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\$17TRN INVESTMENT, AI WAVE TO TRANSFORM ENERGY SECTOR

BY ABDULAZIZ KHATTAK

Utilities can gain immediate financial returns by integrating AI capabilities

THE global energy sector faces a \$17 trillion infrastructure transformation cycle where artificial intelligence (AI) and digital workers have become essential to unlocking operational value from unprecedented capital deployment into generation capacity.

Speaking at the Industrial X Unleashed event in New York, Mark Moffat, IFS CEO, characterised the investment level as “unfathomable” with profound implications for how rapidly AI capabilities will penetrate asset-intensive operations, as reported by **OGN** energy magazine.

This transformation timeline has accelerated significantly, with industrial AI specialists now delivering working solutions in precisely three weeks by identifying highest-value problems, and leveraging existing models tailored to specific operational contexts, whilst utilities sector clients have already discovered tens of millions of dollars through optimisation projects alone.



AI has become essential to unlocking operational value in the energy sector

However, traditional utility operating models prove poorly suited to managing infrastructure incorporating components requiring replacement every three to five years, creating organisational tension between long-term planning horizons and rapid technology evolution cycles.

The operational benefits are nonetheless compelling, as agentic AI technology frees 20-30 per cent of employee capacity while reducing errors by up to 40 per cent, thus enabling utilities to address workforce gaps.

Regional deployment patterns vary considerably, with the Middle East presenting distinct opportunities for large-scale AI implementation from the outset, rather than aging system rehabilitation common in Western markets.

Utilities successfully navigating this transition recognise that infrastructure investment and organisational transformation must proceed in parallel, as installing AI-ready infrastructure without developing workforce capabilities wastes capital and delays productivity gains. ■

Read full report on Page 44

Acwa Power snaps up Engie's GCC assets

KSA-based ACWA Power has completed its acquisition of French energy major Engie's stakes in gas-fired power generation and water desalination assets in Bahrain, along with the related operations and maintenance (O&M) companies.

The Bahrain portfolio consists equity of stakes in Al Ezzel IPP (45 per cent), Al Dur IWPP (45 per cent), Al Hidd IWPP (30 per cent) and 100 per cent ownership of Al Ezzel O&M, which will contribute to providing in-house O&M services across these assets.

The wider acquisition also covers impending Engie's assets in Kuwait, which include equity stake in Az Zour North IWPP (17.5 per cent) and 50 per cent ownership in Az Zour North O&M.

Together, the Bahrain and Kuwait portfolios represent a combined capacity of 4.6 GW of gas-fired power generation and 1.1 million cu m/day of water desalination, for a total consideration of \$693 million (before customary purchase price adjustments).



Energy consolidation drives record M&A growth in Mideast

AVEVA IS combining data-driven insights enhanced with industrial AI and human expertise to deliver what the firm terms Industrial Intelligence.

Jesus Hernandez, AVEVA's Senior Vice-President for EMEA, told **OGN** energy magazine the company has deployed its Intelligent Alert Management System across seven data centres operated by e&, integrating with ETAP's electrical system digital twin to streamline maintenance response and minimise downtime aligned with service level agreements.

AVEVA's CONNECT platform delivers end-to-end

software solutions spanning the complete asset lifecycle from engineering through operations to what Hernandez characterises as “community” stage, connecting internal capabilities with external ecosystems.

Major energy operators including ADNOC and Saudi Aramco have already implemented AVEVA's combination of simulation technologies, data management, predictive analytics, and real-time optimisation across their operations.

The company positions digital twins as central to asset lifecycle digitalisation, with AI integration en-

abling continuous optimisation beyond organisational boundaries.

AVEVA's strategy centres on customer-centric innovation and ecosystem collaboration rather than isolated capability development.

Hernandez says human expertise remains essential throughout AI model development, training, and fine-tuning phases, with technology amplifying rather than replacing human intervention.

The Middle East represents a strategic growth region, which demonstrate stronger appetite for technology deployment. ■ *Read full report on Page 11*

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Ras Tanura in KSA ... extending beyond conventional oil production

SAUDI ARABIA CEMENTS GLOBAL REFINING AND MANUFACTURING LEADERSHIP

The Kingdom accelerates downstream integration through strategic partnerships, targeting 4 million bpd crude-to-chemicals conversion by 2030 while maintaining supply reliability

BY ABDULAZIZ KHATTAK

SAUDI Arabia's refining sector has reached unprecedented operational capacity in 2025, with the Industrial Production Index for refined petroleum products climbing to 123.5 in April, the highest level recorded since January 2023, signalling a fundamental reorientation of the Kingdom's hydrocarbon monetisation strategy.

Aramco's total net refining capacity exceeds 4 million barrels per day (bpd), encompassing wholly owned domestic operations of 1 million bpd, domestic joint ventures processing 1.9 million bpd, and international joint and equity ventures handling 2.5 million bpd.

The Kingdom's refining infrastructure spans major facilities

including the Ras Tanura refinery at 550,000 bpd, SATORP in Jubail at 465,000 bpd, Yasref at 400,000 bpd, and the Samref facility at 400,000 bpd, with the Jazan refinery adding a further 400,000 bpd of capacity since its 2021 commissioning.

Aramco's hydrocarbon production reached 12.8 million barrels of oil equivalent per day (boepd) in Q2 2025, maintaining the company's position as the world's largest daily oil producer while simultaneously expanding downstream capabilities.

The company maintained 100 per cent supply reliability in H1 2025, continuing its exemplary track record of consistency and stability in global energy markets during a period of significant geopolitical uncertainty.

STRATEGIC PETROCHEMICAL INTEGRATION ACCELERATES

In December 2025, ExxonMobil, Ar-

amco, and Samref signed a venture framework agreement to evaluate a significant upgrade of the Samref refinery in Yanbu, with plans to expand the facility into an integrated petrochemical complex through preliminary front-end engineering and design phases.

The Samref refinery currently processes more than 400,000 bpd, and the proposed expansion aims to enhance production of high-quality distillates resulting in lower emissions alongside high-performance chemicals, while improving the refinery's energy efficiency through an integrated emissions-reduction strategy.

In April 2025, Aramco, Sinopec, and Yasref announced a venture framework agreement for a major petrochemical expansion at Yasref in Yanbu, coinciding with the refinery's tenth anniversary and marking a



significant milestone in China-Saudi energy cooperation.

The planned expansion includes a state-of-the-art petrochemical unit featuring a large-scale mixed feed steam cracker with 1.8 million tonnes per year (mtpa) capacity and a 1.5 mtpa aromatics complex, integrated into the existing 400,000 bpd Yasref complex.

Mohammed Al Qahtani, Aramco Downstream President, confirmed the expansion aligns with the downstream strategy to convert up to 4 million bpd of crude oil into petrochemicals by 2030, representing a fundamental shift in the Kingdom's hydrocarbon value chain.

Aramco's current operational data shows 53 per cent of upstream crude oil production is utilised by the downstream sector, demonstrating the accelerating integration between production and value-added manufacturing capabilities.

The \$11-billion Amiral petrochemical complex, developed jointly by Aramco and TotalEnergies at the SATORP refinery in Jubail, received engineering, procurement and construction (EPC) contract awards in June 2023, marking the commencement of construction work following the final investment decision in December 2022.

The Amiral complex will house one of the largest mixed-load steam crackers in the Gulf with capacity to produce 1,650 kilotons per annum of ethylene and other industrial gases, making it the first facility in the region to achieve full integration with an existing refinery.

Commercial operations at Amiral are scheduled to begin in 2027, with the complex expected to provide feedstock to proposed petrochemical and specialty chemical plants throughout the Jubail industrial area, supporting manufacturing of carbon fibres, lubricants, drilling fluids, detergents, food additives, automotive parts, and tyres.

The project represents \$11 billion in total invest-

ment, with \$4 billion funded through equity by Aramco (62.5 per cent) and TotalEnergies (37.5 per cent), while an estimated additional \$4 billion in investments from globally renowned downstream investors will support adjacent specialty chemical facilities.

SUSTAINABLE INNOVATION INITIATIVES

KBR announced in December 2025 that it had been awarded a contract for its PureMSM green methanol technology by Fikrat Al-Tadweer for Saudi Arabia's first biomethanol plant, transforming landfill gas into clean fuels through commercial-scale renewable methanol production.

The PureMSM technology can utilise multiple feedstocks including biogas, gasification-derived syngas, hydrogen, and pure carbon dioxide, enabling flexibility and efficiency in renewable fuel production while aligning with Saudi Arabia's national policy on eliminating landfill gas emissions.

Under the contract terms, KBR will provide technology licensing, proprietary engineering design, catalyst, and proprietary equipment for the biomethanol facility, representing a pioneering application of waste-to-fuel conversion in the Kingdom's industrial landscape.

The Saudi petrochemical sector, with revenue exceeding SR310 billion (\$82.7 billion), accounts for nearly 80 per cent of the Gulf Cooperation Council's (GCC) petrochemical revenue, transitioning from basic chemicals to higher-value downstream products through investments in specialty chemicals, plastics, and advanced polymers.

In 2024, the Saudi petrochemical market reached \$6 billion and it is expected to reach \$9 billion by 2033, exhibiting a compound annual growth rate of 4.6 per cent driven by abundant hydrocarbon resources, integration with refining operations, and government initiatives supporting industrial diversification.

Reports indicate the specialty chemicals market is anticipated to exceed SR26 billion by the end of 2025, reflecting increased usage in advanced manufacturing and high-value products across automotive, healthcare, and electronics applications.

The Kingdom's strategic geographic location at the crossroads of Europe, Asia, and Africa provides exceptional access to key emerging and developed markets, facilitating efficient export logistics.

With the urban population projected to reach 36 million by 2025-end, domestic urbanisation will drive demand for construction materials, packaging, and consumer goods.

Saudi Arabia's decision to prioritise refining represents a structural adjustment aimed at sustaining long-term energy competitiveness, maximising revenue per barrel, building resilience against volatile oil prices, and accelerating development of downstream industries central to Vision 2030 including petrochemicals, logistics, and advanced manufacturing.

Starting in April 2025, a core group of eight Opec+ producers began easing 2.2 million bpd of voluntary production cuts, with Saudi Arabia contributing 130,000 bpd of additional supply in May, yet rather than exporting this additional crude, the Kingdom channelled it into domestic refining operations.

This strategic redirection highlights a fundamental policy preference for value-added transformation over raw crude exports, while the integration of refining with petrochemical and manufacturing sectors enhances competitiveness across industries from plastics and fertilisers to specialty fuels and chemicals.

Major petrochemical producers face ongoing challenges in global markets, with most Saudi companies experiencing margin pressures from rising feedstock prices and lower product sales prices, though the sector maintains significant cost advantages over competitors in Europe and Asia through access to advantaged feedstock, reported EFG Hermes.

Industry experts project Saudi Arabia's petrochemical production capacity will double in the next five years, from approximately 75 mtpa to more than 140 mtpa, with energy costs and strategic infrastructure investments reinforcing the Kingdom's competitiveness as a global petrochemical leader.

The Kingdom is developing comprehensive carbon capture, utilisation, and storage capabilities while advancing green hydrogen production through abundant solar and wind resources, with the NEOM Green Hydrogen Project targeting 650 tonnes per day production by 2025 to establish the world's largest such facility.

Saudi Arabia's petrochemical sector remains deeply integrated with the oil and gas value chain, providing substantial cost advantages through feedstock supply, while Jubail Industrial City offers state-of-the-art infrastructure supporting continued sector growth.

Downstream integration and value addition represent major trends shaping the industry, with the shift from producing basic chemicals to manufacturing higher-value downstream products including specialty polymers, advanced resins, and sustainable alternatives aligning with global decarbonisation efforts.

The adoption of regenerative and sustainable catalysts designed for multiple regeneration cycles reduces waste and operational costs in refining and petrochemical processes, while digital transformation through artificial intelligence, machine learning, Internet of Things, and big data analytics optimises production processes and enhances operational efficiency.

Government support through entities including the Public Investment Fund (PIF) and major state-owned companies, such as Aramco and SABIC, ensures substantial investments in new petrochemical complexes, capacity expansions, and research and development initiatives that position Saudi Arabia as a hub for catalyst innovation and process technology advancement.

The Kingdom's refining expansion serves as connective tissue between crude extraction and higher-value industries, while increasing domestic refinery runs supports value-added industries and bridges the hydrocarbon legacy with a more diversified economic future aligned with Vision 2030 objectives.

As more Saudi crude undergoes domestic refining, global markets experience shifts in product availability particularly for diesel and jet fuel, influencing regional pricing and trade flows throughout Asia and Europe while establishing the Kingdom not merely as a crude exporter but as a leading supplier of refined, high-value petroleum products.

The transformation underway in Saudi Arabia's refining and petrochemical sectors represents a fundamental reorientation of the Kingdom's role in global energy markets.

The Kingdom is combining traditional hydrocarbon advantages with advanced manufacturing capabilities, sustainability initiatives, and strategic international partnerships that collectively position it as an enduring industrial powerhouse extending far beyond conventional oil production. ■

Saudi Arabia's flagship mega-projects signal industrial transformation era

\$180 billion infrastructure offensive transforms Kingdom into a manufacturing powerhouse through integrated refining and petrochemicals expansion

SAUDI Arabia's energy sector is undergoing its most ambitious transformation in history, with flagship mega-projects representing engineering excellence on an unprecedented scale.

The Kingdom has committed over \$180 billion across three cornerstone developments, including Jafurah unconventional gas, Amiral petrochemicals, and Zuluf offshore oil, that will fundamentally reshaping its industrial capacity and global market position.

These initiatives, substantially updated in 2025, integrate upstream hydrocarbon extraction with downstream processing in ways that maximise efficiency and value creation across the entire production chain.

STRATEGIC GAS EXPANSIONS

The Jafurah unconventional gas field achieved a critical milestone in December 2025 when Saudi Aramco brought Phase 1 production onstream with a capacity of 450 million cu ft per day (mmscfd), according to the Saudi Finance Ministry.

Located in the Eastern Province, the \$100-billion project represents the largest unconventional gas development outside the US, with estimated resources of 229 trillion standard cu ft (Tcf) of raw gas and 75 billion stock tank barrels of condensate.

Production is projected to reach 2 billion cu ft per day (bcfd) by 2030, positioning Saudi Arabia amongst the world's top natural gas producers.

In August 2025, BlackRock's Global Infrastructure Partners led an \$11-billion lease-and-leaseback transaction involving Jafurah's midstream assets, creating the Jafurah Midstream Gas Company in which Aramco retains 51 per cent ownership.

Phase 2 contracts valued at \$12.4 billion were awarded in June 2024, covering gas compression facilities, the Riyas natural gas liquids fractionation plant, and expanded processing trains.

In November 2025, GE Vernova announced the start of commercial operations at the Jafurah Cogeneration Independent Steam and Power Plant, featuring the company's first H-Class gas turbine completed in Saudi Arabia.

The Jafurah development directly supports the Kingdom's objectives to displace liquid fuels in power generation, supply feedstock for petrochemicals, and provide energy for emerging sectors including artificial intelligence (AI) data centres, as articulated by Amin Nasser, Aramco President.

Samsung Saudi Arabia contracted Belgium's Saren for heavy rigging work across the 1,500-km network of transfer pipelines, flowlines, and gathering infrastructure.

Production from Jafurah will yield approximately 418 mmscfd of ethane and 630,000 barrels per day (bpd) of gas liquids and condensates, essential feedstock for the Kingdom's expanding petrochemical industry.

PETROCHEMICAL INTEGRATION ADVANCES

The Amiral petrochemical complex represents Aramco and TotalEnergies' \$11 billion commitment to integrated refining and chemicals production at the SATORP refinery in Jubail.

Construction commenced in June 2023, with com-



Jafurah ... the largest unconventional gas development outside the US

mercial operations scheduled for 2027.

The facility features a mixed-feed steam cracker with 1.65 million tonnes per year (mtpa) ethylene production capacity, two polyethylene lines each producing 500,000 tonnes annually, and units for extracting butadiene, aromatics, and high-value derivatives.

The complex will convert feedstock produced directly by the SATORP refinery, including off-gases and naphtha, as well as ethane and light naphtha supplied by Saudi Aramco.

Hyundai Engineering secured the \$5 billion contract for the mixed-feed cracker, Tecnicas Reunidas got contracts worth \$3.2 billion for the natural gas liquids fractionation facilities, while Larsen and Toubro Energy Hydrocarbon secured \$3.9 billion in contracts for gas processing plants and compression units.

The project is designed to supply a specialty chemicals park in the Jubail Industrial City, attracting more than \$4 billion in additional investment across carbon fibres, lubricants, drilling fluids, detergents, food additives, automotive parts, and tyre manufacturing.

The Amiral complex incorporates sustainability measures, including using hydrogen co-produced by the steam cracker to replace methane fuel in SATORP's refinery furnaces, reducing carbon intensity in line with TotalEnergies' net-zero commitments.

Italian manufacturer ORION completed a 114-inch wedge gate valve weighing over 120 tonnes in December 2025, described as a milestone redefining industrial manufacturing limits for the project.

The development is expected to generate 7,000 direct and indirect jobs, with training programmes jointly provided by TotalEnergies and Aramco.

OFFSHORE EXPANSION

The Zuluf oilfield expansion progresses through

multiple offshore packages designed to add more than 600,000 bpd of Arabian Heavy crude production capacity.

Located 40 km offshore in the Arabian Gulf at shallow water depths of 40 m, Zuluf ranks amongst Saudi Arabia's super-giant fields with proven reserves exceeding 31 billion barrels of oil-equivalent (boe).

Aramco awarded fresh contracts in July 2025 for four offshore packages worth approximately \$5 billion.

Package 4 of Zuluf encompasses 12 oil-handling wellhead topsides, two oil tie-in platforms, one electrical distribution platform, and an extendable draft platform with associated jacket structures.

The infrastructure includes 7 230-kilovolt (kV) cables, extending 80 km from landfall to offshore installations, 13 15-kV cables, 10 subsea valve skids, 10 umbilicals, 6 flexible pipelines, and 9 rigid pipelines.

Onshore developments include a new two-train gas oil separation plant processing 600,000 bpd, gas compression facilities, water injection infrastructure, and downstream pipelines to Ju'aymah terminal.

The separated gas and condensate will be transported to the Tanajib gas plant through new dedicated pipelines.

In February 2025, Arab Qatar Petroleum Construction Company completed line pipe coatings and loadouts for Package 4.

These three flagship developments underscore Saudi Arabia's manufacturing prowess while demonstrating the sector's contribution, approximately 40 per cent to the Kingdom's GDP.

The integration of refining with upstream development exemplifies end-to-end efficiency, particularly evident in Aramco's conversion of oil directly into petrochemicals at facilities designed for maximum resource utilisation. ■

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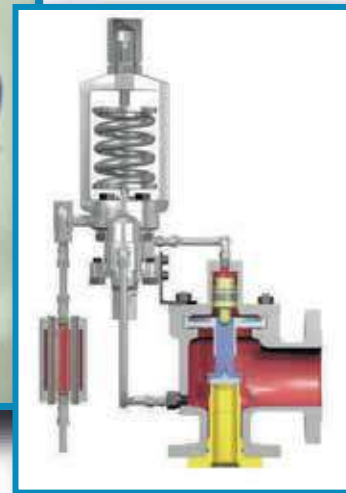
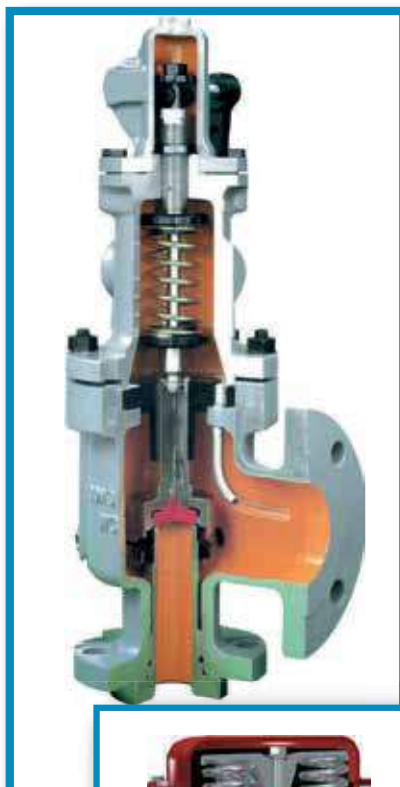
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Compliance with JIP33 builds trust in the long-term reliability of systems and suppliers

The JIP33 tube fitting specification ensures 'improvement' in O&G ops

Ensuring compliance with JIP33 reduces risk, improves long-term reliability of systems and suppliers, and helps to reduce variation throughout the supply chain while enabling greater capital cost control

WHEN a major oil and gas operator was commissioning a topside module with more than 2,000 small-bore tube fitting connections, it selected a supplier that claimed to meet "equivalent specifications".

But when third-party testing began, problems piled up, including inconsistent product quality, missing material certifications, and improper fitting assemblies.

The result? A 12-week delay to source the correct components, \$3 million in cost overruns, expedited shipping fees, and lost labour hours.

It's a scenario that every oil and gas operator wants to avoid, but it's not easy.

Delivering complex oil and gas projects on time and on budget requires technical expertise, effi-

ciency, safety, and consistency at every stage.

That means minimising leaks and rework, reducing engineering cycles, and eliminating avoidable cost overruns.

Standardising component selection is one way that operators can streamline execution and reduce risk, especially on large-scale global projects.

And this is the key goal behind the development of gas fitting requirements under the International Association of Oil & Gas Producers' (IOGP) Joint Industry Program 33 (JIP33) standardising procurement specifications.

JIP33 specifications aim to reduce variation throughout the supply chain and enable greater capital cost control.

The IOGP comprises essentially every major oil and

gas company, meaning these specifications represent agreed-upon best practices for the most critical applications in the world.

JIP33 specifications set requirements for a broad range of componentry, infrastructure, and systems common throughout downstream oil and gas operations.

Among them is Specification S-716, which covers small-bore tubing and fittings—critical components that impact many aspects of an oil and gas facility's ability to remain safe, efficient, productive, and profitable.

For today's professionals, the application of this specification when selecting tube fittings for new construction can make a significant impact on any project.



Among the JIP33 specifications is S-716, which covers small-bore tubing and fittings—critical components that impact many aspects of an oil and gas facility's ability to remain safe, efficient, productive, and profitable

- "Intermixing of tube fittings from different manufacturers shall not be acceptable."
- "Interchanging of tube fittings from different manufacturers shall not be acceptable."

Understanding why these guidelines matter requires a closer look at the differences between intermix and interchange, and how each can compromise system integrity.

Intermix occurs when tube fitting components (such as nuts, ferrules, and bodies) from two or more manufacturers are mixed to assemble a single fitting.

For example, combining tube bodies from one manufacturer with internal components from another would be considered intermix.

In contrast, interchange happens when a complete tube fitting from one manufacturer is installed on a tube, disassembled, and then the tubing, nut, and ferrules are reassembled into a tube fitting body from another manufacturer.

Claims that tube fitting components can be intermixed and interchanged with those of different manufacturers should be questioned.

For example, there are no products from other manufacturers that are reliably proven to be "Swagelok-compatible".

Intermixing and interchanging brands is not only costly, but also risky, as doing so may compromise worker safety and system reliability. IOGP has codified the avoidance of intermix and interchange within the S-716 specification for these reasons.

SPECIFYING COMPLIANT FITTING TECHNOLOGY PER JIP33

One reason that intermix and interchange can

be detrimental is that not all tube fittings are designed and constructed within the accepted definition found within the S-176 specification.

The language specifies: "Tube fittings shall be flareless, double-ferrule type."

While many available tube fittings meet this description, not all do; for example, some commonly available tube fittings are designed with a single-ferrule.

While single-ferrule designs may be suitable for certain applications, a double-ferrule design helps to ensure optimal tube grip strength for the most critical oil and gas fluid system applications.

S-716 further states that tube fittings should be tested following the ASTM F1387-19 standard, which establishes the performance characteristics required for tube fittings in critical tubing systems. It's another measure by which oil and gas professionals can gain greater trust in the performance of their selected tube fittings.

IMPORTANCE OF MANUFACTURER TRAINING & TOOLS PER JIP33

Another important stipulation within the S-716 specification involves adherence to the tube fitting manufacturer's recommendations regarding training, installation, and other factors. Specifically, the standard states:

- "The tubing system shall be installed by personnel who have been certified by the fittings manufacturer's approved product training program or equivalent industry training program including hands-on assembly."
- "Tubing and fittings makeup shall be prepared and marked in accordance with the fittings manufacturer's recommendations."
- "Tubing and fittings shall be assembled using the tools recommended by the tube fittings manufacturer."

Considering these requirements, oil and gas professionals should prioritise working with suppliers who offer not only compliant tube fittings, but also robust training programmes and local hands-on support. These resources can be a significant value add, helping to ensure fittings are installed correctly and efficiently using the proper tools.

Swagelok, for example, has worked with customers to develop tube fitting training programs that meet JIP33 standards and are available globally.

PROPER TRAINING IMPACTS YOUR OPERATIONS

One of the most common sources of fluid system leaks is improper installation practices. A well-trained team of technicians, by contrast, can help eliminate costly reworks and get up-and-running quickly by preventing leaks at the source.

Ensuring compliance with JIP33 doesn't just reduce risk, it builds trust in the long-term reliability of your systems and suppliers.

Swagelok specialists help customers explore how standardising tube fittings to JIP33 specifications can elevate safety, performance, and compliance in their operations. ■

With that in mind, it's worth exploring some of the highlights of JIP33 Specification S-716 and how they can accelerate your project timelines, reduce risk for in the field installation, and ensure you are compliant on your large, capex projects.

AVOIDING INTERMIX & INTERCHANGE PER JIP33

Oil and gas fluid systems rely on thousands of fittings working together to keep operations running efficiently.

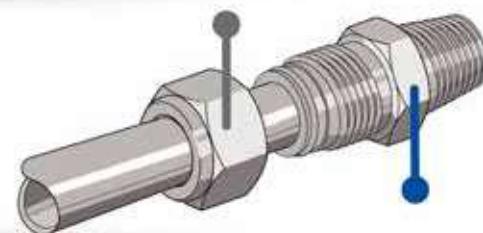
One major way to maintain that harmony and ensure long-term system performance is to use tube fittings from a single manufacturer.

In fact, JIP33 Specification S-716 emphasises this by stating:

- "Fittings shall be from a single manufacturer."



Intermix Interchange



Intermixing and interchanging brands is costly and risky

Saudi Arabia's lubricants market is shifting gears under Vision 2030

Transformation is in motion as Vision 2030, electrification, and industrial expansion redefine the Kingdom's 515-million-litre lubricant industry, Damien Duhamel tells **OGN**

BY ABDULAZIZ KHATTAK

Saudi Arabia's lubricant sector is entering one of the most dynamic phases in its history. Once centred on automotive consumption, it is now being reshaped by Vision 2030's diversification agenda, the electrification of transport, and the emergence of new industrial and manufacturing clusters.

According to Eurogroup Consulting's report 'Changing Patterns in the KSA Lubricant Market', national consumption already exceeds 515 million litres annually, making it the largest lubricant market in the GCC.

Yet behind this scale lies a rapidly changing composition of demand and a growing emphasis on performance, sustainability, and local production.

VISION 2030: DRIVING STRUCTURAL CHANGE

Vision 2030's ambition to expand non-oil industries, tourism, and logistics is forcing lubricant producers to rethink their portfolios.

Investments in giga-projects such as NEOM and Qiddiya are creating demand for specialised industrial, hydraulic, and marine fluids, while the expansion of public transport and ride-hailing services is altering the automotive mix.

"Vision 2030 has created a fundamental shift in how lubricant producers operate in the Kingdom," Damien Duhamel, Managing Partner of Eurogroup Consulting Middle East and Asia, tells **OGN** energy magazine.

"We see both global and local players repositioning their portfolios to align with emerging sectors such as public transport, tourism fleets, and manufacturing."

Beyond the increase in volume, demand is shifting toward higher-quality lubricants, with customers increasingly seeking premium and synthetic formulations that deliver extended service intervals and withstand the Kingdom's high-temperature conditions.

Synthetic and semi-synthetic lubricants are also



Damien Duhamel

gaining popularity among construction and fleet operators due to their durability and efficiency.

As diversification accelerates, the balance between automotive and industrial demand is evolving.

THE EV ERA: FROM ENGINE OILS TO THERMAL FLUIDS

Electric and hybrid mobility is still nascent but gaining momentum. Government policies and public-private partnerships are encouraging EV infrastructure and domestic vehicle assembly, opening a new chapter for lubricant innovation.

"Forward-looking producers are investing in R&D to develop fluids that ensure heat dissipation and long-term performance, particularly under Saudi Arabia's extreme temperatures," Duhamel notes.

These include e-transmission lubricants, battery-cooling fluids, and other specialty formulations that compensate for declining demand in

traditional engine oils.

Fleet operators and rental companies, another fast-growing segment, now prefer lubricants that extend service intervals and improve fuel economy — both essential for cost and sustainability goals.

BASE OIL UPGRADES & LOCALISATION MOMENTUM

A significant structural shift is underway in the supply chain; refiners and blenders are moving from Group I to Group II and III base oils, enabling lower emissions and higher oxidation stability.

This transition also advances the Kingdom's localisation agenda by attracting new blending and refining investments.

"Localisation is not only about producing within the Kingdom," says Duhamel. "It is about transferring technology, ensuring quality consistency, and building a resilient industrial base that supports Saudi Arabia's broader diversification goals."

Local players are scaling capacity while international brands form joint ventures to secure market access.

Pricing and raw-material sourcing remain challenges, but long-term competitiveness increasingly depends on efficiency and supply-chain integration.

Global brands are leveraging advanced formulations and long-standing customer trust to retain market share, while local blenders compete on agility, cost efficiency, and localisation incentives under Vision 2030.

New industrial and manufacturing zones being developed across Saudi Arabia are expected to attract additional lubricant-blending and refining capacity over the next few years.

These initiatives form part of Vision 2030's broader objective to enhance downstream integration and strengthen local content across the energy and industrial value chains.

Ongoing government programmes supporting manufacturing localisation and export-oriented production are also helping position Saudi Arabia as a future hub for high-performance lubricants serving regional markets.

DIGITALISATION & MARKET EVOLUTION

Digital tools are redefining customer engagement, with e-commerce platforms and predictive-maintenance systems now complementing traditional distributors, helping workshops manage inventory and performance data more efficiently.

Producers that combine online access with technical support are building stronger brand loyalty and reducing grey-market exposure.

Market observations show that lubricant e-commerce sales, though still modest, are expanding rapidly.

The trend is driven by younger consumers who prefer digital channels, and by fleet operators, who rely on automated procurement.

Distributors and workshops are adopting CRM systems, digital diagnostics, and data-sharing platforms to improve responsiveness and customer retention.

At the same time, data from connected fleets is



KSA's growing EV infrastructure reflects its shift toward sustainable mobility and next-generation lubricants under Vision 2030

The image shows a close-up of a modern window frame with multiple panes. The window is looking out onto a green landscape with trees and a paved area where two silver cars are parked. The sky is blue with some clouds. The Aumüller logo and tagline are overlaid on the top left of the image.

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 **ALUPCO**
WHERE VISION TAKES SHAPE



Local manufacturing and blending are key pillars of KSA's lubricant-localisation strategy

>>

allowing formulators to tailor lubricants to specific duty cycles, a sign of how analytics and field data are reshaping product development.

FROM COMPLIANCE TO COMPETITIVE ADVANTAGE

Sustainability has moved from corporate messaging to a measurable business imperative.

Regulations by the Saudi Standards, Metrology and Quality Organization (SASO) promote low-sulphur, biodegradable, and re-refined oils, while major producers invest in cleaner processes and recyclable packaging.

"Balancing cost and performance remains challenging, but sustainability is no longer optional; it is a source of differentiation and competitive strength," Duhamel emphasises.

The shift aligns directly with Vision 2030's environmental pillars, positioning sustainability as a growth driver rather than a constraint.

Efforts to collect and re-refine used oils are also expanding, particularly in industrial zones where large-scale consumption occurs.

The introduction of circular-economy practices, such as lubricant recovery and base-oil reprocessing, reflects growing awareness of long-term environmental responsibility across the sector.



Saudi Arabia's lubricant industry is at a strategic crossroads, where economic diversification, digitalisation, and sustainability pressures are reshaping every link of the value chain

INDUSTRIAL LUBRICANTS: POWERING THE KINGDOM'S GIGA-PROJECTS

Heavy equipment for NEOM, the Red Sea Development, and Qiddiya requires durable hydraulic fluids, greases, and gear oils that can withstand demanding conditions. Industrial volumes are, therefore, gaining share against automotive consumption.

Large contractors are also adopting condition-monitoring systems to track lubricant degradation and performance in real time. This approach improves operational efficiency, reduces downtime, and increases safety, factors that are becoming essential for mega-project execution.

The trend is supporting greater use of high-performance synthetic greases and extended-life hydraulic fluids designed for extreme environments.

This expansion also boosts local manufacturing and after-sales services, reinforcing lubricants' role as an enabler of industrial productivity.

SAFEGUARDING QUALITY & BRAND INTEGRITY

While counterfeiting and grey imports continue to challenge legitimate suppliers, manufacturers are countering with QR-code authentication, tamper-proof packaging, and stronger regulatory co-operation. These measures, combined with digital traceability, help preserve product performance and consumer confidence, critical to sustaining trust in a growing market.

Improved enforcement and consumer awareness are also helping reduce counterfeit risks.

Public campaigns are encouraging end-users to purchase from verified distributors, while digital product-registration tools allow customers to authenticate products instantly through mobile applications.

A MARKET READY FOR REINVENTION

Saudi Arabia's lubricant industry is at a strategic crossroads, where economic diversification, digitalisation, and sustainability pressures are reshaping every link of the value chain.

Companies that adapt their portfolios, localise operations, and integrate environmental leadership will capture the next wave of growth.

With Vision 2030 as its compass, the sector is evolving from a volume-driven business into a knowledge- and technology-driven industry, poised to support a cleaner, smarter, and more connected Saudi economy. ■



KSA's lubricants market will reach 515 million litres by 2030

AVEVA leads digital transformation by merging AI and human insight

AVEVA is helping energy companies scale digital transformation by unifying data, AI, and human expertise, and accelerating the Middle East's transition toward high-performance industrial systems, Jesus Hernandez tells *OGN*



AVEVA's Intelligent Alert Management System help data centres overcome situations of power loss or temperate maintenance

BY ABDULAZIZ KHATTAK

DIGITAL transformation has become the defining force reshaping the global energy landscape, with energy companies today facing mounting pressure to optimise operations, modernise ageing infrastructure, and reduce emissions while ensuring reliability and maintaining profitability.

Against this backdrop, AVEVA is positioning itself as a key technology partner helping organisations navigate the complexities of intelligent, low-carbon industrial operations.

In an exclusive interview with *OGN* energy magazine, Jesus Hernandez, Senior Vice President – EMEA, AVEVA, explains AVEVA's strategy centres on unifying data, digital twins, and AI-driven analytics with human expertise to empower operators to act faster, anticipate disruptions, and streamline the performance of energy-intensive assets such as data centres.

This approach is proving especially valuable across the Middle East, where national energy companies and utilities are accelerating digital adoption to strengthen resilience and decarbonise at scale.

Below are excerpts from the interview:

How is AVEVA helping smart management of data



Jesus Hernandez

centre for energy firms, while at the same time working to reduce their overall carbon footprint?

AVEVA has extensive experience working with data centres, where energy consumption is a critical challenge.

Data centres have some challenges when dealing with situations like power loss or failure to maintain specific temperatures as they are tied to service level agreements.

When such situations occur, it is critical for the maintenance crew to be able to resolve such situations as fast as possible.

To tackle such situation efficiently, AVEVA introduced its Intelligent Alert Management System two months ago.

This solution significantly simplifies the information related to a downtime and guides crews with knowledge-based insights to resolve the situation.

Smart visualisation drives the workflow of the maintenance crew or the operator.

Targeted messages or emails are sent with just the necessary amount of information to drive action. If needed, the system can interact with the SCADA alarm management system to suppress unnecessary noise.

Furthermore, the system delivers smart visual elements to help depicts the severity of the most critical active alert in a location and guide the response procedures or steps that should be followed.

Beyond data centres, our approach relies on our industrial intelligence platform.

We start by creating awareness through en-





hanced monitoring and visualisation, essentially transforming raw data into actionable information and knowledge using AI tools.

This empowers people to make informed decisions or deploy specialised applications as needed.

What makes our solution particularly effective is that we have an open and interoperable platform, where we combine our own tools with third-party technologies to deliver comprehensive solutions.

A strong example of this is our work with e& (etisalat and), where we are operating across seven data centres.

We have also integrated our platform and alarm system with ETAP's digital twin for electrical systems.

AVEVA's interoperable industrial data platform serves to systematically address carbon reduction.

Our approach begins by collecting all process-related information and then contextualising and transforming it into actionable intelligence using AI and advanced analytics.

Essentially, we help organisations switch from reactive to proactive operations, and to move beyond alarm and advice to execution mode for more autonomous operations.

To achieve this, we leverage agentic AI that can translate insights into executable code and actions.

This capability applies broadly, whether you are focused on decarbonisation, product optimisation, production efficiency, maintenance, or other operational areas.

How does AVEVA ensure that technology remains human-centric, particularly as AI becomes more embedded in industrial decision-making?

AI doesn't work in isolation; it fundamentally requires human intervention. The process begins with developing the models, which is only possible when you have deep knowledge of what you want to achieve.

You need human expertise to determine what's actually applicable to your specific challenges; next, you must train the models with the right data and context; and finally, there's the fine-tuning phase, which enables more autonomous operation.

At every stage, humans remain central. In fact, technology amplifies human expertise rather than replacing it.

The dynamic integration of data-driven insights enhanced with industrial AI and human expertise is what we call Industrial Intelligence at AVEVA.

We are committed to growing industrial intelligence as this is what helps industry move faster, operate smarter and adapt in real time in the face of volatility.

How are AVEVA's technologies supporting modernisation efforts across the industry and especially the Middle East?

There are several compelling examples for this. For instance, Protium, a hydrogen producer in the UK, is deploying our simulation technologies to simulate different scenarios so it can allocate resources more effectively and improve productivity.

This powerful combination of simulation, data management, predictive analytics, and real-time optimisation have also been successfully implemented with ADNOC and Saudi Aramco.

Another standout example is Iberdrola, the world's largest renewable energy company, which has integrated AVEVA technology into its own AI algorithms to manage curtailment—the deliberate reduction of energy output to balance grid load.

Using our platform, Iberdrola has maximised

production and generated an additional 50 gigawatt-hours per month.

The key ingredients for this kind of success include a solid data foundation and effective change management.

But the biggest challenge we face today isn't proving the concept, it's implementing at scale. For that you need infrastructure that enables deployment at scale to achieve industry-wide impact.

Where does digital twin feature in the picture?

There are different interpretations of a digital twin; you can have a digital twin for engineering, operations, and another for maintenance, with each serving a specific purpose. But regardless, digital twin is central to the vision of digitalising the asset lifecycle.

What's crucial for AVEVA is bringing all these digital twins together in one unified environment.

We use our platform to deliver end-to-end software solutions that span the complete asset lifecycle, from concept through to operation and optimisation, to what I call the next level, which is "community".

At this stage, it's not just about what exists within your plant or assets in isolation, it's about leveraging both internal and external capabilities, and connecting your operations with broader ecosystems, shared knowledge, and collaborative networks.

A digital twin combined with AI becomes truly powerful. It not only replicates the assets digitally, but it also helps optimise them continuously and tap into collective intelligence beyond organisational boundaries.

What are the major global trends currently shaping industrial investment decisions across the Middle East?

We are navigating a challenging period shaped by some major global trends, which are fundamentally impacting investment decisions across all regions, including the Middle East.

The first is supply chain vulnerability: In response to supply chain challenges, some organisations are moving toward onshoring, while others are investing in more sophisticated systems and technologies to build resilience and visibility.

The second is a proper understanding of the systems you have, how they interact with each other, and addressing the skills gap for successful implementation.

With regard to the skills gap, much of the industrial workforce is aging. And while the incoming generation is tech-savvy, it has less industry knowledge. Hence, it is critical to bridge this gap.

And the third global trend is significant geopolitical instability, which creates uncertainty around long-term investments.

The companies that will succeed are those that can strategically deploy technology to address these interconnected challenges while managing financial constraints.

Looking ahead, what excites you most about AVEVA's role in helping organisations navigate the next phase of digital and energy transformation?

We want AVEVA to become the de facto partner for our customers as they navigate this transformation.

To achieve that, we need to excel in several areas, including primarily building a customer-centric approach.

Next is continuous product innovation by embedding and integrating the best technologies available in the market.

And the third, and the most important area, is

building the right ecosystem in the right places.

It's no longer about what one company can do in isolation, it's about how that company collaborates with other providers, suppliers, and industry partners to create greater value.

How confident are you in this region driving all that is going to come ahead?

I honestly believe this region to be far ahead of others in embracing and effectively deploying digital and energy transformation technologies.

One of the region's greatest strengths is the innovative mindset of its people.

When you compare the Middle East to other regions, for example Europe, there's a notable difference in approach.

Europe tends to be more conservative, while there's a genuine appetite to implement and experiment with new technologies in this region.

What's equally important is the focus on outcomes in this region. It's not about adopting new technology simply because it's new, it's about maximising ROI and creating tangible economic value.

You participated in ADIPEC this year. What was the key focus for AVEVA at the event?

In ADIPEC, we see an inspiring conference that brings together people, technology, and innovation.

As the world's largest energy exhibition, it's the perfect platform to address a critical reality, and that is energy is essential for humanity's future.

This means we must use energy more efficiently and sustainably.

Our message at ADIPEC was clear: As a software company, we're here to demonstrate how you can operate your assets differently in the future.

Our mission is to show how data and technology can transform asset operations, enabling more innovative and efficient ways of working.

How did your aim align with ADIPEC's theme of 'Energy, Intelligence, Impact'?

Our approach aligned perfectly with ADIPEC's theme. At the core of AVEVA's technological strategy is the CONNECT platform, our intelligent data platform integrating the entire asset lifecycle.

This holistic integration is designed to facilitate agility within and beyond companies, empowering them to make faster and smarter decisions.

Such improvements in agility are essential for increasing operational efficiency, controlling costs, and driving sustainability initiatives across organisations.

A significant facet of AVEVA's approach is the digitalisation of industrial assets; collecting, contextualising, and maximising the value of data at every phase is essential from engineering and operations to optimisation.

Using our technology, our customers can not only enhance decision-making but also deploy advanced AI throughout their industrial processes. This is how we take industrial intelligence to the next level.

A good example here is ADNOC, recognised as the most powerful AI-enabled energy company in the world.

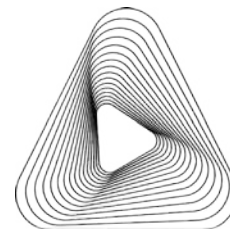
The company brings together three essential elements that work in tandem: People, innovation, and technology.

The key point is that AI alone won't solve everything; you need human intervention throughout.

And that's where AVEVA plays a pivotal role; ensuring that artificial intelligence, data transformation, and human expertise work in harmony to unlock sustainable, long-term value for industry. ■

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Energy operators need to adopt asset integrity strategies that reflect the realities of modern operating environments



Why asset integrity will shape KSA's energy and industrial sector growth?

The Kingdom needs a shift from reactive maintenance to lifecycle-led asset integrity strategies for operational resilience as facilities upgrade and expand, Dennis Snijders, Director Middle East & North Africa, IGS, tells OGN

BY ABDULAZIZ KHATTAK

SAUDI Arabia is undergoing one of the most ambitious energy and industrial expansions in its history.

Eyes are likely to be on the upstream spending projections, predicted to hit \$40 billion in 2025, up 15 per cent on 2015.

But perhaps less attention will be on the downstream powerhouse, where gas processing plants, refineries and petrochemical facilities are pushing ahead with major upgrade programmes to meet growing domestic and export demand.

This is against the backdrop of Vision 2030, which is driving the Kingdom to accelerate industrialisation, urbanisation and energy infrastructure development at unprecedented speed.

Petrochemicals is a central pillar of economic diversification, with significant downstream investments from major players such as Aramco and SABIC already reshaping the landscape.

So, what does this mean for the assets powering this growth? Production, reliability and throughput



Dennis Snijders

are non-negotiable.

But as the region scales up its output, a parallel challenge emerges. Many of the assets underpinning Saudi Arabia's refining and petrochemicals network are ageing.

We're asking more of equipment that is struggling to keep up. Combine this with high utilisation and uniquely corrosive feedstocks due to high sour gas levels, and you start to see the pressure operational conditions are placing on equipment that was ultimately not designed for today's requirements.

Asset integrity, as a result, is becoming a strategic enabler of Saudi Arabia's long-term energy resilience, and the approach towards it must reflect this.

CORROSION RISK FACTORS IN AGEING DOWNSTREAM ASSETS

The vast scale of downstream facilities can mean, at times, corrosion in one part of a large operation is overlooked.

But the reality is, if a single mission-critical piece



Saudi operators are increasingly turning to technologies purpose-built for long-term protection, including solutions such as high velocity thermal spray (HVTS®)

of equipment, be it vessels, columns, drums or heat exchangers, go offline, the whole plant is jeopardised.

An undetected, localised area of surface corrosion that leads to unexpected shutdown could translate to tens of millions of dollars in lost production.

Given the age of equipment in Saudi Arabia – and indeed across many countries in the Middle East – this risk is heightened.

Older assets, particularly those built with lower-alloy metallurgies, are significantly more susceptible to corrosion and cracking, especially as they are now operating under exposure conditions very different from those they were originally designed for.

Compounding this is the challenge that many corrosion issues are only detected during turnaround windows, when operators can inspect internally.

This often means late-stage discovery of integrity issues, emerging too close to end of shutdown for conventional repair methods, like CRA weld-overlay, to be considered due to the excessive time requirements for application and heat treatment.

At the pivotal moment when Saudi Arabia needs greater capacity, asset integrity has become more vulnerable.

ENGINEERING SOLUTIONS FOR A NEW ERA

When it comes to tackling corrosion, while organic coatings offer a low upfront cost to operators, their use is fundamentally limited to low-temperature service.

They cannot withstand the elevated temperatures or chemical severity present across many mission-critical assets. As a result, they tend to degrade prematurely.

The frequent stripping, mechanical repair and reapplication required at each turnaround introduces avoidable downtime and escalates lifecycle expenditure.

Extending shutdown windows by just 3–5 days can translate into million dollars in lost production, before even accounting for the cost of repeat works.

Where corrosion is extensive, weld overlay is a technical option. However, the required preheat and post-weld heat treatment, combined with the inherently longer application time, generally make it impractical within tight shutdown windows, particularly toward the end of the shut-



An IGS team on site

down period.

As a result, Saudi operators are increasingly turning to technologies purpose-built for long-term protection, including solutions such as high velocity thermal spray (HVTS®).

HVTS creates a dense, corrosion-resistant alloy barrier that becomes mechanically bonded to the substrate.

It delivers a permanent upgrade to aging equipment, extending the lifetime and reliability of the asset, supporting increased production and uptime for operators.

The rapid, in-situ application makes it particularly effective for time-sensitive turnarounds.

OVER A DECADE OF PERFORMANCE IN SAUDI ARABIA

Integrated Global Services' (IGS) partnership with one of the world's largest energy producers, based in Saudi Arabia, shows this shift towards long-term, proactive protection in action.

In 2013, HVTS was used to protect a de-ethaniser column that suffered hydrogen-induced cracking (HIC) corrosion with more than 700 cracks.

The internal surface was clad with the HVTS® technology covering a total area of 635 sq m.

This provided a permanent solution, completed within days, avoiding a highly disruptive column replacement that could have taken up to a year.

In 2023, after 10 years of continuous service under aggressive conditions, inspections confirmed

the HVTS remained intact and in excellent condition, with no signs of degradation.

IGS' long-term partnership with the operator is evidenced by the fact that HVTS is now applied in more than 70 assets across multiple gas plants, LNG facilities, and refineries, with over 5,000 sq m in-situ applied.

These examples demonstrate the value of shifting from upfront cost comparison to lifecycle-based decision-making; an area where operators stand to make significant gains.

MOVING ASSET INTEGRITY UP THE STRATEGIC AGENDA

The pace at which Saudi Arabia is scaling its energy and petrochemical sectors is only sustainable if operators adopt asset integrity strategies that reflect the realities of modern operating environments.

The most successful will be those with a long-term vision, supported by engineering teams who truly understand lifecycle value.

Achieving the ambitions of the Kingdom requires operators to rethink not only how they maintain their assets, but how they value them.

The same story is unfolding in downstream across the Gulf, with the region at the epicentre of global oil and gas.

Asset integrity has long been seen as a maintenance task. This new era shifts it to a strategic pillar of the region's energy and industrial future. ■

Brushless excitation systems can 'reduce' maintenance and boost O&G exploration

Brushless systems eliminate the regular wear points that can disrupt voltage stability over time, so the voltage remains reliable and consistent without frequent intervention, Matthew Slater tells *OGN*

WITH over 93,000 oil and gas exploration and production businesses operating worldwide in 2024, these facilities are still key to many modern economies.

However, beneath the surface lies a network of electrical systems that ensure continuous operations.

Thus, it becomes crucial to enhance voltage stability, reduce maintenance and improve reliability in these production facilities.

Here excitation systems play a pivotal role in addressing these power demand challenges.

By regulating generator voltage and providing reactive power support, they supply direct current (DC) power to the generator field windings, creating a magnetic field in the rotor that induces alternating current (AC) in the stator.

A well-designed excitation system precisely controls the generator voltage, rapidly adjusting to load fluctuations.

It can handle sudden shifts without triggering instability and normally includes features like fault detection and limiters for quick corrective actions.

While oil and gas facilities often operate in isolated or islanded modes, disconnected from the national grid, voltage stability and reactive power support remain critical.

In cases where local grid codes apply, such as the Saudi Arabian Grid Code, facilities may be required to comply.

However, many operate under less regulated requirements due to their independent or microgrid status.

In an exclusive interview with *OGN* energy magazine, Matthew Slater, Director at excitation specialist Excitation & Engineering Services (EES), explores how brushless excitation systems offer improved reliability and reduced operational costs, ideal for decentralised or remote installations.

Below are the excerpt from the interview:

What specific design features of brushless excitation systems enable faster voltage regulation compared to static systems?

Brushless systems are not designed for speed over static systems. In fact, static systems often respond slightly quicker because they can apply a negative field instantly, which brushless systems cannot.

The value of brushless lies elsewhere. By removing brushes and commutators, it eliminates the regular wear points that can disrupt voltage stability over time, so the system remains reliable and consistent without frequent intervention.

The focus is on steady performance rather than reaction time.

How are brushless excitation systems engineered to resist environmental stressors, such as saltwater corrosion or extreme temperatures, in offshore or desert environments?

Brushless systems eliminate the brushes and slip rings that are prone to wear and sparks, which is critical in environments with corrosive air or explosion risks.

Many oil and gas sites require explosion-proof



A brushless excitation control unit

equipment, and the absence of sliding electrical contacts makes the system inherently safer.

Materials and coatings are chosen to withstand heat, moisture and salt exposure, while enclosures are rated to keep dust and debris out.

Over time, this means operators can focus on their core work rather than constantly maintaining the exciter.

How do EES's brushless excitation systems ensure compliance with specific grid codes, such as the Saudi Grid Code, in terms of voltage stability and reactive power support?

Compliance begins with detailed calculations

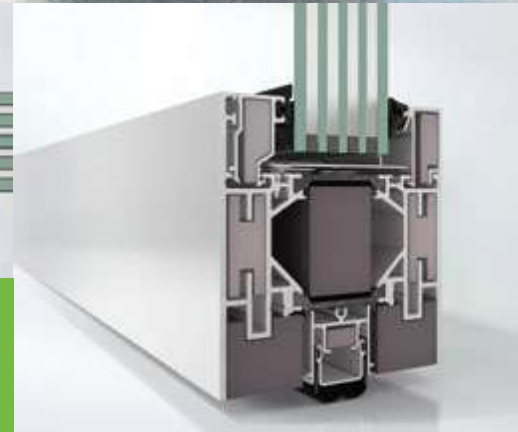
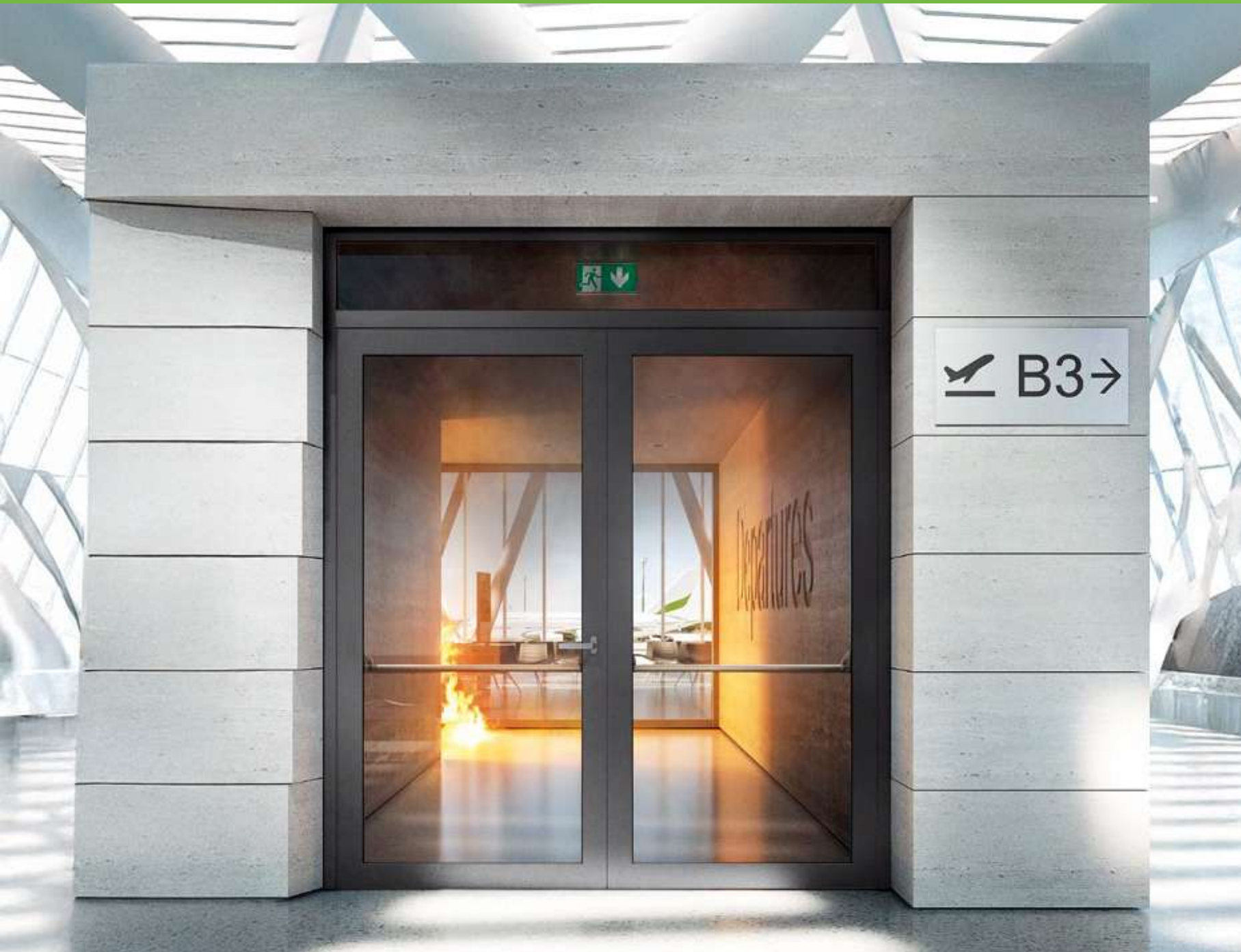
for each site. We establish the required fault ride-through and forcing margins and use these to determine the excitation supply voltage needed to meet the grid code.

The system is then engineered to maintain stability through load swings and disturbances. It is not a generic solution; the excitation system is tuned for the operational profile of the plant, ensuring it behaves predictably under the specific rules of the local network.

Can you provide examples or estimates of the cost savings achieved by using brushless exci-



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Brushless systems need very little maintenance. Cubicles typically last 20 to 25 years, while the machines themselves, built with proven designs from the 1960s, can continue running reliably far beyond that



tation systems in oil and gas facilities?

Brushless systems do not necessarily save money on the upfront equipment cost, they tend to cost a similar amount to static systems of the same rating.

The choice usually comes down to safety and operational performance.

Sites that operate in hazardous environments value the reduced risk of sparks and the reliability of fewer moving parts.

These factors reduce downtime and long-term maintenance costs, which is where the financial benefit becomes apparent, even if it cannot be pinned down to a simple figure.

How frequently do brushless systems require maintenance compared to static systems, and what is the typical lifespan of an EES brushless system?

Brushless systems need very little maintenance because they have no brushes or sliding contacts to wear down.

A static exciter might require routine inspections and replacements as the brushes degrade, which can interrupt operations.

Brushless systems avoid this entirely. Cubicles typically last 20 to 25 years, while the machines themselves, built with proven designs from the 1960s, can continue running reliably far beyond that, demonstrating the long-term durability that operators can rely on.

How does EES tailor its brushless excitation systems to meet the specific needs of different types of oil and gas facilities, such as offshore platforms versus onshore drilling sites?

Each system is configured to the facility's specifications. We work out the required forcing margin and ensure the design coordinates with protection relays and the control and alarm systems already in place.

The engineering does not differ dramatically between onshore and offshore, though offshore units often require higher ingress protection.

Essentially, we adapt to the operational and environmental conditions while ensuring integration into the existing electrical and control infrastructure.

How easy is it to retrofit EES's brushless excitation systems into existing generators or older infrastructure in oil and gas facilities?



An excitation control cubicle

Replacing a static exciter with a brushless system is usually straightforward. The challenges increase when converting from a DC system to brushless, but for most retrofits, integration is uncomplicated.

The system connects into the generator, works with existing protection, and provides the low-maintenance operation without needing extensive modifications.

Can you share specific case studies where EES's brushless excitation systems have improved performance or reduced downtime in oil and gas facilities?

Recent oil and gas-specific examples are limited, but hydroelectric conversions illustrate the benefits clearly.

By removing the DC exciter, maintenance intervals increased and outages became less frequent.

The same principles apply in oil and gas: Fewer moving parts translate into less routine attention, fewer operational surprises and more predictable generator behaviour over time.

How do brushless excitation systems align with emerging trends in the oil and gas industry, such

as the integration of renewable energy or digital monitoring systems?

Brushless excitation systems operate independently of renewable energy integration or digital monitoring.

They maintain voltage and reactive power regulation without interaction with these systems.

That said, they can be monitored and controlled digitally, just like static or DC systems, meaning operators can integrate them into modern monitoring frameworks without requiring system redesign.

How does EES differentiate itself from other providers of excitation systems in the global market?

EES is not tied to a single manufacturer, which allows us to select the controller best suited to each project.

Our approach is guided by customer requirements rather than sticking with a particular brand or model.

Every project has a technical sweet spot, and by choosing components based on performance and integration needs, we deliver systems that work efficiently across different generator types and operating conditions. ■

Middle East energy investments drive demand for advanced PFP systems

For regional operators focused on asset longevity, safety, and maintenance reduction, coatings like PPG PITT-CHAR NX offer a proven solution, Richard Holliday tells **OGN**



The PPG PITT-CHAR NX fire protection system meets all the requirements of UL 1709 Edition 5

THE Middle East holds some of the lowest-cost oil and gas resources in the world and it remains a central force in the global energy landscape.

In 2024, the region provided around 30 per cent of global oil production and 17 per cent of global natural gas output, according to an International Energy Agency (IEA) report.

This has led to a surge in investments, with the region set to invest approximately \$130 billion in oil and gas supply in 2025, representing about 15 per cent of the global total.

Saudi Arabia alone plans to allocate around \$40 billion to upstream oil and gas activities.

From refinery investments in Saudi Arabia and LNG terminals in Qatar to offshore assets in the UAE, oil and gas development is accelerating across the Middle East, driving unprecedented demand for high-performance passive fire protection (PFP) systems.

In parallel, the Middle East has emerged as a global fabrication hub, supplying critical infrastructure and components for major projects in markets such as the US.

This growth brings complex technical demands. From liquefied natural gas (LNG) terminals to refineries across the Gulf region, these facilities operate under extreme conditions, including intense heat, UV exposure, high humidity, salt-laden air and vibration.

These environments, paired with the ever-present risk of hydrocarbon fires and even the risk of

cryogenic exposure, demand PFP that does more than pass laboratory tests.

They must deliver consistent functionality and remain fully available, reliable and survivable in the field for decades without failure, even in the most demanding environments.

ROBUST STANDARDS FOR A TOUGH INDUSTRY

Developments in PFP testing, led by the introduc-



Richard Holliday

tion of Edition 5 of Underwriters Laboratories (UL) 1709 standard, have changed how the oil and gas sector evaluates fire protection coatings.

As part of UL 1709 Edition 5, it became mandatory for products to pass the highest level of UL 2431—the standard for safety for “durability of fire resistive coatings and materials”—to achieve certification.

This requirement introduces significantly more aggressive environmental testing, closing the gap between lab success and in-field survivability.

Since the late 1980s, UL 1709 has been the benchmark for testing PFP systems against hydrocarbon pool fires.

Earlier versions included environmental durability requirements, though the testing standards have since become more rigorous.

In many cases, coatings that passed fire tests in the lab failed in the field after exposure to moisture, ultraviolet (UV), temperature swings or handling damage.

Once cracked or delaminated, even the most fire-resistant coating becomes compromised.

UL 1709 Edition 5 addresses this gap by mandating that products must pass the newly adopted UL 2431 durability standard with more stringent fire testing requirements.

This standard more accurately reflects service conditions in the field, making certification both more rigorous and more relevant across varied geographies and applications.

UL 2431 was developed to align more closely with





climatic conditions. It includes a range of environmental stress simulations:

- **Combined UV and humidity testing (ASTM D4587):** Coatings must withstand a 5,000-hour cycle of 8-hour UV exposure at over 70 deg C, followed by 4-hour condensation at 50 deg C, closely replicating challenging site conditions.
- **Wet-freeze-dry cycle testing:** Products endure 12 cycles of artificial rain (72 hours at 18 mm/hour), followed by deep freezing (-40 deg C for 24 hours), and dry heat (over 60 deg C), which reveal moisture-related damage risks such as cracking.
- **Salt spray corrosion test (ASTM B117):** A 90-day (2,160-hour) salt spray test evaluates corrosion resistance in harsh marine or industrial conditions.
- **High-speed air erosion test (ASTM E859):** Simulates long-term wind exposure at 96.6 kmph (60 mph), a particularly demanding test for cementitious systems.
- **Impact resistance assessment (UL 2431):** A 2-inch steel ball is dropped from 20 ft to simulate mechanical impacts, particularly challenging for cement-based coatings.
- **Vibration durability test (10-60 Hz):** Identifies failure points under vibration, simulating conditions on offshore platforms or industrial plants.

After completing these tests, UL fire test the coatings and compare the fire resistance to unexposed control samples.

While UL 1709 Edition 4 required the exposed sample to test within a 25 per cent deviation of an unexposed sample's fire performance, that deviation has been tightened to only 15 per cent since UL 1709 Edition 5.

THE OIL & GAS CHALLENGE

Facilities across the energy value chain (from upstream to downstream) face increasingly complex fire and environmental hazards.

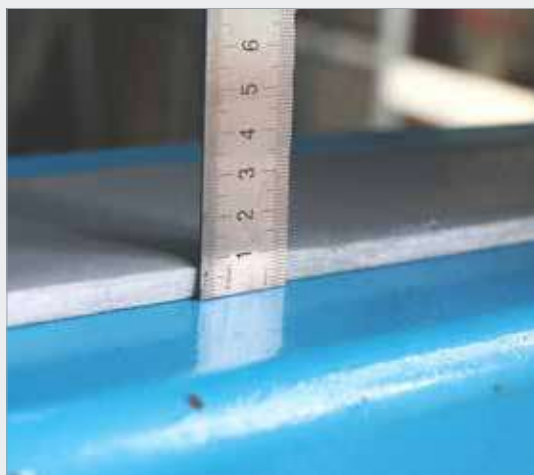
LNG terminals, offshore platforms and onshore refineries and petrochemical facilities all share one need; they need a fire protection system that not only resists heat but also endures harsh environmental conditions without premature failure.

Cryogenic spill protection emerges as another critical requirement, especially in LNG infrastructure.

A coating that becomes brittle under sub-zero conditions could crack and fail before fire even breaks out. The overall durability in PFP thus proves essential.

CASE IN POINT

PPG PITT-CHAR® NX fire protection system meets



The PPG PITT-CHAR NX requires only 7.88 mm to achieve a two-hour UL 1709 fire rating



The PPG PITT-CHAR NX being applied

all the requirements of UL 1709 Edition 5.

Additionally, UL has verified the PFP coating to pass double-exposure testing under UL 2431 without requiring a topcoat.

Designed with a flexible epoxy matrix, the system resists mechanical and environmental stresses without cracking, which is ideal for the harsh conditions of the oil and gas industry.

One example is the Sonker Refinery project at Sokhna Port Basin 3, a critical liquid bulk terminal on Egypt's Red Sea coast.

Sonker Energy needed to protect 14,000 sq m of steel structures and piping in an environment that combined harsh desert conditions with coastal humidity and salt-laden air.

Compounding the challenge were potential temperature extremes ranging from +50 deg C down to -40 deg C, as well as the ever-present threat of hydrocarbon fires.

PPG PITT-CHAR NX was used for its combination of fire performance, flexibility and proven durability without the need for a topcoat. Applied both on- and off-site, the system was:

- **Safer:** Engineered to meet the latest severe hazard testing requirements, including high heat flux jet fire and explosion scenarios, helping reduce asset risk in demanding environments.
- **Tougher:** Designed for long-term durability, the coating withstands stresses and strains during construction, transportation, and service without cracking or delamination.
- **Thinner:** Requires only 7.88 mm to achieve a two-hour UL 1709 fire rating per UL design XR658.
- **Lighter:** Up to 15 per cent lighter than alternative epoxy PFP systems and less than one-third the weight of "lightweight" cementitious systems, reducing structural load.
- **Faster:** Can be applied in a single shift, up to 60 per cent faster than traditional systems, simplifying installation and maintenance, especially in remote locations.

By enabling safe, efficient fabrication and installation, the system allowed Sonker to meet project deadlines while ensuring long-term asset protection.

TOPCOAT OR NO TOPCOAT?

Many PFP systems rely on a topcoat to meet environmental durability standards. The topcoat serves as the first line of defence against UV degradation, water intrusion and mechanical damage.

In controlled environments like indoor facilities, this added layer may perform well over time.

However, oil and gas coatings face salt spray, extreme temperature swings, physical handling and long-term outdoor exposure; the topcoat becomes a potential point of failure.

If it deteriorates or receives inadequate maintenance, it can expose the underlying intumescent layer to damage. Once compromised, the system may no longer provide effective fire resistance.

That's why systems that maintain durability without a topcoat offer an advantage in high-risk environments.

They reduce maintenance requirements and extend service life, especially in remote or offshore installations where access is limited, and inspection intervals may be long. For operators focused on minimising downtime and total cost of ownership, this distinction matters.

RAISE THE BAR FOR FIRE PROTECTION

Choosing the right PFP system, oil and gas specifiers should ask:

- Was the system tested, assessed and certified in accordance with the latest edition of UL 1709, including full environmental durability?
- Is it listed on UL's Product IQ database?
- Can it withstand explosions, cryogenic spills, pool fires and jet fires?
- Was it tested as a full system, including mesh, primer and topcoat (if needed)?
- Is a topcoat optional or required for performance?

If suppliers cannot provide clear answers to these questions, the risk increases. Coatings should protect steel, safety, uptime and investment.

The adoption of the now UL 1709 Edition 6 and UL 2431 durability standards represents a critical shift toward in-field performance expectations in the region.

Coatings like PPG PITT-CHAR NX system are engineered to meet these challenges head-on, combining certified hydrocarbon fire resistance with superior environmental durability.

For Middle East operators focused on asset longevity, safety, and maintenance reduction, this next-generation PFP system offers a proven solution that aligns with the region's drive for resilient, cost-effective infrastructure.

** Richard Holliday is the PPG Global Director of Hydrocarbon Passive Fire Protection for Protective and Marine Coatings. He is an industry-recognised expert on fires, explosions and cryogenic spill testing standards. PPG offers holistic solutions for fire, explosion, and cryogenic protection. ■*



ITER, France

In the south of France, 35 nations are working together to build the world's largest tokamak, a magnetic fusion facility designed to prove the feasibility of fusion as a large-scale and carbon-free energy source.

High-security gates supplied by are located in a strong magnetic field, where they protect against radioactive radiation and heat. They are airtight and watertight and, despite being easy to operate, are designed to be particularly durable and low maintenance.

ProSep contract win for AIMS to result in efficiency for Kingdom's plants

Replacing conventional injection quills, the AIMS will help operators optimise the injection and mixing efficiency of demulsifier, scale inhibitor, and corrosion inhibitor on production headers

PROSEP, a leading provider of field-proven process separation solutions, has won a new contract in the Kingdom of Saudi Arabia for its proprietary mixing technology, demonstrating its commitment to helping operators achieve higher production performance in the Middle East.

The new agreement will see ProSep deliver three of its annular injection mixers (AIM) to an oilfield in the Kingdom.

Replacing the existing legacy and conventional injection quills, the provision of the AIMS will help the operator optimise the injection and mixing efficiency of demulsifier, scale inhibitor, and corrosion inhibitor on three production headers.

Alongside the expectation that this installation will help to improve plant efficiency, it is also anticipated that it could deliver measurable reductions in chemical injection and associated operational costs, potentially saving the client tens of millions of dollars over the operating life of the field.

This latest order follows a long-term collaborative relationship between ProSep and the client.

Following a history of positive results from previous installations, this continued scope of work demonstrates the operators' ongoing trust in ProSep's technology.

Utilising Saudi expertise and in-country fabrication capabilities, the three mixers will be manufactured locally before delivery to the oilfield in 2026.

Also recognising the market demand for its solutions in the Middle East, ProSep has sought to increase its portfolio of partners in the region to help reduce lead times and to leverage local capabilities.

While ProSep's global engineering



ProSep's AIM will be delivered to an oilfield in Saudi Arabia

and technology development remain anchored in Houston, the company has evolved its execution model to combine global expertise with regional delivery.

Commenting on the new contract, Raul Gonzalo, Director of Sales and Operations, says: "Over the last 10 years, ProSep has established a significant reputation in the Middle East. We've worked in-depth across

the region with several operators and service companies, helping to improve plant efficiencies and production records. This new contract is a testament to that reputation, and particularly with this client."

The company has delivered several of its mixing technologies over the years, and has secured some very positive results in the process.

Gonzalo sees the manufacturing of

the mixers in-country a natural evolution for ProSep's presence in the region.

He says: "This decision stems from the local market's demand for our technology and the network of suppliers we now work with. It's with great pride that we can say these mixers will be produced locally and supported by ProSep's global engineering expertise." ■



The AIM could reduce operational costs



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Abdul Latif Jameel Motors to advance hydrogen power solutions in KSA

Abdul Latif Jameel Motors, EODev, and Octopian will jointly work on the introduction, demonstration, and potential future localisation of EODev's hydrogen power technologies

ABDUL Latif Jameel Motors has signed a memorandum of understanding (MoU) with Energy Observer Developments (EODev), a leading French industrial company specialising in zero-emission power generation and energy storage solutions, and Octopian Global Services (Octopian), a multinational technology provider based in the UAE, to accelerate the adoption of hydrogen-powered generator solutions in the Kingdom of Saudi Arabia.

The agreement represents a significant milestone in Abdul Latif Jameel Motors' continuing efforts to deliver cleaner, smarter, and more efficient mobility and energy solutions, in line with Saudi Vision 2030 and the Kingdom's ambition to establish itself as a global hydrogen hub.

Building on successful hydrogen mobility pilots and initiatives, Abdul Latif Jameel Motors is now extending its expertise into stationary hydrogen applications.

Under the terms of the MoU, Abdul Latif Jameel Motors, EODev, and Octopian will work together on the introduction, demonstration, and potential future localisation of EODev's hydrogen power technologies in Saudi Arabia.

EODev's solutions, including the GEH2 stationary hydrogen generator, utilise Toyota's fuel cell technology to provide zero-emission, reli-



able power across a broad range of applications.

Mazin Ghazi Jameel, Managing Director, Toyota Marketing Operations, comments: "This collaboration demonstrates Abdul Latif Jameel Motors' commitment to supporting the Kingdom's transition towards a low-carbon future, fully aligned with Saudi Vision 2030. By extending hydrogen solutions through this MoU

beyond mobility into industrial and commercial applications, we aim to contribute to building a cleaner and more efficient energy landscape for everyone."

Stephane Jardin, Deputy CEO, EODev, adds: "We are proud to partner with Abdul Latif Jameel Motors and Octopian to introduce our hydrogen power solutions to the Kingdom. This collaboration marks a major step in

EODev's global expansion and reinforces the relevance of our GEH2 generator, which combines Toyota's proven fuel cell technology with our energy management expertise. Together, we intend to support Saudi Arabia's ambition to become a leader in clean, reliable, and zero-emission energy, turning vision into action."

Dr Tariq Jbarah, CEO, Octopian Global Services, says: "This collaboration is an important milestone in Octopian's mission to support the region's transition towards cleaner, smarter, and more resilient energy ecosystems. By combining our operational excellence with Abdul Latif Jameel Motors' market leadership and EODev's technological expertise, we aim to accelerate the uptake of hydrogen power solutions that will shape the Kingdom's sustainable future."

The MoU establishes the groundwork for potential local assembly and production opportunities, alongside longer-term plans to develop a comprehensive value-chain ecosystem for hydrogen generators in the Kingdom.

This collaboration underlines the shared commitment of Abdul Latif Jameel Motors, EODev, and Octopian to deploy scalable, zero-emission power solutions in Saudi Arabia, contributing to the Kingdom's carbon neutrality goals and a cleaner, greener future. ■



The EODev GEH2 hydrogen fuel cell generator

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Jotun unveils 'groundbreaking' passive fire protection coating

The Jotachar 1709XT, engineered for hydrocarbon fires, delivers superior mechanical strength, faster application, and significant carbon savings by preserving steel integrity, Andy Czainski tells **OGN**

BY ABDULAZIZ KHATTAK

IN the rapidly growing Middle East passive fire protection market, Jotun's Jotachar 1709XT supports regional net-zero ambitions including UAE's 2050 and Saudi Arabia's 2060 targets through full lifecycle emissions reductions.

Manufactured locally in Oman, the mesh-free solution offers enhanced durability in harsh Gulf conditions without compromising performance.

This innovation positions Jotun as a leader in sustainable, high-efficiency PFP for oil and gas assets.

In an exclusive interview with OGN energy magazine, Andy Czainski, Global Category Manager – Fire Protection, Jotun Performance Coatings, Jotun Paints Arabia, says the Jotachar 1709XT delivers faster installation and lower total installed cost while fully maintaining certified hydrocarbon fire performance.

Below are excerpts from the interview:

How does Jotachar 1709XT's calculated carbon saving per tonne of steel account for its full life-cycle, including manufacturing in Oman and disposal, and what quantitative metrics align it with UAE's Net Zero 2050 or Saudi Arabia's Net Zero 2060 targets?

In passive fire protection, the most impactful decarbonisation lever is preserving steel in service.

We define "carbon saving per tonne of steel" as the avoided emissions that would otherwise arise from fire-induced damage requiring demolition, new steel fabrication, transportation, and reinstallation.

Our accounting spans the full lifecycle, including raw materials and manufacturing in Oman, packaging, logistics, and application, to long-term in-service performance and responsible end-of-life management.

Life cycle assessment (LCA) serves as our primary tool, supported by independently verified environmental product declarations (EPDs) where available.

Quantification is tailored to each project: We model a baseline scenario (steel replacement following hydrocarbon fire exposure) against a protected scenario using Jotachar 1709XT (where steel integrity is maintained), then normalise the emissions difference per tonne of steel kept in service, drawing on conservative, audited intensity factors for steel production, logistics, and site works.

To support ambitious regional targets like UAE Net Zero by 2050 and Saudi Arabia's Net Zero by 2060, our metrics align fully with the GHG Protocol:

- **Scopes 1 and 2:** Driving ongoing operational reductions, with a commitment to 70 per cent renewable electricity by 2030.
- **Scope 3:** Ensuring product transparency through LCA/EPD and robust avoided-emissions modelling for customer assets.

In short, Jotachar 1709XT advances net-zero pathways by preventing emissions-intensive steel replacement and providing rigorous, end-to-end documentation of those carbon savings.



The Jotachar 1709XT is certified to UL 1709 for hydrocarbon fire protection

The Jotachar 1709XT is a climate ready application, as it is engineered for high substrate temperatures and robust handling through fabrication/transport typical of Gulf projects

Can you elaborate on Jotachar 1709XT's technical breakthroughs that allow it to achieve 'faster film build' and superior mechanical strength when compared to other leading PFP solutions?

Jotachar 1709XT is certified to UL 1709 for hydrocarbon fire protection and is built on advanced technology designed for high build, mechanical robustness, and superior application efficiency.

This technology optimises for fast film build with high sag tolerance, enabling efficient one-leg ap-

plication without the need for thinning.

It provides high mechanical strength and adhesion, which significantly reduce the risks of cracking, delamination, or detachment during fabrication, lifting, transport, and service.

The product is mesh-free for up to 60 minutes and offers competitive loadings for up to 120 minutes, resulting in lower installed thickness and weight for UL 1709 projects.

It has proven application performance at elevated substrate temperatures, supporting greater productivity in challenging Gulf climates.

Its durability is demonstrated by UL 2431 certification and pre-qualification to NORSOK M-501:2022, achieved without a topcoat, which underscores its exceptional long-term performance.

Collectively, these features deliver faster installation and lower total installed cost while fully maintaining certified hydrocarbon fire performance.

Beyond reducing lead times, how does localising the manufacturing of the Jotachar range enable Jotun to tailor the coating's performance for the region's harsh environmental challenges?

Localising production in Oman (with an annual capacity 2.4 million litres) does more than reduce lead times.

It lowers embodied emissions via onsite solar share by improving the coating's cradle to gate footprint for regional projects.

The Jotachar 1709XT is a climate ready application, as it is engineered for high substrate temperatures and robust handling through fabrication/transport typical of Gulf projects.

The system's durability is assured through validation to UL 2431 and NORSOK M-501:2022 System

5A standards without a topcoat, demonstrating robust resistance to weathering and mechanical stresses, while owners may specify a compatible topcoat where long-term UV aesthetics are required.

Together, local production, climate tolerant application windows and validated durability help tailor performance to Gulf conditions of heat, humidity and operational exposure.

How is Jotun positioning Jotachar 1709XT against rivals in the growing Middle East PFP market, focusing on total installed cost, application speed, and long-term non-fire durability for oil and gas assets?

Jotachar 1709 XT stands out as the most optimised solution for up to 120 minutes of protection, delivering cost efficiency across all projects by combining low material consumption with competitive loadings and installed costs.

It also offers best-in-class performance for 30- and 60-minute ratings through single-coat application, enabling remarkably fast installation.

This is further enhanced by its easy partial mesh installation when required, along with rapid thickness build-up and high sag tolerance.

Additionally, the product allows for effortless single-leg application without any need for thinning, culminating in an excellent overall finish.

Given the Middle East's shortage of skilled PFP applicators, what training, technology, or quality measures does Jotun's Certified Applicator Scheme use to address the industry skills gap and reduce application risks?

Jotun mitigates the industry-wide skills gap in PFP application through its Certified Applicator Scheme, backed by comprehensive technical service and more than 1,200 dedicated coating advisors worldwide.

We provide full support at every stage, from fire engineering services and loading calculations to engineering guidance and PFP weight optimisation.

We also offer client demonstrations, reference areas, inspection and testing guidance, and hands-on expertise to ensure flawless application and absolute compliance, keeping client assets protected and operations safe.

For typical brownfield asset retrofit projects, how do Jotun's Fire engineering services integrate with owners' existing integrity management systems



The Jotachar 1709XT is engineered for high substrate temperatures

to ensure compliance and minimise operational downtime?

Jotun's Fire Engineering Services team provides Dry film thickness (DFT) loading tables and optimised solutions that fully comply with industry standards and guidelines, ensuring all documentation is audit-ready and minimising the risk of non-conformities or deviations.

Through value engineering and structural fire engineering, we collaborate closely with project designers from the earliest stages to reduce both the overall cost and the weight of PFP material required, without compromising performance.

This proactive approach also shortens application time and reduces the need for repairs.

Additionally, our unique DFT markup drawings streamline the inspection process, enable faster application, and help minimise operational downtime.

The result is faster, fully compliant brownfield execution with significantly lower operational impact.

What is Jotun's roadmap for transitioning its thick-film PFP range to eco-friendly, low-VOC or water-borne formulations while maintaining per-

formance for hydrocarbon and jet fire scenarios?

The transition is not only about greener/environmentally compliant chemistries but also about sustainable outcomes.

By ensuring that steel structures are protected for decades, Jotun's PFP systems minimise resource consumption, reduce repair interventions, and extend the lifetime of critical assets.

This holistic approach means fewer recoats, less downtime, and ultimately a smaller carbon footprint across the asset's lifecycle.

How does Jotun collaborate with regulators and civil defence in Saudi Arabia and the UAE to keep Jotachar 1709XT fully compliant with evolving fire safety regulations?

Jotachar 1709 XT has been subjected to comprehensive testing at third-party test facilities, and is fully certified by leading industry bodies (UL 1709, UL 2431, NFPA 290, NORSOK M 501 pre qualification).

We provide authorities and code enforcers with complete technical dossiers, durability data and specification guidance, and we support owners during approvals and inspections.

Additionally, our regional teams monitor evolving requirements and update documentation, so projects remain fully compliant with local fire safety codes.

What unique dual challenges do explosion scenarios pose to intumescent coatings in UL 1709 hydrocarbon fire tests, and how does Jotachar 1709XT's high mechanical strength maintain structural integrity against blast pressure waves?

Jotachar 1709XT has undergone rigorous testing, including exposure to extreme jet fire scenarios.

Jet fires occur when gas, oil, or hydrocarbons are rapidly released under high pressure, producing a highly erosive flame jet with intense heat fluxes typically ranging from 240 to 300 kW/sq m (and even exceeding 800 kW/sq m in hydrogen fires).

To counter these extreme conditions, Jotun's fire protection systems are engineered to meet the demanding ISO 22899-1 standard, ensuring robust and reliable performance during jet fire events.

This advanced level of protection provides ultimate fire safety, safeguarding lives and critical assets precisely when and where it matters most. ■



The Jotachar 1709XT is tailored to the GCC's conditions of humidity and operational exposure

Underground gas storage hits 424 bcm globally, securing energy supply

Middle East capacity reaches 9 bcm as world relies on 699 facilities for seasonal balancing and energy security amid growing renewable integration challenges, says an IGU report



BY ABDULAZIZ KHATTAK

GLOBAL underground gas storage capacity has reached 424 billion cu m (bcm) across 699 facilities worldwide, providing a critical buffer against supply disruptions and price volatility as the energy transition accelerates, with the Middle East contributing 9 bcm to this strategic reserve.

The expansion represents a 10 bcm increase from 414 bcm reported in 2022, with peak withdrawal rates climbing to 7,371 million cu m per day (mcm/d) compared to 7,221 mcm/d two years earlier, according to data compiled by the International Gas Union's (IGU) Storage Committee through April 2025.

According to the International Gas Union's report, 'Underground Gas Storage: A Critical Pillar for Energy Security', the storage capacity is distributed across North America (164 bcm), Europe (142 bcm), the Commonwealth of Independent States (83 bcm), Asia (20 bcm), the Middle East (9 bcm), Asia Pacific (6 bcm), and Latin America (0.2 bcm).

Natural gas fields dominate the storage landscape, representing 74 per cent of total working gas volume at 314 BCM, though they account for only 57 per cent of the total potential withdrawal rate.

Saline aquifers hold 11 per cent of capacity at 47 BCM, whilst salt caverns, despite comprising just 9

Natural gas fields dominate the storage landscape, representing 74 per cent of total working gas volume at 314 bcm, but account for only 57 per cent of the withdrawal rate

per cent of working gas volume at 40 bcm, deliver 27 per cent of the potential withdrawal rate due to their high deliverability characteristics.

Oil field storage accounts for 6 per cent of capacity at 23 bcm, with rock caverns representing a

negligible fraction of global storage infrastructure.

The US operates the highest working gas volume globally at 138.09 bcm across 403 facilities, followed by Russia with 68.99 bcm in 24 facilities and Ukraine with 32.18 bcm in 13 facilities.

Canada ranks fourth with 25.52 bcm across 64 facilities, whilst Germany holds 22.49 bcm in 44 facilities, placing it fifth globally.

China has achieved the single largest increase in storage capacity, adding 6 bcm to reach 19.83 bcm across 25 facilities, now ranking sixth in terms of total working gas volume.

The Netherlands, following the expansion of the Norg facility, now operates 13.74 bcm across five facilities, outranking France's 11.77 bcm in 14 facilities.

Italy maintains 17.66 BCM across 13 facilities, whilst Austria has expanded to 8.58 bcm in nine facilities, with growth exceeding 5 per cent attributed to completion of past projects.

Hungary operates 6.10 bcm across five facilities, and Iran holds 6 bcm in two facilities, demonstrating the strategic importance of storage across diverse geopolitical contexts.

REGIONAL DYNAMICS & DEVELOPMENT PATTERNS

North America has experienced slight capacity





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At 74 per cent of total working gas volume, natural gas fields dominate the storage landscape

»»

increases, though new project development remains limited, with most capacities derived from small-scale porous reservoirs in a fragmented storage market.

Gas storage serves as the cornerstone of gas infrastructure for winter supply in the region, with withdrawal rates reaching 3,395 mcm/d across American facilities.

Europe's storage capacity has increased slightly compared to 2020-22 levels, with Ukraine now classified under the Europe region rather than the Commonwealth of Independent States.

Completion of extension projects at some storage facilities has counterbalanced capacity losses at sites chosen for abandonment, though conversion to production has commenced in several cases.

European storage facilities remain actively utilised and fundamental for energy system operations, with total withdrawal capacity reaching 2,179 mcm/d across the region's facilities.

The Commonwealth of Independent States (CIS) relies primarily on storage for seasonal balancing and export support, with most capacity linked to large-scale porous reservoirs featuring average withdrawal rates.

Storage facilities in the region are predominantly state-owned, reflecting the strategic nature of gas storage infrastructure in national energy security frameworks.

Asia, driven principally by China's strategic policy shift from coal to gas, stands as the only region experiencing robust storage growth, though infrastructure development lags behind the pace of growing gas consumption.

Turkey is developing storage at a rapid pace, whilst Japan has increased capacity at the Sekihara storage facility and resumed operation of the Shiunji Field.

Latin America reported one new project at the Pilar ESGN Field, whilst Africa recorded no major developments during the reporting period.

Globally, plans for 65.9 bcm of working gas volume exist in various stages of planning and development, with greenfield projects representing 42 per cent of this pipeline and the remainder consisting of expansions of existing facilities.

Policymakers across the globe have introduced measures to preserve or expand gas storage capacity and ensure sufficient gas volumes are stored in advance of winter seasons

STRATEGIC VALUE & SYSTEM RESILIENCE

Underground gas storage facilities provide large volumes of gas strategically located near key demand centres, enabling suppliers to secure firm capacities for potentially significant gas volumes within record delivery times.

The infrastructure optimises energy systems by acting as additional energy supply, reducing the need to overinvest in gas transmission infrastructure from distant supply regions and thereby enhancing financial efficiency.

Locating storage facilities near consumption hubs decreases reliance on flexibility mechanisms within the power system, which are often constrained in both scale and duration, helping avoid substantial capital expenditures and curbing future operational costs.

During the 2020-2021 LNG price surge in Asia, European prices remained largely insulated thanks to storage levels filled to 92 per cent across the EU, providing a buffer that absorbed global shocks.

The second surge in 2021-2022 affected Europe more severely, with storage levels peaking at only 75 per cent, leaving the continent exposed to glob-

al market tensions and contributing to early signs of what became a broader energy crisis.

The EU adopted the Gas Storage Regulation in June 2022, marking the first coordinated attempt to strengthen gas storage requirements across member states in response to demonstrated vulnerabilities.

Gas injection into storage during summer causes slight price increases during low-demand periods, but this effect is offset by substantial price mitigation in winter when demand is significantly higher and more consumers are affected.

The collective savings generated by lower winter prices outweigh modest summer cost increases, delivering meaningful value and stability for consumers across the seasonal cycle.

Storage capacity discharge times range from minutes for tank storage to one year for depleted natural gas fields, with aquifers and salt caverns offering intermediate flexibility options.

Salt caverns can have almost one million times the capacity of battery storage systems, demonstrating the unmatched scale advantages of geological storage for long-duration energy security.

Policymakers across the globe have introduced or reinforced measures to preserve or expand gas storage capacity and ensure sufficient gas volumes are stored in advance of winter seasons.

Countries have adopted various approaches ranging from market-based mechanisms and regulatory interventions to traditional security measures including strategic reserves and minimum storage obligations.

The interaction between gas systems, whether methane or hydrogen-based, and electricity systems must become a priority for enhancing overall energy system resilience as power generation shifts increasingly towards renewables.

This requires an integrated, system-wide approach reflecting the interdependencies of a decarbonising and increasingly interconnected energy landscape, moving beyond siloed sectoral thinking.

Sustained international cooperation, continuous innovation, and active knowledge-sharing will prove essential to ensure underground gas storage remains a robust, future-proof pillar of the global energy system. ■