition: the recycling industry and consumer packaged goods (CPG) brands.

## TRANSFORMING RECYCLING WITH AI & ROBOTICS

Did you know that only 21 per cent of recyclables actually get recycled, and at the recycling facility level, about 30 per cent of recyclable materials are sent to landfills?

Issues like a lack of education, low access to recycling, labor challenges, and the absence of innovative technology are all contributing to these low recycling rates.

Unfortunately, every time a piece of recycled material is sent to a landfill, there are substantial environmental and economic consequences.

Increasing the recovery of recyclables is crucial to creating an efficient circular economy and a healthier planet. Luckily, new technologies, like AI and robotics, are here to help.

The recycling industry is undergoing a significant transformation, driven by the integration of AI-powered robotics that improves traditional processes.

These advanced technologies enable more efficient sorting, processing, and management of recyclable materials, drastically reducing materials sent to landfills and putting them on a journey to be repurposed.

By automating tasks that are labor-intensive, difficult to staff, and prone to human error, AI-powered robotics ensure two to three times higher recovery rates, allowing employees to be upskilled and moved to higher-priority positions.

One of the most impactful benefits of AI in recycling is its ability to adapt and learn over time. Machine learning (ML) algorithms can ana-



JD Ambati

lyse vast amounts of data, making these systems increasingly proficient at recognising and sorting different types of materials.

This continuous improvement enhances the speed and accuracy of recycling processes and reduces the contamination rates of recyclables, making the output more valuable and easier to repurpose.

As a result, these AI-driven robotics allow recycling facilities to operate more efficiently, with less downtime and lower operational costs.

## CPG BRANDS' ROLE IN SUSTAINABILITY

To improve circularity as a whole, it is imperative that all stakeholders participate in implementing sustainable practices.

For recycling facilities, this means finding new ways to increase recovery rates. For consumers, this could be buying products made with sustainable products or ensuring they are recycled correctly.

For consumer packaging companies (CPG), this means:

- Utilising more recycled content in packaging.
- Using highly recyclable materials in their products and packaging.
- Providing education to their consumers about the recyclability of their products.

Around 36 per cent of all plastic produced is used for packaging, and about 85 per cent of this packaging ends up in landfills.

With CPG companies being responsible for 36 per cent of plastic waste, it is crucial that they take steps to reduce the environmental impact of their packaging.

New legislation like extended producer responsibility (EPR) and corporate sustainability commitments require CPG brands to make advancements in sustainable packaging. And

technology, like AI, can help CPG brands optimise their packaging to meet these packaging requirements. Here's how:

AI can identify brand-specific packaging in MRFs and provide companies with vast amounts of data about the recyclability of different packaging types.

This information can be used to optimise packaging design to ensure packaging is recovered and placed back into the circular economy.

In addition, if a brand doesn't know whether their products are being recovered at a materials recovery facility (MRF), then it is impossible to say they are meeting their goals accurately.

AI can provide companies visibility into recycling streams like never before, while robotics can be placed into a recycling facility to ensure a brand's packaging is being recovered, ensuring the circularity of a specific brand's packaging.

CPG brands are under increasing pressure to adopt more sustainable practices, and technology plays a crucial role in making this achievable.

a fundamental shift from a linear to a circular economy, which can only be achieved if all stakeholders, including CPG brands and the recycling industry, commit to doing their part.

Technological advancements, particularly AI-powered robotics, are playing a pivotal role in transforming recycling processes.

By increasing recovery rates and reducing landfill waste, AI enhances efficiency and sustainability in recycling facilities.

Consumer packaging companies have a significant responsibility to reduce plastic waste. With new sustainability commitments and regulations in place, AI offers these brands valuable insights into packaging recyclability and helps ensure their materials reenter the circular economy.

As technology evolves, the potential to meet circular economy goals becomes more attainable, but widespread adoption and collaboration across all sectors will be key to realising a sustainable future.

Together, through collaboration and innovation, the path to a circular economy can create a more sustainable future for the planet.

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# Can museums inspire action against climate change?

By weaving climate action into their core mission, museums can help to foster a culture of sustainability and responsibility that resonates far beyond their walls, creating a ripple effect that can create global influence

By ABDULAZIZ KHATTAK

As the climate crisis looms larger than ever, the need for innovative and effective ways to mobilise public engagement is paramount. One often-overlooked ally in this fight is the museum.

Traditionally seen as repositories of history, art, and culture, museums possess a unique capacity to educate, inspire, and catalyse action.

In a world where scientific data alone often fails to evoke the urgency of climate action, museums can bridge the gap between knowledge and motivation, transforming passive visitors into active participants in the climate movement.

The primary function of museums has always been education. From art to science, museums curate experiences that inform and provoke thought.

With climate change affecting every aspect of life on Earth, museums are uniquely positioned to showcase the multifaceted nature of the crisis.

They can present not just the science behind climate change, but also its socio-economic implications, historical context, and potential solutions. By hosting exhibitions that highlight local environmental issues or global challenges, museums can foster a deeper understanding of how climate change impacts communities and ecosystems.



A sculpture titled Giant Plastic Tap by Canadian artist Benjamin Von

Consider the impact of interactive exhibits that allow visitors to visualise carbon emissions or witness the effects of rising sea levels.

These experiences can elicit an emotional response that data alone often fails to achieve. When visitors can see the potential future of their own communities whether it's through art, virtual reality, or compelling storytelling they are more likely to feel a sense of urgency and responsibility to act.

One example is the "Ocean Plastic" exhibition at the California Science Center, which uses striking visuals and hands-on activities to illustrate the devastating impact of plastic pollution on marine life. Such immersive experiences not only inform but also inspire visitors to rethink their consumption habits and engage in community clean-up efforts.

Beyond mere facts and figures, storytelling is one of the most powerful tools in a museum's arsenal.

By showcasing stories of communities directly affected by environmental degradation or climate disasters, museums can evoke empathy and inspire visitors to reflect on their own roles in the global ecosystem.

For instance, an exhibit focused on indigenous communities and their traditional ecological knowledge can not only inform visitors about sustainable practices but also elevate the voices of those who have been on the frontlines of climate action for generations. Such narratives can serve as a call to arms, motivating individuals to engage with the issue in their own lives.

Museums are often community hubs, providing a space for dialogue and collaboration. By engaging with local residents, museums can develop programmes that empower communities to take action.

This could include organising workshops on sustainable practices, hosting clean-up events, or collaborating with local environmental organisations to amplify their efforts.

Moreover, museums can serve as platforms for discussions and events centred on climate action, they can help galvanise community efforts and connect individuals with shared interests.

This grassroots approach not only empowers communities but also creates a sense of collective responsibility and urgency.

For example, the Brooklyn Museum has partnered with local organisations to host community forums on climate justice, allow-

ing residents to voice their concerns and collaborate on solutions. By fostering an environment of inclusivity and participation, museums can become vital catalysts for change in their communities.

In an age where technology plays a crucial role in communication and education, museums can leverage innovative exhibits to captivate and engage their audiences.

Interactive installations that use augmented reality or virtual reality can immerse visitors in climate scenarios, allowing them to experience the consequences of inaction firsthand.

Such technologies can make the concept of climate change more tangible and immediate, prompting visitors to reflect on their choices and behaviours.

Additionally, museums can showcase emerging technologies and sustainable practices, highlighting innovations that individuals and communities can adopt.

The Smithsonian's National Museum of Natural History, for instance, features exhibits that demonstrate the science behind climate change, including the latest research on carbon sequestration and renewable energy technologies.

These exhibits not only educate but also empower visitors by showcasing viable solutions that can be implemented at individual and community levels.

Museums can also engage in advocacy efforts, using their platforms to influence policy decisions related to climate action.

By partnering with environmental organisations and participating in campaigns, they can amplify their impact and reach a broader audience.

The effectiveness of museums in inspiring climate action can be further enhanced by creating lasting connections with their audiences.

Museums can encourage ongoing engagement by providing resources, such as online toolkits or guides for sustainable living, and by promoting events that allow visitors to stay involved in climate initiatives after they leave the museum.

Additionally, museums can harness social media and digital platforms to reach wider audiences and keep the conversation going.

Sharing stories, updates on exhibitions, and community initiatives can help maintain momentum and encourage more individuals to participate in climate action.

In conclusion, museums are uniquely equipped to inspire climate action. Through education, storytelling, community engagement, innovative exhibits, and sustainable practices, they can transform the climate narrative from one of despair to one of hope and empowerment.

It is time for museums to embrace this responsibility fully. By harnessing their resources, creativity, and community connections, they can inspire individuals to not only understand the climate crisis but also to take meaningful steps towards a more sustainable future.

By weaving climate action into their core mission, museums can help to foster a culture of sustainability and responsibility that resonates far beyond their walls, creating a ripple effect that can influence communities, governments, and individuals worldwide.



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# Ocean light pollution has been invisible for too long



Industry is a major source of ocean light pollution

Scientists increasingly understand the damage done by artificial light and action is needed now, says Thomas Davies of the Global Ocean Artificial Light at Night Network

**F**OR years the world has largely ignored an insidious pollutant humanity has been carelessly throwing into the ocean: light.

Newly hatched turtles can be sent off course by the glow of nearby beachfront restaurants, taking them away from the sea and to their deaths.

Scientists have shown that marine birds can become so confused by artificial light that they drop from the sky in “fallout events”.

But the issue of just how pervasive and damaging artificial light is at sea has struggled to garner the attention it deserves, lagging behind greenhouse gases, plastics and noise in the pantheon of pollutions plaguing the oceans, Thomas Davies tells Daniel Cressey of Dialogue Earth.

Davies, a marine conservation researcher at the University of Plymouth in the UK, is one of the leaders of the Global Ocean Artificial Light at Night Network (GOALANN).

This group of leading experts on marine light pollution launched earlier this year to try and remedy the situation.

Davies tells how light impacts everything from breeding to feeding to movement in the sea, how the problem is likely to get worse before it gets better, and what should be done about it now.

Below are excerpts from the interview:

**How did you start working on ocean light pollution?**

It wasn't really around as a subject at all until about 2014. For years, nobody was really thinking about this beyond sea birds and sea turtles. Nobody was thinking about the broader impacts of light pollution on marine ecosystems.

I think biologists assumed that there just

wasn't sufficient artificial light reaching into the marine environment to cause biological impacts.

As soon as you realise as a marine ecologist how fundamental light is in shaping the marine environment, suddenly it becomes really obvious how light pollution might be doing the same thing down to 100 m plus.

The 100 m case is taken from a situation with *Calanus* copepods (tiny crustaceans) that live in the Northeast Atlantic and sub polar regions, which are really important for carbon budgets and the food web in those regions.

They normally migrate up to the surface at nighttime to feed and then migrate down during the daytime, presumably to avoid predation.

But if you turn your ship lights on (at night), then they basically scatter sideways and downwards to get away from the light sources.

It's an instantaneous response. You can see these deep holes where the zooplankton should be, where the light is penetrating down into the water. Vertical migration can be suppressed down to 100 m depth.

**What is the largest current concern about ocean light pollution?**

I think the biggest emerging concern is probably with the corals.

There is an increasing body of knowledge now, which is showing us the huge variety of ways in which light pollution can shape coral physiology, shape broadcast spawning, and shape their daily activity cycles in terms of when they feed.

That presents a really big issue because obviously, corals are under threat from multiple different things at the moment, but also corals by their ecology tend to inhabit waters that are

very clear. So, exposure of coral reefs to light pollution which is biologically relevant to them is quite widespread.

**Do you think light pollution is likely to increase in future?**

Yes, I think it is, especially in the developing world.

Coastal populations are projected to increase quite significantly by 2050. And a lot of that is going to occur in developing economies.

It will develop along coasts, where the trade comes, where the rivers emerge, where the ports and harbours are. That's where the cash tends to be.

There is going to be a lot of urban development along coastlines.

If you look at stretches of the Iberian Peninsula from the nighttime satellites, you can't actually see any breaks in the lights moving across the whole of the south coast of Spain from the Rock of Gibraltar. That kind of development is on par for some parts of Southeast Asia. It will be quite severe.

**What should change about how we light the ocean?**

First of all, people need to consider whether they need light in the first place. Then, how much light they need, where they need it, and when.

At that point, they need to consider whether or not the colour of that light can be altered to avoid ecological impacts. The decision-making process should go in that order.

If we can get some lighting regulations to reduce light pollution from offshore infrastructure, that would be good.

If we could get some regulations to manage lighting on vessels at sea, that would be useful

as well. Currently, there is almost no regulation.

It's a case of making sure that we get light pollution integrated into the international and national policy frameworks in the same way that noise pollution has been over the last 10 years. I think we've got a 10-year journey ahead of us to achieve that.

**Where do you, and the Global Ocean Artificial Light at Night Network, go from here?**

A key objective for GOALANN is moving the science into the policy agenda and to try to reach out to big international organisations, in the hope of being able to make some meaningful change in terms of the impacts of light pollution.

We're just in that phase now where the science has moved to a point where we can start to really have that influence, and I think we need to start that kind of impact agenda now. To try and see if we can start to make a difference. You start doing the science and then you need to try to make the science make a difference.

*\* Daniel Cressey is ocean editor at Dialogue Earth. Based in London, he worked as a journalist for two decades at publications including Nature and Research Professional News before joining Dialogue Earth in 2024. He has degrees in chemistry, history of science and journalism. His areas of interest at Dialogue Earth include fisheries; marine conservation and protected areas; plastic and other marine pollution; climate change and ocean acidification; and ocean governance and justice.*

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