Inside



Saudi Arabia, Vision 2030

Qanbar trials CO2-injected concrete
Championing localisation
Exploring semiconductor manufacturing 17
Revolutionising interface measurement 17
MSA Safety plans for green energy 16
Using AI to reduce carbon14
Eliminating toxic mercaptans with OLI 12
Saudi Multichem localises nanotech 10
Spark grows with new Aramco facility
AMI brings leading FMTC training to KSA 6
Net-zero goals: the journey continues4

Next-gen reactors' key role in future energy

Onshore Drilling	5	24
------------------	---	----

Developing energy storage system for rigs

Key downstream event	
AVEVA expedites decarbonisation	
Middle East Energy returns to Dubai	
Africa needs to curb declining production 30	

Products & Services (online reports)

Emerson to accelerate hydrogen production

Overcoming connectivity challenges

Wartsila to fit vessels with efficiency engines

Kingdom on the ball with energy transition

Saudi Arabia has the financial and human capacity to drive ahead energy transition; strengthening public-private partnerships will prove helpful in this regard

By ABDULAZIZ KHATTAK

AUDI Arabia has in place all the ingredients, including institutional, human and financial capacities, needed to facilitate the ongoing energy transition, specifically its adoption of the holistic circular carbon economy (CCE) approach.

In their paper, 'Energy Transition in Saudi Arabia: Key Initiatives and Challenges' Fateh Belaid and Aisha Al Sarihi, researchers at King Abdullah Petroleum Studies and Research Center (Kapsarc), have attempted to understand the magnitude of the efforts by the kingdom in this regard and the challenges that come with it.

Energy transition has become a prominent concern for policy-makers around the world. In this context, alternative energy sources will play a key role in the process of energy mix decarbonisation and in the implementation of a new economic model, aiming to advance social well-being and sustainability. The Paris Agreement of 2015 on climate change outlined two key energy policies to achieve the climate and sustainability goals: energy efficiency and renewable energy.

A success factor in realising these goals is to accelerate the development and adoption of high-impact clean energy technologies.

While many technologies, such as batteries, solar, and wind, have achieved significant cost reductions and large-scale adoption thresholds, critical technology shortfalls exist in other sectors, including industry and transportation.

ENERGY TRANSITION IN KSA

Saudi Arabia has for long been actively joining global forces to address climate change and managing energy transition both at international and domestic levels.

It ratified the UN Framework Convention on Climate Change (UNFCCC) in 1994 followed by the Kyoto Protocol in 2005. Then in 2015, Saudi Arabia submitted its Intended Nationally Determined Contribution (INDC) ahead of the Conference of Parties (COP 21) in December 2015, and ratified the Paris Agreement in 2016.

A few years later, in April 2021, Saudi Arabia joined the Net Zero Producers Forum to come up with pragmatic net-zero emission strategies, including methane abatement, advancing the circular carbon economy approach, development and deployment of clean-energy and carbon capture and storage technologies, diversification from reliance on hydrocarbon revenues, and other measures in line with





implementing energy efficiency initiatives. Currently, the National Energy Efficiency Plan is focusing on the design of the first energy conservation law and national and regional regulations, preparation of a new national database on energy supply and demand, capacity development of energy efficiency managers, and public awareness.

Also, in 2010, the Saudi Green Building Forum was launched to promote the construction of energy and resource efficient and environmentally responsible buildings.

By the end of 2014, the kingdom had more than 300 green building projects, investing approximately \$53 billion.

• **Renewable Energy:** Given the geographic location of Saudi Arabia within the Sun Belt, the country has a remarkable renewable energy potential.

Additionally, developing alternative energy sources is in line with the Kingdom's Vision 2030, which aims to diversify the economy by substantially reducing reliance on oil.

In 2017, a Renewable Energy Project Development Office (REPDO) established at the Ministry of Energy, launched the National Program for Renewable Energy Projects to oversee the development of KSA renewable energy in the country.

The targeted renewable energy source size then was 9.5 GW. But, in January 2019, REPDO increased the target to 58.7 GW by 2030, including 40 GW generated from solar PV, 16 GW from wind power, and 2.7 GW from Concentrated solar power (CSP). The plan also included the development of more • **Hydrogen:** In line with Vision 2030 and the CCE approach, Saudi Arabia has embarked on several hydrogen development initiatives.

In July 2020, a \$5-billion Saudi green hydrogen plant, powered by 4 gigawatts (GW) from renewables, was announced in Neom city. The plant will produce 650 tonnes of hydrogen by 2025 for the international market. In September 2020, Aramco sent the

world's first shipment of blue ammonia produced locally to Japan.

Also, early 2021, Saudi Arabia and Germany signed agreed to enhance bilateral cooperation in hydrogen.

• **Circular Carbon Economy (CCE):** A key insight from CCE is to achieve a pathway towards net zero emissions based around 'four Rs:' Reduce, Reuse, Recycle, and Remove.

CCE builds on the kingdom's earlier efforts on reducing its carbon emissions, including the kingdom's pilot project in 2015, which comprises a CO2 capture plant in Hawiyah and an enhanced oil recovery project in 'Uthmaniyah oil field,

At the centre of the CCE approach are the Ministry of Energy, King Abdullah Petroleum Studies and Research Center (KAPSARC), King Abdullah City for Atomic and Renewable Energy (KACARE), Saudi Energy Efficiency Center (SEEC), Designated National Authority (DNA), Electricity and Cogeneration Regulatory Authority (ECRA), Nuclear and Radiological Regulatory Commission (NRRC), and the Executive Committee for Governance of Price Adjustment of Energy and Water Products.

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For more features, visit www.ognnews.com each country's national circumstances.

At the domestic level, Saudi Arabia has adopted many goals to accelerate energy transition. These include the country's initiatives in energy efficiency, renewable energy, nuclear, and hydrogen.

Most notably, its CCE approach encompasses a broad range of transition pathways and options available, considering different national circumstances, while striving to meet shared global aspirations.

• **Energy efficiency:** One of the first energy efficiency initiatives in Saudi Arabia was the launch of the National Energy Efficiency Program in 2003. Building on that experience, the Saudi Energy Efficiency Center was established in 2010.

In 2012, the centre launched the Saudi Energy Efficiency Program to improve the kingdom's energy efficiency by designing and than 35 sites across the Kingdom.

In January 2021, Saudi Arabia announced to generate 50 per cent of its electricity from renewables by 2030, and the other half from natural gas-fired power generation.

The total renewable energy installed capacity in Saudi Arabia has increased from 3 MW in 2011 to 413 MW in 2020.

• **Nuclear power:** Saudi Arabia currently has no nuclear power plants, but has plans to include atomic energy in its future energy mix. It aims to build a domestic nuclear industry to meet rapid increase in energy demand across the industrial and residential sectors.

In 2010, the King Abdullah City for Atomic and Renewable Energy (KA-CARE) was established that launched the National Atomic Energy Program.

Preliminary studies show that Saudi Arabia boasts an estimated 60,000 tonnes of uranium ore.

CONCLUSION

With all these measures, Saudi Arabia is on track for its energy transition goals. However, there is still room for improvement.

The Kingdom should further enhance cooperation public, private, financial, and academic entities in order to reduce risks of conflicting strategies, additional regulatory burdens, or inefficient budget allocation.

Support should be extended to research and evidence-based policy making as well as innovation in the energy sector by stimulating cooperation between all stakeholders, who can be potentially involved in energy innovation. Furthermore, localisation of alternative energy technologies needs to be enhanced reduce dependency on other countries for these technologies.



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Institute brings FMTC training to KSA AMI specialises in oil and gas safety training, offering accredited training courses in health and safety subjects for the construction and other industries in KSA – Page 6



Spark grows with new facilities for Aramco The project will centralise Aramco's drilling and workover services facilities in a single location in addition to supporting the localisation of key industries – Page 8



Eliminating toxic mercaptans in crude OLI Systems' software provides the thermodynamic underpinning for modeling how foul-smelling mercaptans can be removed from hydrocarbon streams – Page 12

Saudi Arabia is not leaving any stone unturned to reach its net-zero goals, but its efforts have to be consistent with economic development and minimum impact to it

NET-ZERO GOALS: A PASSIONATE JOURNEY

Saudi Higher officials at the iktva

Forum and Exhibition

By ABDULAZIZ KHATTAK

A FTER the Kingdom of Saudi Arabia set 2060 to achieve net-zero goals and national oil company Aramco announcing it would do it by 2050, there is clear expectation from all stakeholders to share and uphold those ambitions.

Aramco CEO Amin Nasser especially called upon partners to its localisation programme iktva (In-Kingdom Total Value Add) to share their "passion for sustainability and strengthen ESG performance".

These calls build on the Kingdom's Vision 2030 by uniting all sustainability efforts to increase reliance on clean energy with five key focus areas, including the reduction of carbon emissions, protecting oceans, defending wildlife, preventing desertification, and increasing recycling. This approach is complemented by the Saudi Green Initiative (SGI) launched in November 2021.

Saudi Arabia has been actively engaged in joining global forces to addressing climate change and managing energy transition both at international and domestic levels.

In line with Vision 2030, which aims to diversify the economy by substantially reducing reliance on oil, the Kingdom has adopted a circular carbon economy (CCE) approach

In this context, it is developing alternative energy sources and has embarked on several hydrogen development initiatives.

Being one of the largest oil producers in the world, Saudi Arabia has always been wary of its emissions.

Policies to reduce flared gas have been implemented since the 1970s, and rigorous monitoring under Aramco's methane leakage detection and repair programme brought down methane intensities to as low as 0.06 per cent in 2018

Saudi Arabia, however, is ranked as having one of the lowest methane intensity rates globally

According to data released in June 2021 by the energy data provider Enerdata, the Kingdom's CO2 emissions from fuel combustion decreased by 3.3 per cent, from 508.3 million tonnes of CO2 (MtCO2) in 2019 to 491.8 megatonnes of CO2 (MtCO2) in 2020.

According to a report, entitled 'What Drove Saudi Arabia's 2020 Fall in CO2 Emissions?' by the King Abdullah Petroleum Studies and Research Center (KAPSARC) Saudi Arabia is one of four G20 emerging economies whose change in GDP has exceeded its change in CO2 emissions on a year-on-year basis.

In 2020, across most of the G20, there was a massive drop in CO2 emissions from fuel combustion, largely in line with the fall in economic activity measured by GDP.

drivers: the emissions intensity of the fossil fuels used and the share of fossil fuels in the energy mix.

There has been year-on-year changes in CO2 emissions from fuel combustion in the Kingdom over the past decade.

Three broad trends can be identified. First, CO2 emissions from natural gas combustion have been increasing steadily over the past 10 years. Second, CO2 emissions from oil products have been falling since 2015, which, third, has driven an overall decrease in fossil fuel combustion-related CO2 emissions.

The year-on-year fall in oil-related emissions in 2020 was steep, at 5.4 per cent, but this was on par with the reduction in 2017 (5.3 per cent) and less than the fall in 2018.

Upon examining CO2 emissions by sector, it was found that overall the industrial sector is the largest contributor, with a 47.2 per cent share in 2020, followed by the energy (27.7 per cent) and transport (24.1 per cent) sectors.

Emissions fell in all sectors year-on-year in 2020, except in industry, which increased by 2.9 per cent.

Furthermore, a detailed look at emissions in the energy/power sectors show that CO2 emissions from power generation, which account for approximately 80 per cent of energy sector emissions, have been falling since 2015. These are driven by decreasing emissions from oil-fueled electricity generation. Fuel switching to natural gas took place at the fastest rate between 2016 and 2017, but this appears to have slowed down in 2018. The year 2020 continued the trend of falling overall CO2 emissions from power generation (-3.3 per cent), while the share of natural gas has remained at slightly over 50 per cent since 2018.

In contrast to the overall declining CO2 emissions trend in the energy sector, there was a large increase (11 per cent) in emissions related to refining.

These emissions have consistently increased from 2015 onward due to capacity expansions and upgrades in existing refineries, in addition to new refineries coming online.

During this period, refining from total energy sector emissions increased from 8.5 per cent to 19.5 per cent.

• **CCE Index:** Kapsarc developed the CCE Index to help develop metrics to support policymaking. The index promotes further understanding of the CCE concept and the idea of adopting a holistic approach to managing emissions across energy systems and economies, and achieving carbon circularity.

In the region, Saudi Arabia's has an aggregate CCE Index score of 40.16, second to UAE's 42.09.

However, the country's performance score, which gauges how countries are performing presently on the different CCE activi-



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local focus, global vision

Emissions can be understood as a function of four major components: population growth, per capita economic growth, changes in the energy intensity of the economy, and emissions intensity of the energy mix. This equation, known as the Kaya identity.

Considering the last two for brevity, Saudi Arabia's energy intensity performance has fluctuated in recent years, but 2020 appears to have followed a similar pattern to 2019. In 2020, the Kingdom's energy intensity increased by an estimated 1.4 per cent.

Energy intensity generally improves as a country's production processes become more energy-efficient, or as a country moves away from energy-intensive manufacturing toward services.

For comparison, to reach the UN Sustainable Development Goal (SDG) 7 (Affordable and Clean Energy) target of doubling the global rate of improvement in energy efficiency, countries' energy efficiency should improve by 3 per cent each year, on average.

Alternatively, the carbon intensity of Saudi Arabia's energy mix has decreased since 2017, albeit at a decelerating pace: In 2017, its carbon intensity decreased by 4.2 per cent, whereas in 2020, this rate was only 0.6 per cent.

The carbon intensity of the energy mix is influenced by two



ties, is 40.63, more than the 34.83 score of UAE.

CONCLUSION

Despite the agreement to move towards a sustainable energy future, there are complexities and challenges to consider. In a recent interview, Nasser acknowledged that the current

transition is not going smoothly.

Speaking remotely at the B20 conference in Indonesia, he said investments in hydrocarbons had to go hand in hand with new energies as demand for conventional energy would likely prevail for, "quite some time".

"As the global economy has started to recover there has been a resurgence of demand for oil and gas but since investment in oil and gas has fallen supplies have lagged which is why we see very tight markets in Europe and parts of Asia," he said, stressing that he was not advocating for a change in climate goals.

"I am proposing that investment in both existing and new energy be continued until the latter is developed enough to realistically and significantly be able to meet rising global energy consumption," he clarified.





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Azda Marine Institute brings leading FMTC training to KSA

The institute will specialise in oil and gas and related petrochemical safety training, and while offering accredited training courses in health and safety and related subjects for the construction and other industries in Saudi Arabia

HE new Azda Marine Institute (AMI) KSA, a joint venture between Azda Group (KSA) and leading European based safety training company FMTC (Netherlands) is situated strategically in Ras Tanura on the East Coast of Saudi Arabia, home to one of the largest Saudi Aramco gas operations in the Kingdom, and north of the Jubail Industrial City and south of the new Ras Al Khair Port development.

The AMI building in Ras Tanura is similar in design and operation to other FMTC training facilities around the world and hosts 10 classrooms, one theatre lecture hall, full pool with lifeboat, life raft and helicopter underwater escape training (HUET) and a basic fire-fighting ground.

The centre is expected to be expanded this year to include an OPITO major emergency and incident response training suite with a full control room and examination room.

Speaking to **OGN**, Abdulwahab Al Mousa, Chairman of the Azda Marine Institute and a retired Saudi Navy Commodore, says: "Historically, global companies spend a lot of time and energy looking for a reliable partner in virgin territories like ours, whereas regional companies spend a lot of energy trying to find the right partner with the right product to meet the regional needs. At the Azda Marine Institute, we aim to bridge that gap." FMTC is global leader in emergency response, survival and

safety training for the offshore oil & gas (OPITO), Renewable (GWO) and Maritime (STCW) and Industry (OSHA).

Heading up the new Azda Marine Institute in Ras Tanura is Australian safety training veteran Adam Piggott, General Manager FMTC KSA, a renowned figure in international standard safety training.

He says: "Safety training for the industrial sectors, whether for those working in an offshore or onshore capacity, is not simply about obtaining a certificate or ticking a box on a training matrix. Rather, the primary goal of excellence in safety training is to change for the better the safety behaviour of individuals in an organisation, at all levels."

Behavioural safety is what you do when nobody is watching you, he says, adding: "It is your instinctive approach to safety.

"You don't follow the rules because you have to follow them; you follow the rules because you want to follow them. Successful training of this type will affect not only how you work but also how you live outside of work and ultimately your own survival and those around you who may depend on you."

As such, Piggott says: "Opening in Ras Tanura is an exciting new opportunity for FMTC in a dynamic and fast evolving part of the world. For me, the ability to work closely with Azda Marine Institute and benefit from their local knowledge has been a huge help and demonstrates that working together with a strong local partner was definitely the right decision."

The AMI facility at Ras Tanura boasts a HUET METS (modular egress training simulator) system designed, and purpose built by Canadian company Survival Systems.

The HUET is the most advanced design in the world and is typically used by militaries and offshore oil platform operators for advanced helicopter rescue training.

The HUET is equipped with multiple redundancy systems to ensure the safest possible training environment for delegates. Michel Hogervorst, Managing Director of FMTC Safety, says:





Piggott and Al Mousa (right) at AMI

"As part of our strategic expansion plans, I am delighted to commence our training centre in Saudi Arabia together with our valued local partner Azda Marine Institute. We have put together the best team that will support the growth of the company in the Kingdom and at the same time ensure that the customers have a unique experience."

Anyone working in or wanting to work in the offshore oil and

gas, wind energy or wind industry needs the knowledge and skills to work safely and to obtain certain certificates to work in the industry.

Whether doing a basic course, a refresher course, or a more specific course, at FMTC Safety, the courses are taught by qualified professionals with years of experience.

The courses that will be offered by the Azda Marine Institute cover everything needed to ensure that employees can work safely in their industries. FMTC Safety is fully certified and super flexible, and students can follow the courses they need, when they need them.

Appropriately accredited and presented courses ensure that students can learn about occupational safety, health, risk assessments and fire safety to world class standards.

FMTC Safety has training centres, which are located around the world including Houma, Louisiana, the US; at the practice centre of the Fire Brigade Amsterdam at Schiphol Amsterdam Airport; Dordrecht, near Rotterdam, in The Netherlands; and Dunkirk, France.

The accredited training courses and proprietary signature facilities ensure realistic practices and assures that training is delivered with the best equipment, training products and instructors.

Although specialising in oil and gas and related petrochemical safety training, the Azda Marine Institute will also offer accredited training courses in health and safety and related subjects for the construction and other industries in Saudi Arabia.





The HUET is the most advanced design in the world

The AMI building hosts 10 classrooms and one theatre lecture hall



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Spark grows with new drilling, workover facilities for Aramco

The project is designed to centralise Aramco's drilling and workover services facilities in a single location in addition to supporting the localisation of key industries such as rig and equipment manufacturing, as well as casting and forging



The Spark energy hub will be spread over 50 sq km and offer world-class infrastructure and support facilities

King Salman Energy Park (Spark), the region's only fully integrated energy hub, continues to expand its industrial infrastructure with the latest project launched at the mega hub in the Eastern Province having been a 277,000-sq-m drilling and workover facility for energy giant Aramco.

Work on the new Aramco drilling and workover head office and industrial hub is scheduled to be completed by the second quarter of 2023, says Spark, which will be providing the infrastructure and amenities for a workforce of 1,200 drilling and workover employees.

The project is being implemented by Aramco in co-ordination with Horizon Project Company on a build, own, operate and transfer (BOOT) model for a 22-year period.

Horizon is a special-purpose vehicle jointly owned by a Saudi consortium of Al Fouzan Al Sabiq Holding Company and Almutlaq Real Estate Investment Company.

The project is designed to centralise facilities for Aramco's Drilling and Workover Services Department in a single location and further the oil and gas giant's collaboration with oilfield service providers, in addition to supporting the development and localisation of key industries such as rig and equipment manufacturing, as well as casting and forging.

Nasir Al Naimi, Senior Vice-President of Upstream at Aramco, says: "This is another significant venture by Aramco that will contribute to business continuity. We expect the new facilities to attract other oilfield services companies, who have an indispensable role to play within the collaborative setting of an interacted energy executed." Designed to ensure ease of access to global markets, the 3-sq-km dry port will target growing demand for logistics services for energy-related products in the Middle East and beyond while also serving neighbouring industrial cities.

Eric Ip, Group Managing Director of Hutchison Ports, states the company would leverage its logistics expertise to create value and competitiveness for the tenants of Spark.

Al Qahtani says the partnership with Hutchison Ports marks an important milestone in the project's ongoing development.

"The dry port and logistics zone will be the key to unlocking the potential of our strategic location in the Eastern Province of Saudi Arabia, a region which is known for its unmatched oil and gas resources," he says. "We are tremendously excited to work with Hutchison Ports to help connect our investors to the world, allowing them to operate efficiently and save on transport times and costs."

Spark, which is a manufacturing, service centre and logistics hub for the energy sectors and an integral part of the Saudi Vision hub, is fast taking shape over a 50-sq-km site located between Dammam and Al Ahsa and is being developed, operated and managed by Aramco.

Strategically located at the heart of the global energy market, Spark is focused on providing investors with ease of access, ensuring that supply chain and raw material companies are located in close proximity or are easily accessible through its Logistics Zone, which includes a dry port, bonded area and a future railway connected to neighbouring countries.

Spark offers world-class infrastructure and support facilities which will also enable the localisation and integration of energy supply chains.

"Through its partnership with Oilfields Supply Company Saudi (OSC), a 1-million-sq-m Common User Supply Base will create a favourable environment for small and medium enterprises (SMEs) and startups to gain access to their customers by providing pre-built industrial manufacturing facilities, de-risking the set-up phase for investors. The OSC facility offers the flexibility for investors to rent short-term or on demand, offering a multitude of support services to accelerate business growth," Al Qahtani states.

The first phase of the development is reported to be already 80 per cent allocated to industrial investors, with commitments for more



than \$2 billion of investment.

This phase is divided into a number of clusters: logistics zone, industrial hub, business district, digital hub, and residential and commercial areas.

The dry port and logistics zone will include warehouses and storage facilities, a bonded area and on-site customs clearance.

The non-industrial zone is a 7-sq-km site which includes office and administrative buildings, a digital hub, housing and accommodation, as well as commercial and municipal infrastructure.

The energy hub is expected to contribute more than \$6 billion to the kingdom's GDP and create up to 100,000 direct and indirect jobs at the maturity stage. It is targeting industrial investors across five strategic sectors: upstream, downstream, petrochemicals, power, water and wastewater.

Apart from Aramco, which itself is an anchor occupier, Spark expects to attract major players and a broad range of suppliers, complementing Saudi Arabia's ongoing efforts to localise the energy industry supply chain for maximum domestic economic benefit.

The park will also seek to draw in investors from sectors with a supporting role to play, such as logistics operators and real estate developers.

Spark is pioneering the use of multiple cutting-edge technologies, ensuring that sustainability remains at the heart of the development. In particular, the park will feature two hubs focused on non-metallic materials and digital technology.

'In non-metallics, Aramco is already working with local and international suppliers and research institutes to accelerate development of solutions such as non-metallic pipelines and flowlines in the oil and gas sector," says Nabil Chaachou, Spark Vice-President for Strategy and Business Development. "Similarly, the digital hub reflects the importance of technology development for the energy sector. It will host data centres and advance cutting-edge technologies that are expected to have significant benefits for the industry, from artificial intelligence and big data analytics to 3D printing and process automation." "By placing anchor industrial investments at the heart of the energy market, we are providing a world-class ecosystem that facilitates the growth of our tenants' businesses and offers sustained value to communities," he concludes.

integrated energy ecosystem."

Abdulhameed Al Rushaid, Vice-President of Drilling and Workover, says: "The development strategically advances our role as an anchor tenant at Spark. As an integrated ecosystem for the energy sector, the Saudi facility is being designed to capture the full economic value of demand for energy-related goods and services."

Meanwhile, Saif S Al Qahtani, Spark President and CEO, says: "We're excited to announce Aramco's new drilling and workover head office and industrial hub here. Its establishment will enhance the oil and gas supply chain by utilising the energy park's advanced offerings, such as its logistics hub and dry port, to establish a thriving eco-system."

In September last year, Spark formed a joint venture with Hutchison Ports to manage and operate the dry port and bonded logistics zone in the energy industrial city.

Mohammed Al Qahtani (right), Chairman of Spark, and Saif Al Qahtani during the online signing ceremony with Hutchison Ports





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Saudi Multichem localises innovative nanotechnology

With recent breakthroughs, the company has established a focus area, greatly expanding R&D activities to create new nano systems for oil and gas, Dr Abdulllah Al Dhafeeri, Senior Consultant for Saudi Multichem tells **OGN**

AUDI Multichem, a wholly-owned subsidiary of the Saudi Al Saidi Group, is developing innovative green nanotechnology that is set to change how traditional chemicals perform by making them more efficient and cost effective.

The company offers specialised and cutting edge technologies that help resolve critical issues in oil and gas.

In an interview with Abdulaziz Khattak of *OGN*, Dr Abdullah Al Dhafeeri, Senior Consultant for Saudi Multichem, says the company's R&D team has developed two environment-friendly nano chemicals — NanoStim and NanoLube — for use in upstream operations.

• NanoStim: This unique and powerful technology can be used in oil and gas wells — both mature and marginal — as a long-term solution for stimulation and productivity enhancement.

The bio-derived and biodegradable product is manufactured using a new balanced formula of 20 bio-derived nanoparticles.

NanoStim can effectively dissolve oil well obstructions, such as paraffin (solidified), asphaltene and carbonate (salt, scales) formed in well casing pipes and oil reservoirs.

"Due to a permanent removal of condensate banking, the treated oil wells became highly productive wells with a tremendous increase in productivity index and sustainability," Dr Al Dhafeeri explains.

NanoStim offers several advantages over conventional acid chemical treatment including:

- It is a non-corrosive chemical product
- It is derived from natural materials that are biodegradable with no negative impact on the environment.
- It helps achieve sustainability goals and health, safety and environment-(HSE) objectives unlike conventional products, which cause emissions of carbon dioxide and volatile organic compounds.
- NanoStim products can sustainably increase the production rate by more than 100 per cent.
- The annual downtime of NanoStim treatment is 60 per cent lesser than the conventional treatment methods.
- NanoStim is a patented unconventional solution based on nanotechnology particles. Saudi Multichem offers a whole service package with NanoStim that includes:
- Pre-stimulation analysis and diagnoses for subject wells.
- Use of NanoStim regenerating products for stimulation treatments process.
- Training the client's technical team.
- Providing technical supervision for each



Dr Al Dhafeeri ... productivity focus

"Currently, the Alsaidi Trading and Industry Company (a member group company) is in the process of proposing NanoStim for low-productivity and dead oil and gas at Saudi Aramco and Kuwait Oil Company (KOC)," says Dr Al Dhafeeri.

He says NanoStim has been successfully implemented at low-productivity and dead oil and gas wells resulting in a tremendous increase in well productivity. The company offered its solution to an anonymous client to improve well productivity to the latter's satisfaction.

It's worth mentioning that Saudi Multichem has its nanotechnology manufacturing facilities located in the Eastern Province in order to localise production at the hands of skilled Saudi cadre.

Alsaidi Trading and Industry Company also offers other best-in-class nano chemicals solutions for upstream operations especially related to drilling and workover operation activities. These include

• Nano Drill-Zyme Chemical S & X: A bioderived, biodegradable product for wellbore cleanup after drilling and workover operation. This is designed to restore well productivity and prevent formation damage in oil and gas wells. This group of chemicals includes Nanolube for stuck pipe prevention; Nanolube for freeing stuck pipe; Nanolube for formation damage prevention (as an additive in drilling fluid); Nanolube filter cake removal (as a wellbore placement); Nanolube sand production prevention (used after drilling operation and during well production).

In addition to these products, Saudi Multichem is working on new nano chemical systems to address issues related to upstream and downstream operations.

Dr Al Dhafeeri says all these products are cus-



Saudi Multichem is developing innovative green nanotechnology for the energy industry

based on several aspects, such as fluid and rock properties; temperature and pressure; water geochemistry; and field location (onshore/off-shore).

Saudi Multichem is targeting major oil, gas and petrochemical companies from the region and beyond to demonstrate and prove the uniqueness of its nanotechnology, which Dr Al Dhafeeri says can make a huge and positive economic impact by increasing oil and gas production.

To support its clients, Saudi Multichem offers technical support through its engineering service company, Medra Arabia, which in addition to engineering requirements also participates in pipeline purging with nitrogen, cleaning and pigging activities.

With these breakthroughs Saudi Multichem has established a new focus area in nanotechnology. Naturally, it has greatly expanded its R&D activities in this regard to create new systems.

Additionally, it has established several joint ventures to expand and open new business lines to meet the demand in drilling and production operations.

The Alsaidi Group strongly aligns its goals and objectives with the Kingdom's vision 2030 through several initiatives, including:

- Localising most in demand chemical products used in oil and gas.
- Maximising the use of biochemical products in oil and gas applications.
- Manufacturing environment-friendly chemical products.
- Transferring of advanced technologies relat- down

and emissions control.

- Partaking in Saudi Aramco's in-kingdom total value add (iktva) programme.
- Hiring Saudi candidates and training them as part of its Saudisation programme.
- Building a manufacturing facility for shaker screens for rig and drilling operations. This will be the first in the Middle East.
- Creating partnership with companies and universities worldwide in search of opportunities to serve oil and gas industrials.
- Conducting research and development.
- Expanding the export of specialty chemicals worldwide. Late last year, Saudi Multichem become the first Saudi company to export MEA Triazine to the US designed to remove hydrogen sulfide from drilling fluids and pipelines.

Business this year has improved for Saudi Multichem as the effects of the Covid-19 pandemic start to wither off. Although last year, similar to other companies, the pandemic did have an impact; factories were shut down and disrupted supply chains affected operations, increasing the prices of specialty chemicals products.

However, the company showed resilience and didn't downsize employees during the period.

"This is because we at Saudi Multichem value our employees as the most important assets for the company," says Dr Al Dhafeeri.

To avoid disruption to its operations like it saw during the pandemic, Saudi Multichem established a logistics company. "This will cut down lead times for material supplies," Dr Al

stimulation process and phases.

tom designed as per the region and site location

ed to hydrogen generation, carbon capture Dhafeeri concludes.



Saudi Multichem ... first local company to export MEA Triazine to the US

Localisation ... Saudi Multichem has set up manufacturing facilities in the Eastern Province







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Eliminating toxic mercaptans in crude processing with OLI platform

OLI Systems' software provides the thermodynamic underpinning for modeling how foul-smelling mercaptans can be removed from hydrocarbon streams by utilising caustics, and is a dramatic improvement over an alternative, experimental-based design, write Jiangping Liu and Dr Samir Ujam

ROCESSING various sources of crude oils leads to increased sulfur carryover to desulfurisation and demercaptanisation units in refineries.

In order to meet product ultra-low sulfur specifications and for environmental compliance, the liquefied petroleum gas (LPG) treatment plant has an essential role in a refinery regardless of the declining margin of the product itself.

The Merox Process is a proprietary UOP technology dating back to 1958 that selectively sweetens petroleum products by oxidising mercaptans into the sweeter disulfides, which remain in the product, leaving the total sulfur content the same.

The treatment process, sometimes known as a sweetening process, involves liquid-liquid extraction of the mercaptan (RSH) in LPG with a caustic solution and is much cheaper to install than a hydrotreater, which actually lowers the sulfur content.

The resultant disulfides are separated and the caustic is reused for extraction. The sulfur content of the extracted hydrocarbon is reduced.

MERCAPTAN CHEMISTRY & CHALLENGES

Mercaptan, or thiol, is a sulfur-based component that is naturally occurring in both crude oil and natural gas, mainly as an impurity.

It is analogous to an alcohol in chemical structure, and is similar to it in physical and chemical properties.

Mercaptan, a sulfur equivalent of an alcohol, has the generic formula, R-SH, where R represents an alkyl or other organic group. The combination of this R-SH group gives the mercaptan molecule very distinct chemical and physical properties.

It has a particularly foul odour, and is more acidic character compared to its alcohol counterparts due to the sulfur atom's stabilising effect.

Mercaptans, however, are only slightly acidic, and this acidity is reduced as the molecular weight of the mercaptan increases.

Relative to alcohols, mercaptans are more acidic. Therefore, mercaptanate salts can be created by treating mercaptans with alkali hydroxides, such as NaOH.

Furthermore, unlike hydrogen sulfide, mercaptans can come in many different forms, such as methyl mercaptan, ethyl mercaptan, propyl mercaptan, butyl mercaptan and other branched and more complicated variations.

All these mercaptans in lighter feeds are



Fig 1 - The binary system propyl mercaptan - water

converted to disulfides, which remain in the sweetened hydrocarbon product in an alkaline environment.

In addition, mercaptan has weaker intermolecular forces; it shows little association by hydrogen bonding with water molecules or among itself.

Mercaptan has a lower boiling point and is less soluble in water and other polar solvents than alcohols of similar molecular weight. Therefore, mercaptan will have higher equilibrium vapour pressure and will be more soluble in hydrocarbon phases. Due to a lower boiling point, some mercaptans are also gaseous at ambient conditions.

A knowledge of the thermodynamic properties and vapour-liquid equilibria (VLE), vapour-liquid-liquid equilibria (VLLE) of all kinds of mercaptans and disulfides with water and hydrocarbons as well as partitioning of mercaptans in water and hydrocarbon solvents is important because it ensures high mercaptan extraction efficiency, low re-entry of disulfide in the treated products and maximum desulfurisation with a minimum caustic circulate rate.

OLI SYSTEMS ELIMINATE TOXIC CONTAMINATION

OLI Systems' software provides the thermodynamic underpinning for modeling how mercaptans can be removed from hydrocarbon streams by utilising caustics. It is a dramatic improvement over an alternative, experimental-based design.

The simulation technology, which is based on its proprietary Mixed Solvent Electrolyte (MSE) model, is available in OLI Studio V11, OLI Studio V11, OLI Flowsheet ESP V11, OLI Cloud APIs and other OLI software products.

0.8 1.0 The MSE thermodynamic model includes the relevant hydroxides, C1-C7 mercaptans and disulfides, and various light and heavy hydrocar-

bons as well as the interactions between mer-

Knowledge of the phase behaviour of systems

involving mercaptans and water is necessary

to help remove mercaptans from raw natural

As mercaptans are found in very small quan-

tities in crude oil or natural gas streams, the

Henry's law approach is generally used. By def-

inition, the Henry's law coefficient is defined

The Henry's law constant is directly related

to the residual chemical potential of the solute

at infinite dilution, which is evaluated from the

intermolecular potential between one solute

Limiting activity coefficient is directly deter-

There are estimation methods to calculate

infinite dilution activity coefficients, but these

are inadequate in the absence of consistent

On the other hand, experimental measure-

Here, the MSE thermodynamic framework in

the OLI Software Platform V11 can accurately

predict solubility of mercaptans in water and

Fig 1 shows vapour-liquid-liquid equilibrium

ments are expensive and time-consuming es-

pecially at extremely low concentrations.

water solubility in mercaptans.

molecule and one solvent molecule.

mined from Henry's law coefficient.

captans, disulfides and hydrocarbons.

gas and LPG.

at infinite dilution.

thermodynamic data.

(VLLE) of propyl mercaptan with water at 1 atm.

Because of the partial miscibility, VLE, liquidliquid equilibrium (LLE), and VLLE are present on the phase diagram.

The concentrations of each phase are calculated and are in good agreement with the experimental data. As temperature increases, the solubility of propyl mercaptan in water increases. In the organic phase, the solubility of water in propyl mercaptan also increases.

Modeling of the process requires the knowledge of the behaviour of sulfur compounds in hydrocarbons. Information on such systems is scarce.

OLI Software Platform V11 has more than 26 pairs of C1-C7 mercaptans with hydrocarbons as wells as estimations of C1-C10 n-alkanes with all these mercaptans.

In a liquid-liquid extraction process, the overall distribution of a mercaptans between an oil phase and an immiscible alkaline solution is dependent upon two equilibrium factors: the partition of the non-neutralised mercaptan between the two phases; and, the hydrolysis of the mercaptide in the alkaline phase.

Fig 2 shows two mercaptan partition coefficients in water with isooctane solution without caustic. Kp is the partition coefficient of the non-neutralised mercaptan between the aqueous and oil phases. It is proportional to the solubility of the non-neutralised mercaptan in the aqueous phase.

In Fig 2, Kp of propyl mercaptan is larger than that of butyl mercaptan's. It is apparent that an increase in molecular weight of mercaptan causes a great drop in the water solubility and in the partition of the mercaptan between isooctane and water.

The lighter mercaptans are more readily extracted than the heavier mercaptans. In addition, Kp increases as temperature increases which means higher temperature will improve extraction mercaptans from water and isooctane solution.

EFFECT OF SODIUM HYDROXIDE CONCENTRATION

Kq, the over-all mercaptan distribution constant, is of fundamental importance since it may be used to calculate the extent of mercaptan removal from gasoline under specified conditions, such as caustic gasoline volume ratio.

It is obvious that the higher the value of Kq, the more complete is the extraction of the mercaptan from the oil phase by the aqueous alkaline phase.





Fig 3 - Propyl and butyl mercaptan partition coefficients in NaOH solution-isooctane

A comparison of Fig 2 and Fig 3 shows that the over-all extraction constant, Kq, becomes larger in the presence of sodium hydroxide. Propyl mercaptan has a larger Kq than butyl mercaptan which the same trend as in Fig. 2. An increase in the sodium hydroxide concentration improves the extraction of mercaptans but not in proportion to the increased hydroxide concentration. This is due to the saltingout of the unneutralised mercaptan from the aqueous phase by the NaOH.

EFFECT OF TEMPERATURE & 'SOLUTISERS'

The effect of temperature on extraction of mercaptan is to increase Kq appreciably as the temperatures decrease. A decrease in the extraction temperature increases the degree of removal of mercaptans from the oil phase.



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Aramco, US AI firm explore solutions to reduce carbon

Through its AssetCare platform, mCloud offers complete asset management solutions for commercial buildings, renewable energy, healthcare, heavy industry, and connected workers in support of Saudi Vision 2030 ESG objectives

CLOUD Technologies, a leading provider of AI-powered asset management and environmental, social, and governance (ESG) solutions, is unlocking the untapped potential of energy intensive assets using AI and analytics, curbing energy waste, maximising energy production, and getting the most out of critical energy infrastructure.

The US-based company continues to make strides in providing solutions to the oil and gas industry as well as the buildings sector in the Kingdom of Saudi Arabia.

It recently signed a memorandum of understanding (MOU) with Aramco to explore the co-development of a digital technology hub for delivering ESG solutions in the Kingdom of Saudi Arabia.

The hub would enable both parties to jointly develop new AI-powered innovations to facilitate the carbon reduction of complex energyintensive assets throughout the Kingdom and abroad.

Additionally, mCloud plans to develop a centre of excellence that will serve as a home base for a dedicated team of ESG and digital



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transformation experts based in Saudi Arabia.

Targeted application areas include 3D digital twins, AI solutions for asset performance management, visual inspection to drive asset reliability and asset integrity, fugitive gas and leak detection, mobile connected work, and digital facility management.

Commenting on the new agreement, Russ McMeekin, mCloud President and CEO, says: "This MOU with Aramco is the largest, most ambitious agreement signed by mCloud to-date and is the basis for tremendous growth and innovation.

He says Aramco is driving the digitalisation of oil and gas and the adoption of advanced technologies to decarbonise and drive positive ESG outcomes.

"The collaboration between mCloud and Aramco has remarkable strategic and operational significance to mCloud's growth, and I intend to have a regular minimum quarterly presence in the Kingdom of Saudi Arabia to support the success of this initiative for many years to come," McMeekin adds.

This new agreement follows mCloud's cloud agreement in December with Saudi-based Virtual Vision (V2), a local provider of cloud computing services within Saudi Arabia, to host its flagship AssetCare solutions on the V2 Public Cloud for use in the Kingdom.

The agreement enables mCloud to complete the onboarding of several new Saudi customers and immediately take these customers live with AssetCare.

The agreement with V2 also ensures mCloud is ready for scalable deployment within Saudi Arabia and in a manner compliant with Saudi legal requirements by geo-locating AssetCare data within the Kingdom.

And now the proposed center of excellence would leverage V2's high performance infrastructure to deliver next-generation ESG-focused applications powered by mCloud's AssetCare platform.







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Worker solutions are connected through a control centre



FEBRUARY 2022

SAUDI ARABIA, VISION 2030 | 15

ESG OBJECTIVES

mCloud has been driving new business throughout the Kingdom in support of the ESG objectives of Saudi Vision 2030.

Its solutions include fugitive leak detection technology to reduce methane gas emissions at processing facilities as well as indoor air quality/energy management solutions in office buildings, restaurants, retail, etc.

Through its AI-powered AssetCare platform, mCloud offers complete asset management solutions for commercial buildings, renewable energy, healthcare, heavy industry, and connected workers.

IoT sensors bring data from connected assets into the cloud, where AI and analytics are applied to maximise their performance.

About the agreement with V2, Costantino Lanza, mCloud co-founder and Chief Growth and Revenue Officer, says: "As we build our footprint in Saudi Arabia, it is imperative we have a capable, secure, and scalable cloud partner in the Kingdom of Saudi Arabia," says Costantino Lanza, mCloud co-founder and Chief Growth and Revenue Officer.

"The speed at which we are able to deploy our first solutions is indicative of the high-performance environment that V2 maintains for its customers."

"V2 hosts and partners with customers key to mCloud's plans in Saudi Arabia," Lanza adds.

"With AssetCare now hosted in the cloud with V2, we are setup to take our business to scale by offering a robust, highly secure, and compliant environment for Saudi customers." "We at V2 are looking forward to mCloud's

ability to drive results in the health and performance of assets for companies in Saudi Arabia," says Hazem Sandouka, V2 Chief Operating Officer.

"The ability to provide results driven by savings and productivity gains is going to assist organizations in Saudi Arabia to meet their future ambitions."

V2 has successfully implemented and supported enterprise-grade solutions to help cli-



ents drive business growth and revenues. Its customers and partners include CloudSigma, Hewlett Packard Enterprise, Microsoft, and Aramco.

With a cloud Tier-3 data centre in Riyadh, V2 offers customers a combination of raw underlying computing power with an approach and tools that channel computing power most effectively.

In collaboration with local partners such as V2, mCloud has brought the full suite of Asset-Care solutions to Saudi Arabia, including ESG tracking and reporting capabilities via Asset-Care Enterprise, HVAC and indoor air quality solutions via Connected Buildings, connected worker solutions through AssetCare Mobile, and the Company's 3D Digital Twin offering, all of which are seeing customer adoption in support of the ESG objectives of Saudi Vision 2030. "A key principle of the Saudi Vision 2030 is to innovate and apply advanced digital technologies in many different areas to drive economic growth and prosperity. mCloud's AssetCare portfolio in this context is an ideal platform for this. Working with Aramco to deploy and develop applications focused on eliminating waste and reducing carbon intensity will help assets and workers be highly productive. The joint ESG and digital hub with Aramco sets the path forward," McMeekin tells **OGN**.

In October last year, the company received a license to conduct business activities from the Ministry of Investment of Saudi Arabia (MISA), the first foreign company to offer cloud-based asset management solutions to receive such an approval. In the subsequent month, mCloud equipped the first two of over 100 restaurants owned and operated by the AFCO Restaurant Group in the Kingdom.

The company expects to add numerous buildings and oil and gas assets to its AssetCare portfolio by mid-2022.

With a worldwide presence and offices in San Francisco, Vancouver, Calgary, London, Perth, Singapore, and Beijing, the mCloud family includes an ecosystem of operating subsidiaries that deliver high-performance IoT, AI, 3D, and mobile capabilities to customers, all integrated into AssetCare.

The company has over 100 blue-chip customers and more than 63,000 assets connected in thousands of locations worldwide, mCloud is changing the way energy assets are managed.

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MSA Safety plans projects for cleaner, greener energy

By assembling products locally, the company can ensure faster deliveries and a higher level of service support to customers

SA Safety, a global leader in the development, manufacture and supply of sophisticated safety solutions that help protect people and facility infrastructures, remains committed to Saudi Arabia and has a number of projects in the

pipeline, including new hydrogen production plants for cleaner, greener energy.

"MSA's outlook for Saudi Arabia remains positive," says a company spokesperson.

In the Kingdom, MSA is supporting Sherbiny, who has been its local channel partner for more than 30 years, with the local assembly of the MSA General Monitors S5000 fixed gas detector. Their new facility was opened last year and has a dedicated

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workshop for the General Monitors S5000.

"This is just one initiative that is aimed at supporting the Kingdom's vision 2030 for local investment and developing local industry in the country," says the spokesperson.

The S5000 gas detector has the latest, state-of-theart sensor technology, which can monitor its health and functionality, automatically correct for any sensor measurement drift, and also monitor its inlet for blockages, which would prevent gas from reaching the sensor.

"Being able to offer our customers the S5000 from stock in Saudi Arabia will support them with faster deliveries and we will also be able to offer a higher level of service support," the spokesperson says.

Last month, MSA showcased state-of-the-art solutions of fixed gas and flame detection technology at the iktva 2022 Forum and Exhibition held at Dhahran Expo Center in Dammam from January 24-26.

Vistors got the opportunity to experience solutions that help better protect workers and plants from dangerous substances. These included:

- The S5000 Gas Monitor, now assembled locally in Saudi Arabia, versatile and ideal for extreme environments, where workers need to detect combustible and toxic gases or monitor oxygen levels.
- Enhanced Laser Diode Spectroscopy (ELDS), which offers laser-based open path gas detector solutions to monitor combustible and toxic gases by making use of the latest optical laser-based detection technology.
- The IR5500 Detector, an IR-based open path gas detector that continuously monitors for flammable gas leaks over large open areas.
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- increase the probability of detecting gas leaks.
- The FL4000H & FL500: These flame detectors detect fires over a large area and the flame recognition software improves the false alarm immunity, which avoids unwanted shutdowns.

Established in the US in 1914, MSA Safety products integrate a combination of electronics, mechanical systems and advanced materials to protect users against hazardous or life-threatening situations.

The company's comprehensive product line is used by workers around the world in a broad range of markets, including oil, gas and petrochemical industries, fire service, construction industry, mining and the military. MSA's core products include self-contained breathing apparatus, fixed gas and flame detection systems, portable gas detection instruments, industrial head protection products, firefighter helmets and protective apparel, and fall protection devices.

The company has manufacturing operations in the US, Europe, Asia and Latin America, and a presence in more than 40 international locations.



Two different technologies, GWR and Capacitance, are combined in a single instrument to derive the advantages of both technologies

SensorFusion tech revolutionises interface measurement

NTERFACE measurement is always a challenging and critical application in the hydrocarbon industry. Ideally the separation between two media with different densities results in a clearly defined interface line. Practically, however, a transition

layer often develops between the two media, a socalled emulsion layer.

An emulsion is formed when two non-soluble liquids (like oil and water) are agitated together to disperse one liquid into the other, in the form of drops. Emulsions can either be oil-in-water (O/W) or water-in-oil (W/O), depending on whether the continuous phase is the water or the oil, respectively.

"There are many technologies available in the market, but none of these technologies provide satisfactory measurement results," says Sivaji Nemalipuri, Product Manager - Level & Pressure, Endress+Hauser.

Guided wave radar (GWR) will provide only top-level measurement when an emulsion layer exists and cannot provide interface measurement when emulsion layers exceeds more than 60 mm. Capacitance probes are a well proven and preferred technology for interface measurement, but it cannot provide top level signal. Other technologies like DP transmitters or displacer level transmitters also have some limitations.



The Levelflex FMP55 multiparameter device is an innovation in interface measurement

After thorough research on interface application measurement techniques, Endress+Hauser developed the SensorFusion technology. This is a combination of two different technologies in a single instrument: GWR and capacitance technologies are fused into one device to derive the advantages of both technologies.

The two technologies were chosen because of:

 Capacitance technology's proven track record performance with emulsion layers.
CMD's performance for example precision layers.

GWR's performance for overall precision level. This innovative and redundant approach brought about a revolution in interface measurement solutions. It is not only a precise and reliable solution, but it is also cost effective. This multi-parameter transmitter can measure the overall level of liquid and interface between the two liquids. The switch between GWR and capacitance technologies is automatically made to provide concise and reliable interface measurement, even in the presence of emulsion or rag layers. This device can withstand temperatures up to 392 deg F (200 deg C) and pressures up to 580 PSI. Interface range up to 33 ft can be measured and is available with different probe options like coaxial, flexible and rod types. This sensor fusion technology device has advanced features like HistoROM, SIL Certified, multi-echo tracking, etc. Due to the advanced features, the device has numerous and advanced benefit, for example, in the event of electronics replacement due to failure, data can be fed automatically from HistoROM to new electronics which saves maintenance time. For processes where interface layers are present, a precise measurement is decisive for the safe control. The availability of the measuring point and process safety are of the utmost importance in the operation of any plant. The benefits of using SensorFusion technology include:

- Process density changes will never influence measurement performance.
 - Exact instrument and process diagnosis to assist fast decisions.
- Measure and assign additional diagnostic information, like relative echo amplitude, which will ensure effective demulsi-fier dosing.
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A KSA firm that 'ChampionXs' **localisation and sustainability**

From chemical and digital solutions, sustainable product lines to value-creating acquisition strategies, ChampionX is playing its part in supporting the Kingdom's sustainability effort in line with Saudi Vision 2030

HAMPIONX says it offers all-round solutions to resolve the dilemma of operators, which want to improve production efficiently while keeping operations sustainable.

The company, which delivers chemical technologies to many oil and gas facilities in the Kingdom of Saudi Arabia, also provides valuable solutions to maximise asset life.

Another key area it has expertise in is unconventional gas, a growing sector in the Kingdom. In an interview with Abdulaziz Khattak of OGN, Mohammed Al-Khalifa, General Manager, Champion Arabia, discussed how ChampionX is leveraging technology, including recent acquisitions, to help companies in the industry responsibly maximise their operations.

How can ChampionX Corporation help companies reach their environmental sustainability targets?

Helping companies deliver sustainable operations is at the heart of what we do, and we're deeply passionate about supporting our customers as they reduce their operational emissions. Internally, this means leveraging our products,

services, digital platforms, and technical expertise to help responsibly maximise their operations.

ChampionX has developed chemical solutions which can provide greater efficiencies and reduce operational emissions to support industry net zero goals, while delivering greater oil recovery.

For example, in the Middle East, we developed a customised, cost-effective, and sustainable corrosion inhibitor (CI) treatment programme for a major operator experiencing pitting corrosion.

Upon application, our CI reduced chemical consumption by more than 40 per cent, delivering financial savings and lowering the operator's carbon footprint by reducing the storage space and frequency of deliveries required to effectively manage their program.

We also recently completed field trials of our enhanced, sustainable Clean n Cor® product line in the Middle East. These products are multi-functional and address the challenges of constrained production or water injection due to solids deposition, while also protecting the system from corrosion.





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KABBANI



ChampionX's ground-based solar powered SOOFIE technology monitors emissions and sends alerts to operators

> The solution uses less acidic chemistry, and the corrosion protection functionality mitigates against the risk of future failures, delivering greater efficiencies with less environmental impact.

project to implement and upgrade our delivery fleet, which includes 10 new bulk road tankers, designed locally in the Kingdom.

The upgraded fleet offers a more sustainable and efficient logistics solution for our bulk chemical deliveries, which will result in optimi-

What new technologies does ChampionX offer to achieve sustainability?

As the industry we serve evolves, we are transforming our business portfolio to align and support the emissions reduction goals of our customers, including the addition of industry-leading emissions monitoring technologies and services through the acquisition of Scientific Aviation.

Their ground-based, solar-powered system, called SOOFIE (Systematic Observations of Facility Intermittent Emissions), provides 24/7 continuous site monitoring of emissions and immediately alerts operations about potential concerns.

This emissions monitoring capability provides an opportunity to leverage our expertise in upstream production well sites.

We also recently acquired Tom-

Al-Khalifa ... 'leadership is essential'

sation for our respected customers.

In my role, I am also an advisor and supporter



son Technologies and Group 2 Technologies, leaders in a nano technology platform with proven commercial applications that help energy companies lower the operating expenses and carbon footprint of their oil and gas production operations.

What role does leadership play in achieving net-zero/decarbonisation?

Leadership is essential in driving change from the top down and ensuring sustainability goals are communicated and implemented across all areas of the husiness

In Saudi Arabia, I've been working with our regional teams on a critical business improvement of ChampionX's Sustainable Energy Empowers Development (SEED) internal employee resource group.

SEED aims to connect employees around the world with a shared passion for sustainability, and my active involvement in this group helps to promote and share our learnings while encouraging our workforce in Saudi Arabia to find ways to improve in this area.

What edge does this region have over other parts of the world in achieving net-zero goals?

In November 2021, Saudi Arabia launched the Green Initiative, which will play a key role in achieving the kingdom's net-zero goals. This builds on the existing Saudi Vision 2030 by uniting all sustainability efforts to increase reliance on clean energy with five key focus areas, including the reduction of carbon emissions, protecting oceans, defending wildlife, prevent-



SAUDI ARABIA, VISION 2030 19

ing desertification, and increasing recycling.

more than half of which are Saudi nationals.

This unified approach highlights how important achieving net zero is to Saudi Arabia, and we are excited to play our part in supporting this effort.

As a leading supplier to the oil and gas industry, what are the highlights of your impressive journey over the years?

Operating as Champion Arabia, we entered the Saudi market more than 30 years ago with a long-term growth strategy.

We understood the key importance of having a local presence, so in 1982, we opened our facility in Dammam with just six people. Today, we deliver a vast suite of chemistries to many oil and gas facilities in the kingdom, and we employ 46 people in-country,

What specialised solutions do you offer the oil and gas industry?

In Saudi Arabia, we deliver a range of oilfield chemical solutions and technical services. We continue to see high demand for corrosion and scale inhibitors, emulsion breakers, water treatment chemicals, and an increasing demand for biocide applications.

Our solutions are designed to help operators achieve greater production and enhance project efficiencies, while delivering more sustainable operations for our customers.

We have seen an increased need in recent years to support aging assets, so we have been working with our customers to provide solutions that actively protect downhole equipment while maximising asset life.

Our global network of experienced scientists, engineers, and subject-matter experts are readily available to support our local technical team any time there is a need for troubleshooting or innovation to improve our customers' operations.

What major projects is ChampionX currently participating in?

The unconventional gas market in Saudi Arabia is growing exponentially. This is an area of ChampionX expertise, and we believe there is great added value in utilising our previous experience in the US and Canada.

We have developed a diverse range of integrated chemical, drilling, artificial lift and digital applications that can support our customers throughout the unconventional gas lifecycle in Saudi Arabia.



ChampionX supports the Saudi market with a range of oilfield chemical solutions and services

What are some of the new innovations in your segment of the industry?

The application of digital solutions has become more prominent as operators realise the sustainability and efficiency benefits of technology, such as AI, and this trend will undoubtedly grow in the coming years.

We've been working to combine technical advancements and multi-functional products into one package to deliver highly efficient products for our customers.

What are the company's plans for this year?

Moving into 2022, we have a well-defined growth strategy

in place to support our growing operation in Saudi Arabia. This includes expanding our in-country footprint by opening an additional office, which allows us to support the increasing demand for our chemical technologies and solutions.

While ChampionX already has a strong localisation plan in place, we are aiming to significantly enhance our programme to align even more closely with the In-Kingdom Total Value Add (IK-TVA) program.

This progression will enable us to deliver even greater economic benefit to the country as we upskill the local workforce to support the evolving demands of the energy industry in Saudi Arabia.

Yokogawa, Aramco to explore semiconductor manufacturing



Yokogawa's minimal fab application laboratory

OKOGAWA Electric Corporation, represented in Saudi Arabia by Yokogawa Saudi Arabia, has signed a memorandum of understanding (MoU) with Aramco to collaborate and explore potential opportunities for seeding and localising semiconductor chip manufacturing in the Kingdom and thereby promoting growth in the industrial digital business domain. Under the MoU, Yokogawa, which has been a central member of Japan's Minimal Fab Promoting Organization since 2017, will offer its expertise in deploying Minimal Fab technology to Aramco facilities.



It will also provide related training, maintenance, and support services with a view to ensuring end-to-end success.

Yokogawa, which is the only integrator of Minimal Fab technology, will serve as the optimal fit for Aramco as a one-stop provider of solutions including infrastructure development, start-up, operational support, and after-sales services.

Minimal Fab is an innovative production system that enables high-mix, low-volume manufacturing of semiconductors and MEMS (micro-electromechanical system) without the need for a cleanroom.

Yokogawa aspires to collaboratively expand its business horizons by working with Aramco to co-create value for society and the Kingdom in line with the country's ambitious Vision 2030 and its own corporate brand slogan of 'Co-in-novating tomorrow'.

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Qanbar first to trial CO₂-injected concrete mix in Kingdom

CarbonCure is being launched for the first time in Saudi Arabia

The green concrete will be used at projects in the King Salman International Complex for Maritime Industries and Services which will be supplied from Qanbar Ready-Mix's batching plants located in Ras Al Khair



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HASTERN Province-headquartered Qanbar Ready Mix, which has 40 years' experience in the supply of quality readymix concrete, has taken a pioneering role in Saudi Arabia and the Middle East by conducting the first trial mix of concrete injected with carbon dioxide (CO2) using innovative technology from Canada's CarbonCure.

The company conducted a full-scale plant trial of the first CO_2 -injected readymix concrete mix design on December 27 in Ras Al-Khair Industrial City in the presence of employees from its customers, Saudi Aramco, and an invited audience of about 100 engineers.

The green concrete will be used at projects in the King Salman International Complex for Maritime Industries and Services which will be supplied from Qanbar Ready-Mix's batching plants located in Ras Al Khair.

Speaking to *OGN* at the launch, Saud Abdul Aziz Al-Ansari, Board Member and Managing Director of Qanbar Ready Mix, said: "We are using new technology called Carbon Cure, which is a very simple and straightforward technology where we inject CO2, as a liquid form, into the concrete mix. This material bonds with the mix, and provides some additional features. We are the first to launch this technology from North America in Saudi Arabia and the Middle East. This particular technology has



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The company is committed towards having a proactive involvement in the localization programs in the Kingdom, IKTVA most important and strategic programs focused on developing the energy sector and creating a world-class supply chain and Saudi Fal is proud to be an active member of this rapid-growing initiative.



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SAUDI ARABIA, VISION 2030 2 1

been proven a success in North America and Europe as well as elsewhere in the world. So, we're happwy today to launch it and we're hoping to contribute to a low-carbon society."

The quantity of carbon emissions that can be saved in this process is enormous, according to Al Ansari.

He elaborated: "CarbonCure technology is estimated to save about 25 kg per cu m produced. So by simple calculation, if we assume that we produce a million cu m of concrete a year, this implies savings of carbon emissions equivalent to about 25,000 tonnes. And we can achieve this target in two ways. Firstly, by using carbon as a natural source, and as an admixture for the concrete, we save carbon emissions. Carbon dioxide injected into the mix enhances its properties and makes it stronger, and therefore we use this as the cement content.

"The second way we save emissions is by reducing cement content – and we all know that cement production involves a lot of carbon emissions. So that's what we're aiming for and are receiving support from different authorities. We hope that we can start production on a commercial basis very soon."

CarbonCure's technology for the concrete industry introduces recycled CO_2 into fresh concrete to reduce its carbon footprint without compromising its quality or performance. Once injected, the CO_2 undergoes a chemical reaction and converts into a mineral – calcium carbonate - and becomes permanently embedded, improving the compressive strength of the concrete. This allows concrete suppliers to optimise their mix designs and safely reducing cement content, thus gaining economic and climate benefits, according to CarbonCure.

The green mix that Qanbar Ready Mix used in the trial comprised 135 kg/cu m of cementitious materials including Ordinary Portland Cement (250 kg/cu m), fly ash (110 kg/cu m) and microsilica, which are mixed with carbon dioxide constituting 0.1 per cent of the cementitious content in a central mixer. The cementitious materials are combined with water (135 kg/cu m), aggregate and admixtures including retarders and superplasticisers (2 kg per cu m, each) and will achieve a compressive strength of 32 MPA at 28 days.

Testing of the product – both on freshly poured and hardened concrete – is being conducted by Arab Company for Laboratories and Soil, as recommended by CarbonCure.

> The green concrete will be supplied from Qanbar Ready-Mix's batching plants located in Ras Al-Khair





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