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OIL, GAS, MARINE & OFFSHORE, SHIPBUILDING AND HEAVY EQUIPMENT

OFFSHORE WIND: NEW OCEAN GRID PROJECT IN THE NORTH SEA

PONANT'S POLAR EXPLORER REACHES NORTH POLE WITH ABB TECHNOLOGY, SETTING NEW STANDARDS FOR CRUISE

22 MINUTES WITH

MR. EUGENE NG
VICE PRESIDENT OF STRATEGY & BUSINESS DEVELOPMENT
NatSteel

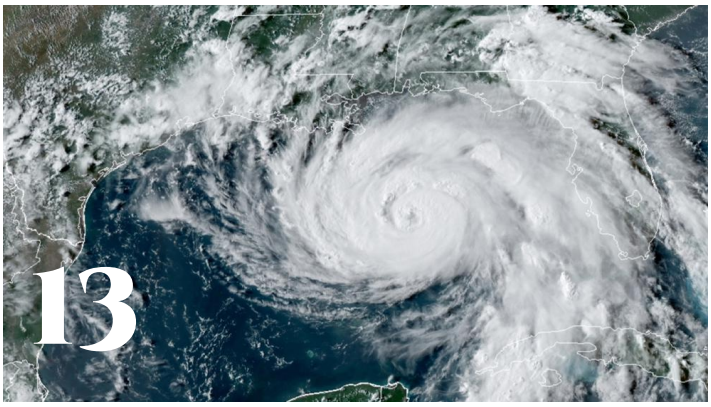
MR. JIANSEN LIU
VICE PRESIDENT
XCMG

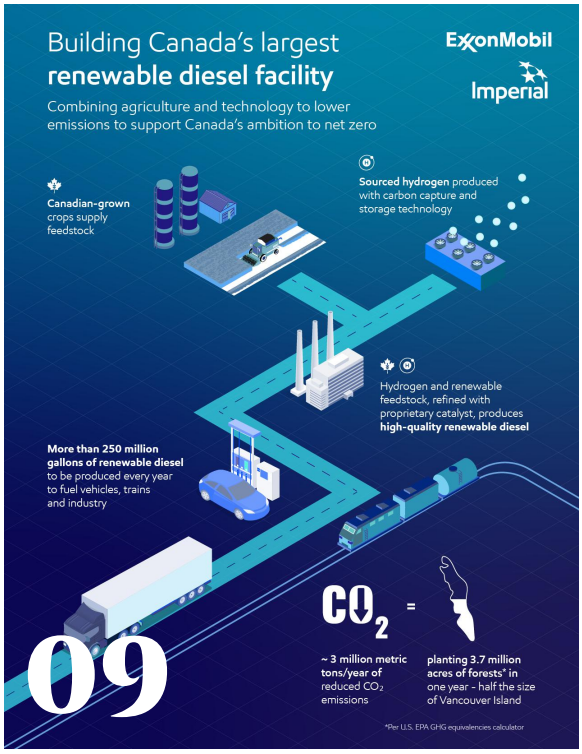
MR. FRIEDHELM BEST
VICE PRESIDENT APAC, HIMA
HIMA
SMART SAFETY.

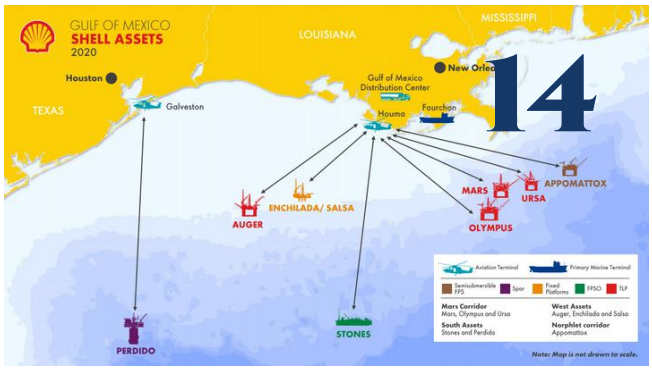
SINGAPORE TO HAVE FIRST ELECTRIC FERRY SERVICE IN 2023, RUN BY SHELL

CONTENT PAGE

Insight Out







CONTENT PAGE

86

79

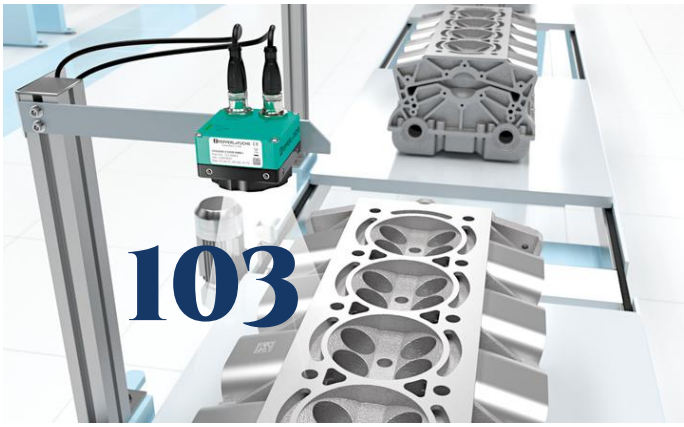
91

74

Product News

CONTENT PAGE

Technology News

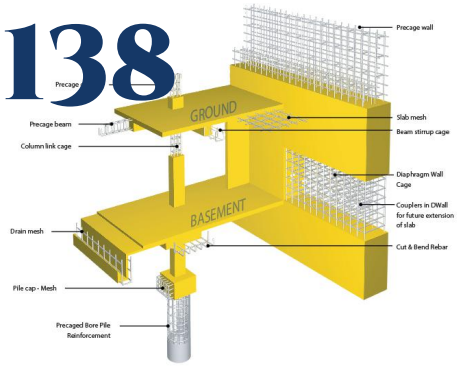


Success Story

Feature Story

22 Minutes

Great Opportunity



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Hola!

In this issue, we will explore how the oil and gas industry is driving the demand for heavy machinery globally.

Companies, such as Caterpillar and Volvo Group, are upgrading their machinery to meet these rising demands. In addition, we will also look at how the oil and gas industry has been impacting global trade.

The oil and gas industry has seen an upheaval in recent years. The move to more renewable sources of energy has caused a decline in the demand for oil. Even more, the change in technology has shifted the way many people use oil and gas products. This is why it is so important to not only think about the future of this industry but also how it will affect other industries.

Many areas of life are starting to experience changes because of new technology like electric vehicles, solar panels, and wind turbines that don't require any combustion engines.

Companies that do not figure out how they can adapt to this new technological landscape risk disappearance or becoming irrelevant over time.

The oil and gas industry has undergone a massive transformation in the past few years. The traditional oil companies are now under the pressure of new players such as electric vehicle manufacturers, technology companies, and other future-ready entrepreneurs.

The first sign of the change was when Shell started to invest in electric vehicles and other renewable energies. The second sign came with investments from Apple and Google. These were not the only signs that the industry was changing, but they were two of the most significant ones to date.

As we can see from these examples, there will be a lot more changes coming to this industry in the future. This is why it is important for all stakeholders to keep an eye on what's happening because this could potentially affect them as well.

I am glad to announce that the December edition of our publication will be all about robotics,i4.0, Automation and Vision Systems . We have thoroughly researched the latest technological advancements in this field and are thrilled to share them with our readers.

Please send your articles over for the next issue, which will be coming out in the month of Christmas.

We are pleased to announce that IIGA Digital is now part of the Industrial Guide Asia. In the past few months, we have been working on new digital products that combine our digital marketing services with industrial companies. We now have expanded our offerings to help clients from different industries to achieve their marketing goals, as well as achieve their quality.We are here to help industrial companies excel in the digital age.

If you're looking to build SEO content for your industrial segments, email marketing to keep your subscribers informed, or launch a social media campaign to get new leads, talk to us now.

Till then , stay safe and healthy!

Team Industrial Guide Asia

Building Canada's largest **renewable diesel facility**

ExxonMobil

Imperial

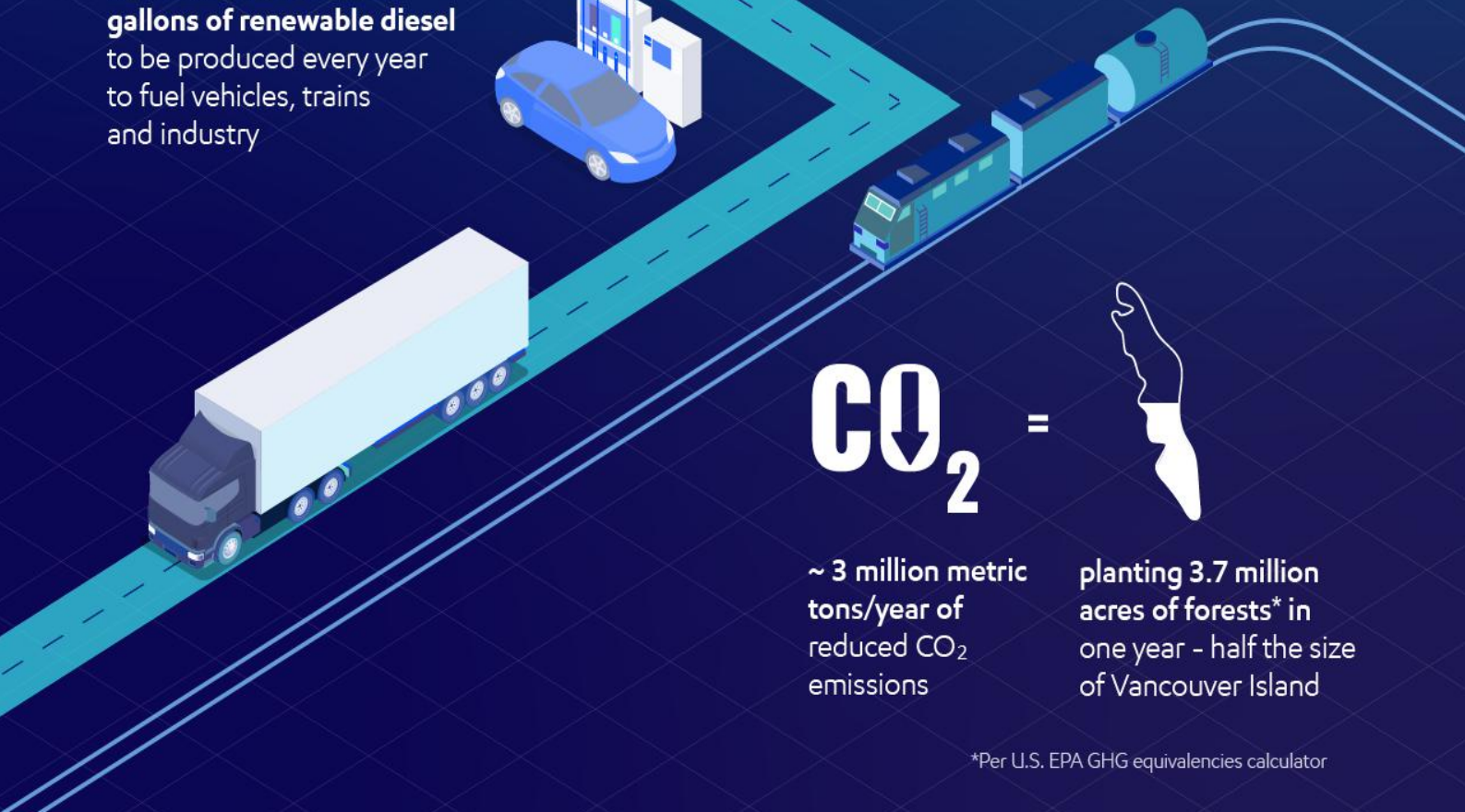
Combining agriculture and technology to lower emissions to support Canada's ambition to net zero

Canadian-grown crops supply feedstock

Sourced hydrogen produced with carbon capture and storage technology

Hydrogen and renewable feedstock, refined with proprietary catalyst, produces **high-quality renewable diesel**

More than 250 million gallons of renewable diesel to be produced every year to fuel vehicles, trains and industry



CO_2 =

~ 3 million metric tons/year of reduced CO_2 emissions

planting 3.7 million acres of forests* in one year - half the size of Vancouver Island

*Per U.S. EPA GHG equivalencies calculator

ExxonMobil affiliate to produce renewable diesel to help reduce transportation emissions in Canada

ExxonMobil announced its majority-owned affiliate, Imperial Oil Ltd., is moving forward with plans to produce renewable diesel at a new complex at its Strathcona refinery in Edmonton, Canada. When construction is complete, the refinery is expected to produce approximately 20,000 barrels per day of renewable diesel, which could reduce emissions in the Canadian transportation sector by about 3 million metric tons per year. The complex will utilize locally grown plant-based feedstock and hydrogen with carbon capture and storage (CCS) as part of the manufacturing process.

"Canada's proposed low-carbon fuel policies incentivize the development of lower-emission fuels that can make meaningful contributions to the hard-to-decarbonize sectors of the economy, including transportation,"

IAN CARR,
PRESIDENT OF
EXXONMOBIL FUELS &
LUBRICANTS COMPANY

- **Project will include carbon capture and storage, hydrogen to meet low-carbon fuel standards**
- **Strathcona refinery could produce 20,000 barrels of renewable diesel per day in 2024**
- **Renewable diesel has the potential to reduce annual CO2 emissions by about 3 million metric tons compared to conventional fuels**

"The Strathcona project is an example of how well-designed policies allow us to leverage our existing global facilities for capital efficiency, utilize our proprietary catalyst technology, and bring our decades of processing experience to develop low-emission fuels."

The renewable diesel production process will utilize blue hydrogen, which is produced from natural gas with carbon capture and storage. Production of blue hydrogen has been shown to have substantially reduced greenhouse gas emissions compared to conventionally produced hydrogen. Approximately 500,000 metric tons of CO_2 are expected to be captured each year utilizing CCS. The blue hydrogen and biofeedstock will be combined with a proprietary catalyst to produce premium low-carbon diesel fuel.

"ExxonMobil Low Carbon Solutions has made the broad commercialization of carbon capture and storage our initial focus, and we are seeing increased momentum for projects that include hydrogen and biofuels – areas that we are uniquely suited to address and advance in combination with CCS,"

JOE BLOMMAERT, PRESIDENT OF EXXONMOBIL LOW CARBON SOLUTIONS

"We strongly support an economy-wide price on carbon because it is the most efficient approach to changing behaviors and accelerating investments in low-emission technology. However, Canada's Clean Fuel Regulation could be a model for other countries considering a sectoral approach. Technology-neutral, lifecycle carbon-intensity based fuels policies like the one proposed in Canada can quickly bring projects like Strathcona to scale and rapidly reduce emissions at a low cost to society."

A final investment decision will be based on several factors, including government support and approvals, market conditions and economic competitiveness. Imperial will lead the project, which is expected to create about 600 direct construction jobs. Renewable diesel production is anticipated to start in 2024.

Based on an analysis of California Air Resources Board data, renewable diesel from various non-petroleum feedstocks can provide life-cycle greenhouse gas emissions reductions of approximately 40 percent to 80 percent compared to petroleum-based diesel. The United States Environmental Protection Agency estimates that reducing 3 million

metric tons of greenhouse gases is equivalent to taking more than 650,000 passenger vehicles off the road for one year.

The Strathcona renewable diesel project is part of ExxonMobil's plans to provide more than 40,000 barrels per day of low-emissions fuels by 2025. In the United States, the company has agreed to purchase up to 5 million barrels of renewable diesel annually from Global Clean Energy to supply markets in California. Chemically similar to petroleum-based diesel, renewable diesel can be readily blended for use in engines on the market today.

In March, ExxonMobil established a Low Carbon Solutions business to commercialize low-emission technologies, including CCS, biofuels and hydrogen.

In June, Imperial announced its participation as a founding member of the Oil Sands Pathways to Net Zero Alliance. The goal of this unique alliance, working collectively with the broader oil and gas industry and the federal and Alberta governments, is to achieve net-zero greenhouse gas emissions from oil sands operations by 2050 to help Canada meet its climate goals, including its Paris Agreement commitments and 2050 net-zero aspirations.

The International Energy Agency projects CCS could mitigate up to 15 percent of global emissions by 2040, and the U.N. Intergovernmental Panel on Climate Change (IPCC) estimates global de-carbonization efforts could be twice as costly without CCS.

TechnipFMC Announces Sale of Stake in Technip Energies N.V.

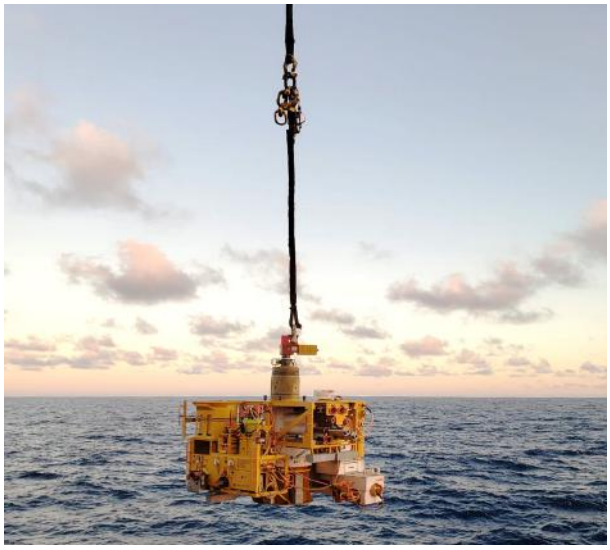
TechnipFMC plc announced the sale of 17.6 million Technip Energies N.V. shares through a private sale transaction with HAL Investments, the Dutch investment subsidiary of HAL Holding, N.V. The sale price of the Shares in the Sale is set at €11.15 per Share, yielding total gross proceeds of €196.2 million. HAL has agreed to a lock-up of 180 days for its shares in Technip Energies.

Upon completion of the Sale, representing approximately 9.9% of Technip Energies' issued and outstanding share capital, TechnipFMC retains a direct stake of approximately 12.3% of Technip Energies' Share Capital.

The Sale was conducted without a public offering in any country.

Settlement for the Sale will take place in two tranches. HAL will first acquire 8.6 million Shares from TechnipFMC, with settlement expected to take place in the coming days. Settlement for the remaining 9 million Shares is subject to HAL obtaining customary regulatory approvals and is expected early in the fourth quarter of 2021.

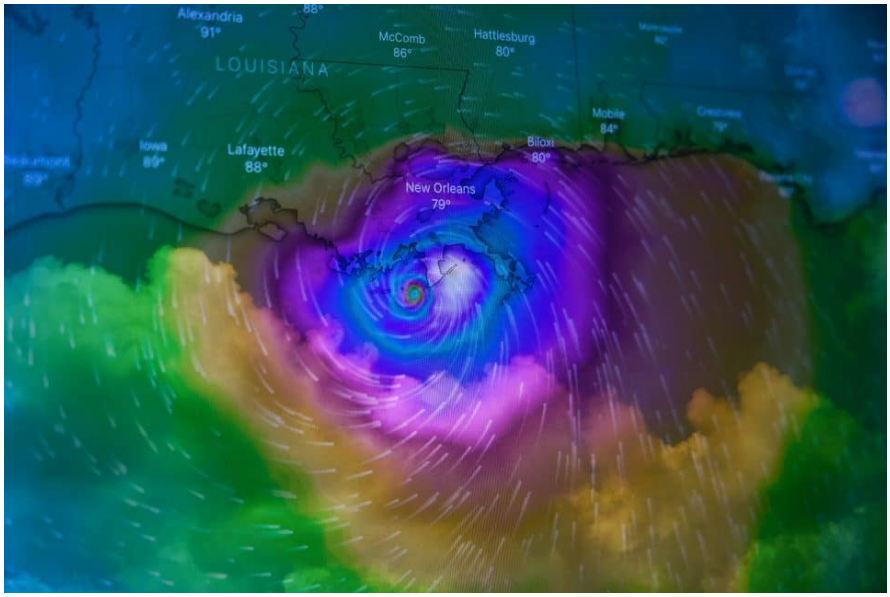
TechnipFMC is subject to a 60-day lock-up for its remaining shares in Technip Energies that expires on October 2, 2021, subject to waiver from the Joint Global Coordinators involved in the previous private placement and certain other customary exceptions. The Joint Global Coordinators granted a waiver solely for the purpose of the Sale. The 60-day lock-up for TechnipFMC remains in effect in all other respects.

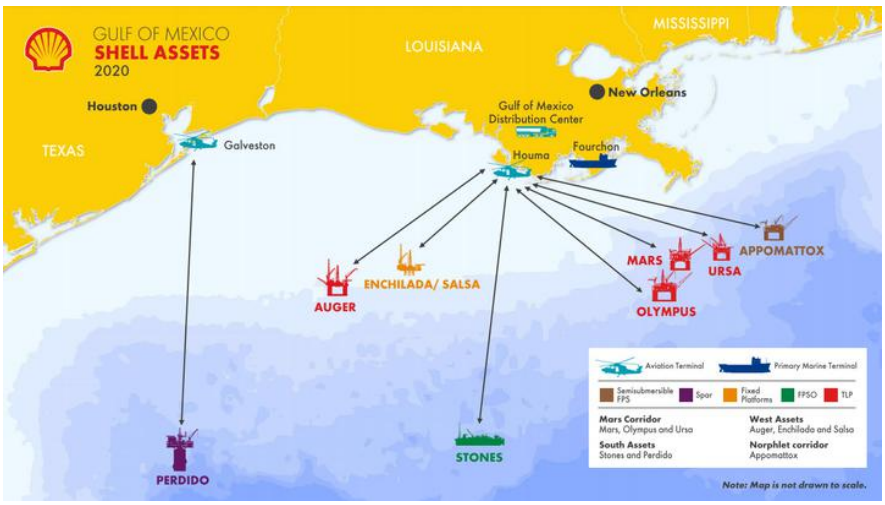


Shell Identifies Damage to WD-143 from Hurricane Ida in the Gulf of Mexico

Shell Offshore Inc.

(Shell), a subsidiary of Royal Dutch Shell plc, conducted an initial flyover of our assets in the path of Hurricane Ida. During this initial flight, we observed damage to our West Delta-143 (WD-143) offshore facilities. When it is safe to do so, we will send personnel offshore to provide a closer inspection of these facilities to understand the full extent of the damage and the degree to which our production in the Gulf of Mexico will likely be impacted.





The WD-143 facilities serve as the transfer station for all production from our assets in the Mars corridor in the Mississippi Canyon area of the Gulf of Mexico to onshore crude terminals.

Our Perdido asset in the southwestern Gulf of Mexico was never disrupted by the hurricane, and our floating production, storage and offloading vessel, the Turritella (also known as Stones) is currently back on line. All of our other offshore assets remain shut in and remain fully evacuated at this time. At the early phase of assessment and recovery, approximately 80% of Shell-operated production in the Gulf of Mexico remains off line.

In our initial flyover, we did not observe any visible structural damage to the rest of our offshore assets. When we are able to safely deploy personnel offshore to these assets, we will conduct additional inspections and work to restore production as soon as possible.

As we assess the impact of Hurricane Ida on our Upstream and Downstream businesses, our top priorities continue to be the protection and recovery of our people and assets, the community and the environment.

Marathon Petroleum Corp., ADM Announce Feedstock Partnership to Support Renewable Diesel Production

- **Marathon to invest in ADM's recently announced Spiritwood soybean processing facility, which will provide soybean oil to Marathon's renewable diesel facility in Dickinson, N.D.**

- **Companies to explore further opportunities to support renewable transportation fuels**

Marathon Petroleum Corp. and ADM announced today an agreement to form a joint venture for the production of soybean oil to supply rapidly growing demand for renewable diesel fuel. Under the terms of the agreement, the joint venture will own and operate ADM's previously announced soybean processing complex in Spiritwood, North Dakota, with ADM owning 75 percent of the joint venture and MPC owning 25 percent. When complete in 2023, the Spiritwood facility will source and process local soybeans and supply the resulting soybean oil exclusively to MPC. The Spiritwood complex is expected to produce approximately 600 million pounds of refined soybean oil annually, enough feedstock for approximately 75 million gallons of renewable diesel per year.

In addition to the Spiritwood joint venture, the companies anticipate working together to explore other opportunities for agriculture to support renewable transportation fuels.

"ADM has always been at the forefront of innovative fuels made from nature, and we are uniquely positioned to take action to reduce the carbon intensity of our business and lead our industry as we live our purpose,"

KEN CAMPBELL,
ADM's PRESIDENT OF NORTH AMERICA OILS, BIODIESEL, AND RENEWABLE CHEMICALS

"We already provide MPC with soybean oil for renewable diesel production, but this agreement will significantly expand our collaborative relationship. Together, MPC and ADM have the expertise, scale and capabilities to deliver sustainable outcomes that start on the farm and go all the way to the fuel in millions of commercial and personal vehicles — and in this case, supporting renewable diesel demand that we believe may be as much as 5 billion gallons by 2025. And what's even more exciting is that we see the opportunity to work together to do more to support sustainable solutions."

"At MPC, we are challenging ourselves to lead in sustainable energy," said Dave Heppner, MPC's senior vice president of Strategy and Business Development. "This joint venture marks another step in advancing our ability to optimize and source logistically advantaged feedstock for our nearby Dickinson facility, and also creates a platform for further collaboration with a 2 world-class partner as we continue to invest in a sustainable, energy-diverse future."

When complete, the approximately $350 million complex in Spiritwood will feature state-of-the-art automation technology and have the capacity to process 150,000 bushels of soybeans per day. The construction of the new complex is supporting hundreds of jobs in the region, and the facility will employ approximately 75 people once operational. The Spiritwood complex is expected to begin production for the 2023 harvest.

NOVATEK and JBIC sign Strategic Cooperation Agreement

As part of today's Eastern Economic Forum, PAO NOVATEK and the Japan Bank for International Cooperation (JBIC) signed a Strategic Cooperation Agreement on low-carbon projects.

The Parties intend to cooperate on projects to produce hydrogen and ammonia, carbon capture, utilization, and storage technologies, as well as renewable energy projects in Russia, including ammonia and hydrogen production projects in the Yamal Peninsula.

"We are actively studying options to further reduce our current low carbon footprint from NOVATEK's LNG production by using renewable energy sources, carbon capture and storage and hydrogen-based fuels at our LNG projects,"

LEONID MIKHELSON, NOVATEK's CHAIRMAN OF THE MANAGEMENT BOARD

"This Strategic Cooperation Agreement provides opportunities for us to work with Japanese companies and financial institutions on developing our low-carbon solutions, attracting investments and expanding the range of suppliers of state-of-the-art equipment and technologies. Moreover, it facilitates opportunities for us to market our clean fuel products to a wider range of consumers from Japan to reduce the total carbon emissions."

Chevron Commits $3 Million to Support Hurricane Ida Relief and Recovery Efforts

Chevron Corporation announced today it is making a commitment of $3 million to support relief and recovery efforts underway in the communities affected by Hurricane Ida.

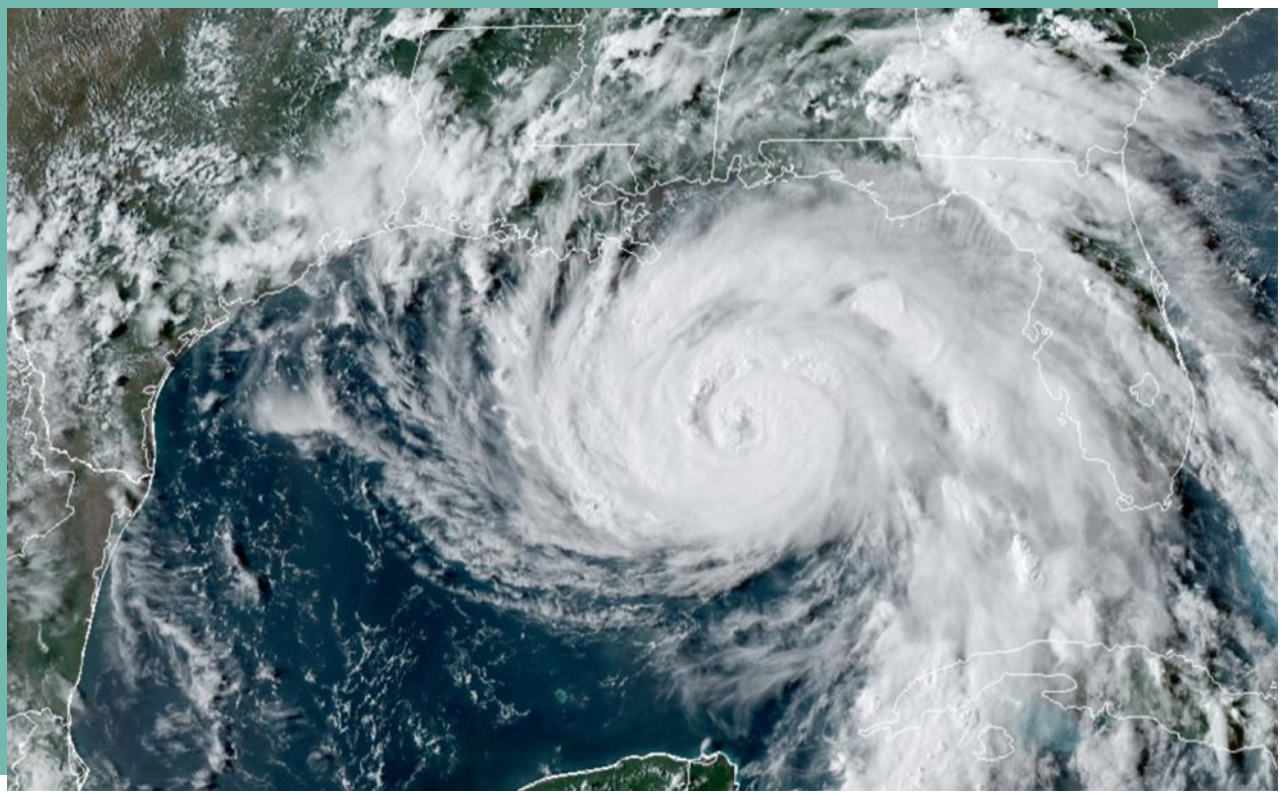
"As a major employer and longtime partner in several Gulf Coast communities, Chevron is fully committed to helping the region recover from the impacts of Hurricane Ida,"

said Brad Middleton, vice president of Chevron North America Exploration and Production Company's Gulf of Mexico Business Unit, which is headquartered in Covington, Louisiana.

"We understand that these resources are vital to support the needs of our communities. There is significant recovery work to be done, and Chevron stands by our fellow Louisiana residents through this difficult time."

American Red Cross, Catholic Charities and Team Rubicon will each receive a $500,000 donation to support immediate relief efforts throughout the impacted region, including Jefferson, Lafourche, Terrebonne, St. Charles, Orleans, St. Charles, Orleans, Plaquemines and St. Tammany parishes, and others. The remaining $1.5 million will be distributed across local organizations focused on disaster relief. In addition, the company will match qualifying donations to hurricane relief efforts made by employees and retirees, as well as provide financial contributions to organizations where employees volunteer. Together, this financial assistance aims to help Chevron's employees, families and communities during times of need.

"For decades, Catholic Charities has responded to the needs of the community after natural disasters," said Sister Marjorie Hebert, president



and CEO of Catholic Charities of the Archdiocese of New Orleans.

"As we prepare to respond to short- and long-term needs in the community, we are so grateful for Chevron's commitment to Louisiana and that they have entrusted us with the funding to be able to help people after Hurricane Ida."

"Chevron's support of Team Rubicon is truly an incredible investment in Louisiana's recovery, especially as we begin to understand the extent of the damage left by Hurricane Ida," says Art delaCruz, chief executive officer of Team Rubicon. "This partnership will allow our Greyshirt volunteers to make an even greater impact as we assist communities in recovering after the storm."

Chevron has been producing and delivering energy in Louisiana and the Gulf of Mexico for more than 80 years. Its Gulf Coast-based workforce supports offshore operations in the Gulf of Mexico, Chevron Pipeline Company in Port Fourchon and the Chevron Oronite Company's Oak Point plant. The company also operates the Chevron Pascagoula Refinery in Mississippi, and with its marketers, Americas Fuels and Lubricants has Chevron- and Texaco-branded retail stations across the Gulf Coast region.

CNOOC Limited Announces Bozhong 26-3 Oilfield Expansion Project Commences Production

CNOOC Limited announced that Bozhong 26-3 oilfield expansion project has commenced production.

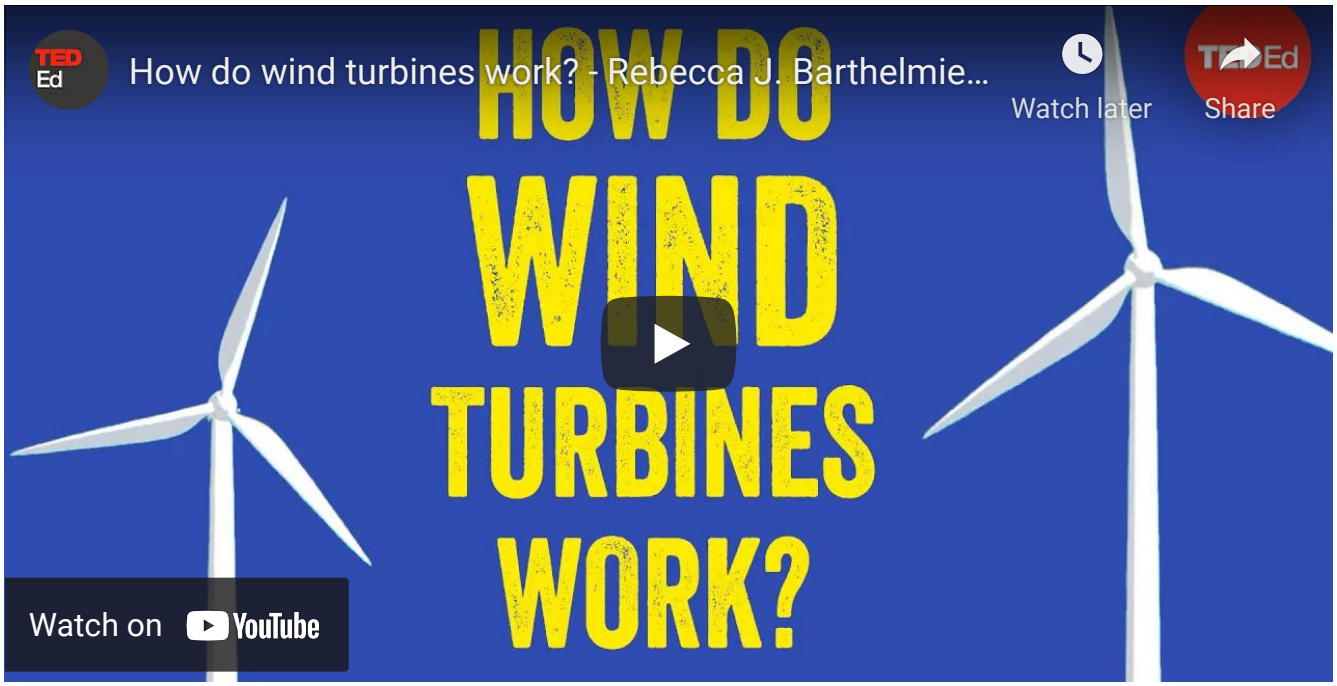
Bozhong 26-3 oilfield expansion project is located in the south of Bohai Sea, with average water depth of about 21 meters. In addition to fully utilizing the existing processing facilities, the project has built a new unmanned wellhead platform and a power platform. A total of 8 development wells are planned, including 5 production wells, 2 water injection wells and 1 development and appraisal well. The project is expected to reach its peak production of approximately 2,670 barrels of crude oil per day in 2021.

CNOOC Limited holds 100% interest in Bozhong 26-3 oilfield expansion project and acts as the operator.

US Wind Announces Major Offshore Wind Progress

US Wind, Inc., Maryland's leader in offshore wind development, announced major steps forward in the development of offshore wind energy for Maryland, including major labor agreements to support US Wind's first major offshore wind project for Maryland, the 22-turbine MarWin project, and all other future projects; anew port facility agreement with Tradepoint Atlantic to develop 90 waterfront acres into a new offshore wind deployment hub, where US Wind will initially invest $77 million via the MarWin project; expansion plans for development of up to an additional 1,200 MW of offshore wind energy with the new Momentum Wind project; and a proposal for a new steel fabrication facility in Baltimore County at the Tradepoint Atlantic site – Sparrows Point Steel – to be built in conjunction with Momentum Wind.

"Because of the successes we've achieved in the development of MarWin, US Wind is ready to offer Maryland its most ambitious clean energy project to-date and, with it, the state's first permanent offshore wind steel fabrication facility," said Jeff Grybowski, US Wind CEO. "Developing Momentum Wind and Sparrows Point Steel at full capacity will give Maryland the opportunity to bring steel back to Baltimore and become the epicenter of offshore wind manufacturing."



At full capacity, Momentum Wind would include up to 82 turbines and will be Maryland's most ambitious clean energy project, able to fully satisfy the state's offshore wind energy goals and make substantial progress toward meeting Maryland's renewable energy and greenhouse gas reduction goals.

Catalyzed by a landmark 90-acre lease agreement with Tradepoint Atlantic at Sparrows Point Shipyard, the former home of Bethlehem Steel, US Wind will build on the port investment already committed via the MarWin project to facilitate the investment of an incremental $150 million to develop Sparrows Point Steel, Maryland's first manufacturing facility dedicated to the creation of offshore wind foundations, known as monopiles.

"The combination of expanding offshore wind and welcoming steel back to Sparrows Point is truly a full-circle moment for Tradepoint Atlantic," said Tradepoint Atlantic Managing Director, Kerry Doyle.

"We are here today because both the private and public sectors have consistently pulled together to reimagine this iconic site and once again make it a place where thousands of hard-working Marylanders could find good paying jobs and provide for their families. US Wind's vision for the future and commitment to establishing critical elements of the offshore wind supply chain at Tradepoint Atlantic is transformational and we look forward to partnering with them for many years to come. Ultimately, there is much work to be done to keep Maryland well-positioned in this emerging industry and Tradepoint Atlantic will continue to be a national leader pushing for even greater growth and success. As Marylanders, we should be very proud – offshore wind is here, and steel is back."

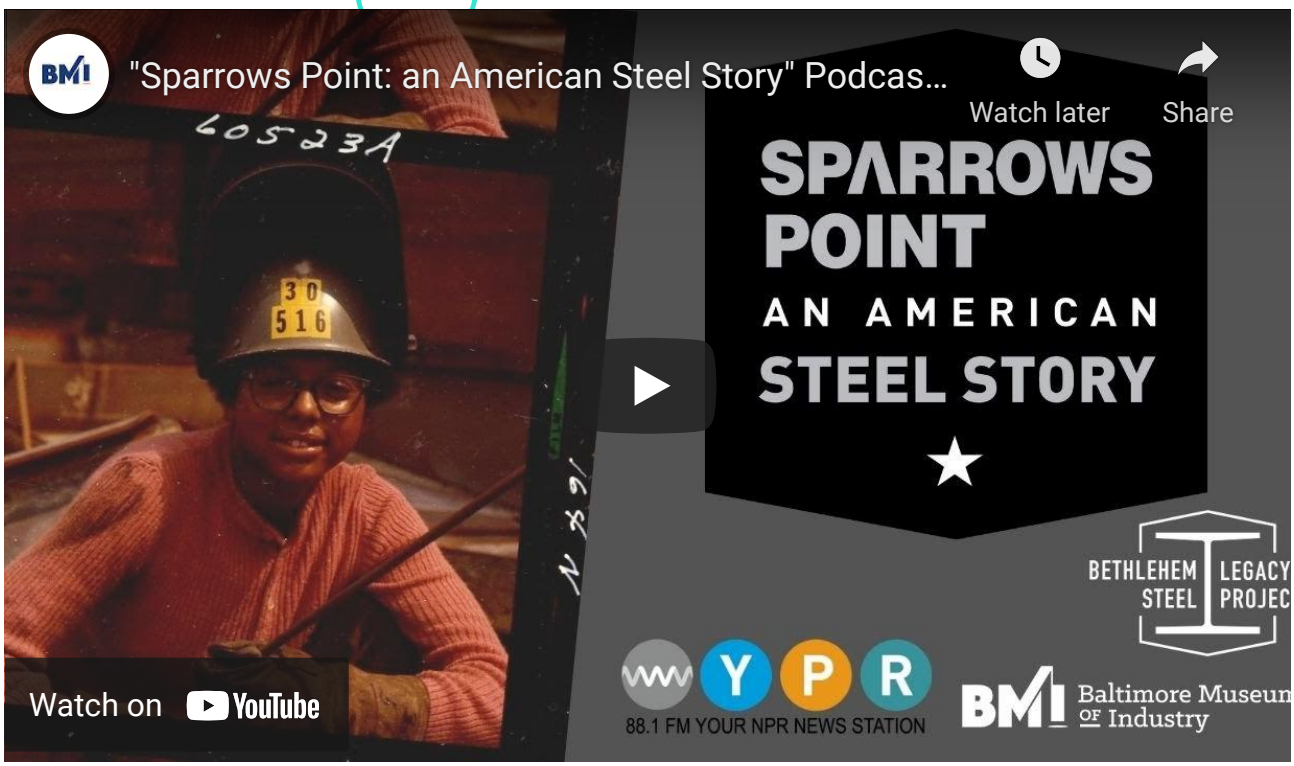
Sparrows Point Steel has the potential to be one of the largest offshore wind staging ports in the United States. With significant marshaling and storage land, considerable quayside access, and an adjacent drydock, Sparrows Point Steel would be one of the most competitive wind logistics hubs on the East Coast, capable of staging and delivering several wind components, such as nacelle, towers, and blades, as well as foundations.

"The State of Maryland is proud to support this transformative and game-changing partnership between US Wind and Tradepoint Atlantic, two of the leaders of Maryland's economic turnaround," said Governor Larry Hogan. "Offshore wind presents a once-in-a-generation opportunity to expand and diversify our economy and our energy portfolio. Maryland is proud to continue to be an example of strong environmental leadership, and I am confident that we will be a leader in offshore wind development for decades to come."

"Tradepoint Atlantic in Baltimore County offers an ideal location for the development of an offshore wind industry in Maryland, and I'm thrilled that US Wind and others are investing in our community, creating jobs and building a sustainable future," said Baltimore County Executive Johnny Olszewski. "The legacy of Sparrows Point is one built on good jobs for families, and I'm excited about the prospect of the return of manufacturing to this storied site."

Focused on Local Jobs and Economic Impact

Through the development, construction, and operations phases of Momentum Wind, the project can support thousands of Maryland jobs and lead directly to the investment of hundreds of millions of dollars in the Maryland economy. The benefits of the 1,200 MW buildout of Momentum Wind to the Maryland economy are massive:



- Direct Construction Jobs: approximately 3,500
- Construction Labor Income (Direct Jobs): over $300 million
- Direct Operations Jobs: approximately 100
- Operations Labor Income (25 Years, Direct Jobs): over $500 million

The additional economic benefits stemming from Sparrows Point Steel are a game-changer for the state. When the facility is at full operations, it will support more than 500 local, permanent jobs; generate more than $1 billion in labor income over 20 years; and increase Maryland's GDP by $6.9 billion over 20 years.

US Wind has made substantial commitments to the region's leading building and construction trades to supply the skilled labor needed to build both Momentum Wind and Sparrows Point Steel. The investment in Sparrows Point Steel also adds a new dimension to the economic benefits of Maryland's offshore wind program by creating 500 permanent full-time manufacturing jobs. An agreement with the United Steelworkers to support the operations at Sparrows Point Steel has special historical relevance to both United Steelworkers and the greater Baltimore community, which thrived when Bethlehem Steel was still in operation.

"Sparrows Point has always been hallowed ground for me and my fellow Steelworkers,We're thrilled to be a part of US Wind's visionary plans to bring steel back to Baltimore, back to this hallowed ground. US Wind is committed to supporting thousands of family-sustaining union jobs and we couldn't be happier to be partnering with them on this new venture.""

Jim Strong, Assistant to the Director,
United Steelworkers.

"The Building Trades can't wait to put steel in the water off Maryland's coast with US Wind to not only create a clean source of renewable energy, but to also ensure the construction workers will be paid family-sustaining union wages,"

Stephen Courtien, President, Baltimore-D.C. Building and Construction Trades.

US Wind is the only offshore wind company in America exclusively focused on developing clean energy and jobs for Maryland. With its headquarters in Baltimore, US Wind has committed all its local job creation efforts to Maryland – from Baltimore to Ocean City. With a best-in-class team of professionals with deep experience in involving Maryland small and minority-owned businesses in major construction projects, US Wind offers with Momentum Wind a comprehensive program to develop local business talent through innovative small business incubator and mentorship programs.

"Investing in renewable energy sources like offshore wind will not only help us tackle the threats of climate change but will also create thousands of clean energy jobs and boost Maryland's economy, creating more opportunity in our communities," said U.S. Senator Chris Van Hollen. "This project will have a big impact on our state – supporting good-paying, union jobs from the Eastern Shore to Baltimore. This is a win for our economy, our environment, and – most importantly – Maryland workers. I will continue working at the federal level to support responsible offshore wind development and a Clean Energy Standard to incentivize renewable sources."

"This announcement further solidifies Maryland's position as a national leader in creating clean energy jobs in our State," said U.S. Senator Ben Cardin. "Offshore wind will help fulfill President Biden's Build Back Better agenda to recover the economy and our national greenhouse gas emissions reduction commitment to combat climate change."

"For more than a century, the steel that literally built our country was produced right here in Sparrows Point. Now, with US Wind and the United Steelworkers, that legacy will continue, providing more jobs that will support more local families," Congressman Dutch Ruppersberger said. "It will also help lay the foundation for our country's new clean energy economy, with the potential to become the largest offshore wind staging ports in America. Maryland's federal delegation has secured tens of millions in federal funds to support the Tradepoint Atlantic project and we will continue to fight for resources to transport Sparrows Point into a 21st century transit hub."

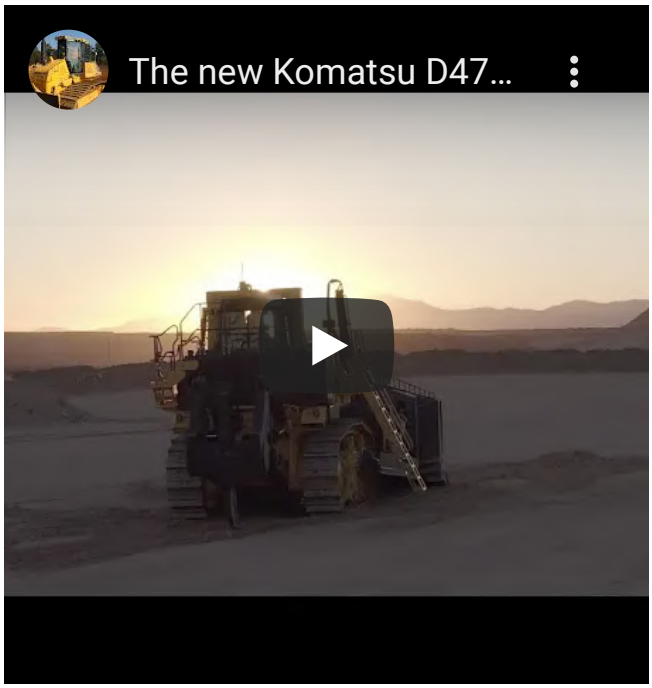
Maryland's solicitation of up to 1,200 MW of offshore wind energy is

the direct result of the Clean Energy Jobs Act of 2019 (CEJA). Maryland now has a golden opportunity to start a chain of events that will bring steel back to Baltimore and the ripple effect of jobs and prosperity that will power Maryland's post-COVID economy.

"I'm excited that US Wind, headquartered in my district, plans to bring steel manufacturing and good-paying union jobs back to Baltimore," said Maryland Senate President Bill Ferguson. "It's great to see how the policy programs we pass in Annapolis transform into the growth of an emerging clean energy industry in our state. This progress will aid our efforts to combat the climate crisis with urgency."

"US Wind is accelerating renewable energy expansion in Maryland," said Adrienne A. Jones, Speaker of the Maryland House of Delegates. "Meeting our statewide goal of 50% clean energy over the next decade will be more attainable than ever with US Wind's clean energy projects in full operation. These projects are further indication that we can take aggressive action to reverse climate change while stimulating the state's workforce and economy."

Komatsu and Vale working to advance the future of rock excavation and mechanical cutting technology -Mining company and equipment/technology supplier to co-present at MINExpo International



Global mining equipment and technology provider Komatsu and Vale, one of the largest producers of iron ore and nickel in the world, are working together to advance the future of underground hard rock excavation by collaborating to optimize use of Komatsu's DynaCut mechanical cutting technology. The companies will start trialing DynaCut's capabilities on Komatsu's new MC51 machine at Vale's Garson Mine in Sudbury, ON, Canada, working together to increase the pace at which the innovative technology will be available to the larger market.

"True innovation requires effective collaboration between the end user and suppliers to ensure the technology meets the needs of the industry," said Dino Otranto, chief operating officer of North Atlantic Operations and Asian Refineries for Vale. "This partnership is that first step to really prove and understand the technology, while meeting our high standards for safety."

Through more than 10 years of research and development, Komatsu has determined how to break rock continuously and precisely through a fully electric system that outputs zero emissions. By automating and controlling processes so the machine can be operated remotely via line of site, Komatsu customers have the opportunity to move their operators further from the cutting face and from harm's way leveraging DynaCut technology and the MC51 machine.

"We're excited to be trialing this new machine and technology because it offers the potential to really change the way our customers mine," said Rudie Boshoff, director of hard rock cutting systems at Komatsu. "Not only does the DynaCut technology provide a very controllable way of cutting rock – within 50 millimeters accuracy to plan - the machine itself, the MC51, is designed to advance more sustainable mining methods by reducing the amount of equipment required to get to the ore body."

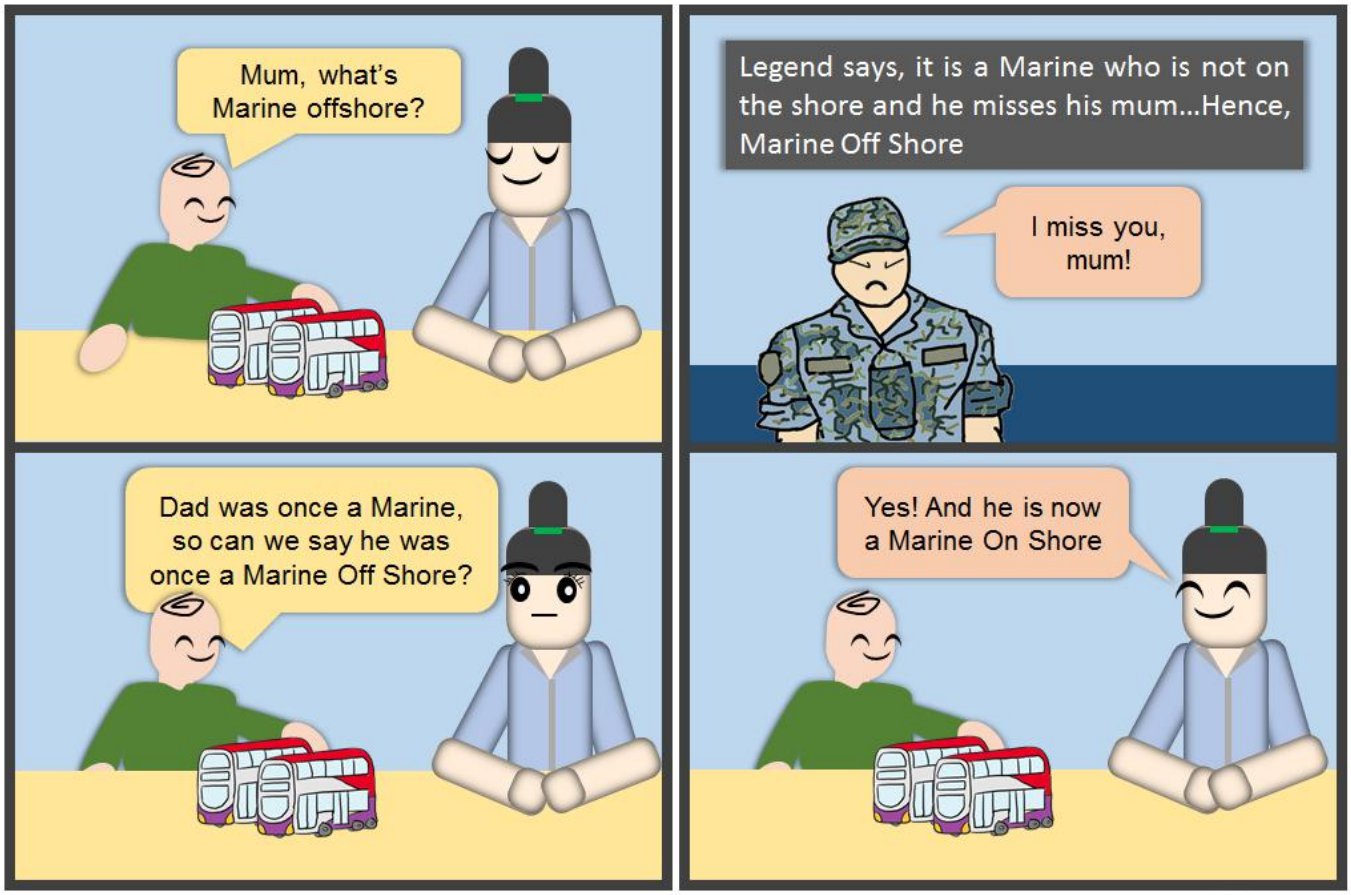
Prysmian cable project for a new floating offshore wind farm in France

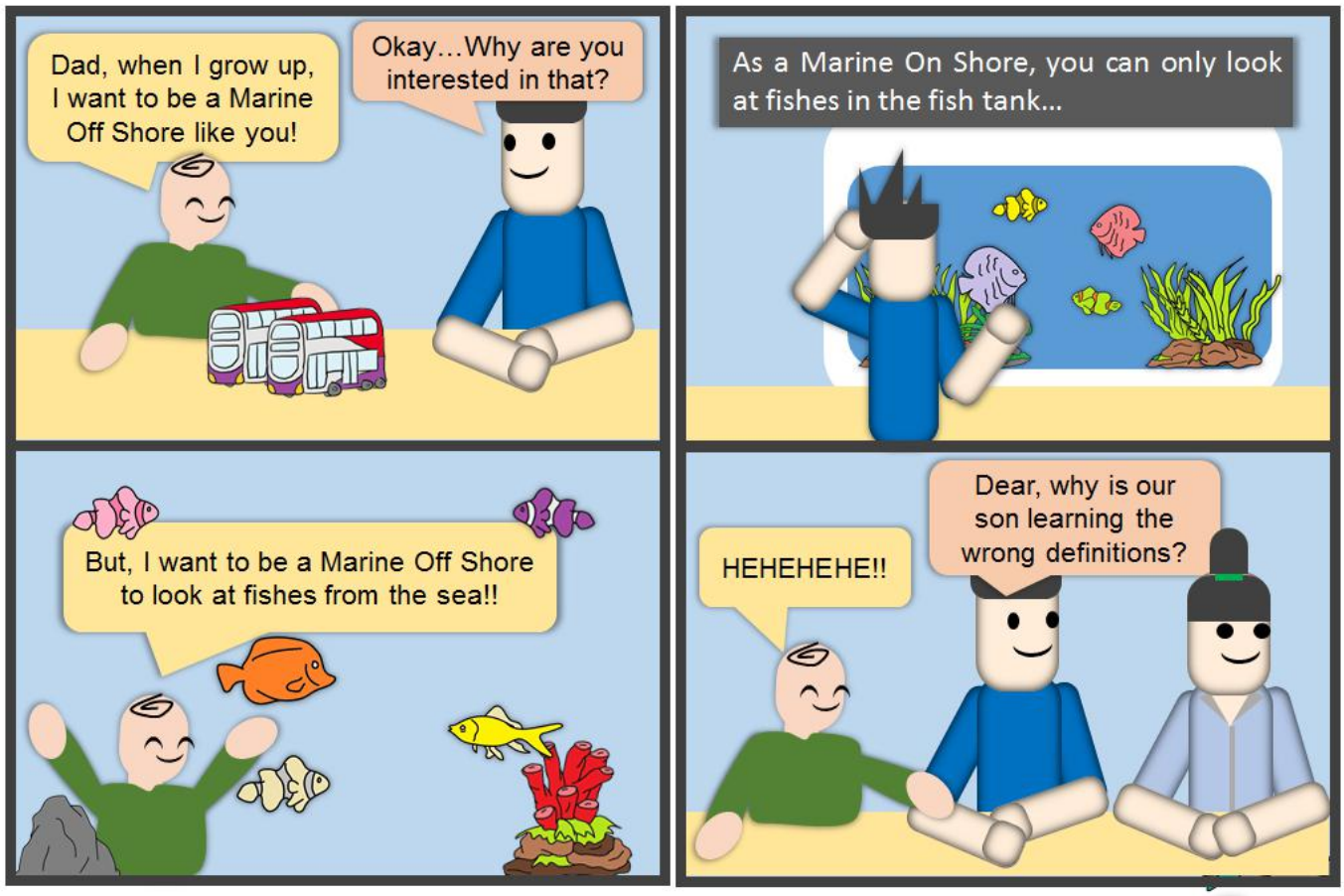
The project strengthens the Group's position as enabler of the transition to renewable sources

while the land cables will be manufactured at the Gron plant (France). The notice to proceed is planned by the end of November. Commissioning is scheduled for July 2023.

Asso.subsea, a technology-driven company specialised in providing offshore solutions worldwide, will undertake the installation services of the Project. Asso.subsea will design and perform all marine works required for the project, such as cable loading, route preparatory works, cable installation and protection and HDD works at landfall.

Following the Kincardine and Provence Grand Large projects, Prysmian further consolidates its position in the floating offshore wind farm market, deploying its knowledge, experience, and capability to cope in this high-profile engineering pilot market.
This contract confirms the trust and confidence that RTE places in Prysmian, having already awarded the Group other projects such as those for the Fécamp, Courseulles-sur-Mer, St. Nazaire and Noirmoutier offshore wind farms.





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PETRONAS

Prysmian Group, world leader in the energy and telecom cable systems industry, in consortium with Asso.subsea, a specialized submarine installation contractor, has signed a contract worth approximately €30 million with RTE, Réseau de Transport d'Électricité, for the development of an export submarine power cable system for the Gruissan floating offshore wind farm located in Southern France.

Prysmian Group will be responsible for the design, supply, termination, testing, and commissioning of one 66 kV three-core export submarine cable with EPR insulation for a total of 25 km and attached another 66kV submarine dynamic cables with EPR insulation for about 1 km connecting the shore to a floating sub-station. The Group will also provide additional 3 km of onshore 66 kV cables with XLPE insulation.

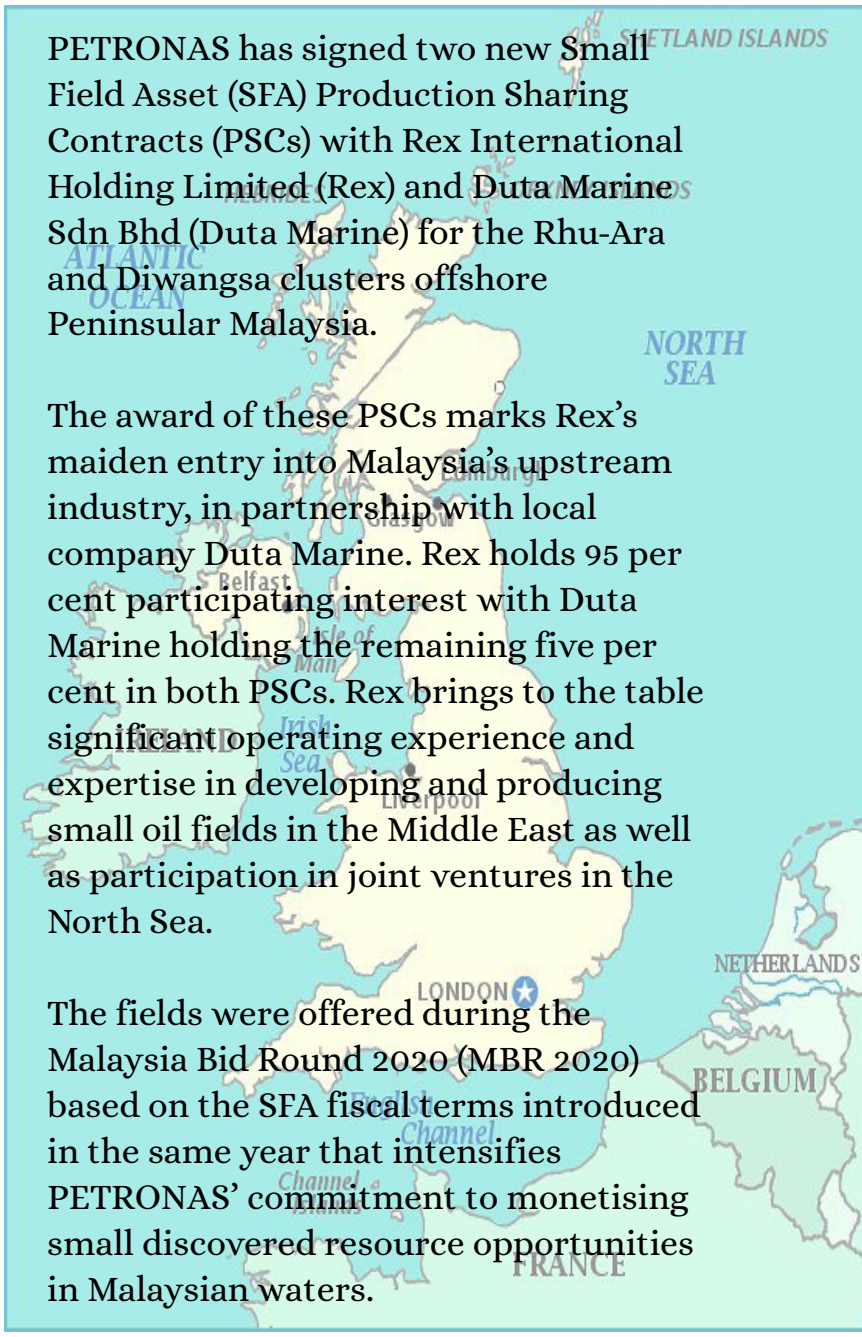
All submarine cables will be produced at Prysmian Group's centre of excellence in Nordenham (Germany),

PETRONAS Intensifies Malaysia's Small Fields Development, Awards Two New Production Sharing Contracts

PETRONAS has signed two new Small Field Asset (SFA) Production Sharing Contracts (PSCs) with Rex International Holding Limited (Rex) and Duta Marine Sdn Bhd (Duta Marine) for the Rhu-Ara and Diwangsa clusters offshore Peninsular Malaysia.

The award of these PSCs marks Rex's maiden entry into Malaysia's upstream industry, in partnership with local company Duta Marine. Rex holds 95 per cent participating interest with Duta Marine holding the remaining five per cent in both PSCs. Rex brings to the table significant operating experience and expertise in developing and producing small oil fields in the Middle East as well as participation in joint ventures in the North Sea.

The fields were offered during the Malaysia Bid Round 2020 (MBR 2020) based on the SFA fiscal terms introduced in the same year that intensifies PETRONAS' commitment to monetising small discovered resource opportunities in Malaysian waters.



The Rhu-Ara Cluster, consisting of Rhu and Ara fields, lies within the Penyu Basin 150km off the coast of oil centre Kerteh, Terengganu. The Diwangsa Cluster, which lies in the northwestern side of the Malay Basin, comprises Diwangsa, Bubu, Korbu and Lerek fields. These previously discovered fields have total estimated recoverables of 12.7 MMstb for the Rhu-Ara Cluster and 10.7 MMstb for the Diwangsa Cluster. Both clusters are now primed for development under the SFA PSC terms which incorporates a simplified fiscal model and governance process.

A virtual ceremony was held to commemorate the signing of the two SFA PSCs. PETRONAS was represented by its Senior Vice President of Malaysia Petroleum Management (MPM), Mohamed Firouz Asnan, while Rex and Duta Marine were represented by their Executive Chairman, Dan Broström and Director, Mahyudden Abdul Wahab, respectively.

Mohamed Firouz said, "We believe that Rex's proven capability in developing small fields abroad could be deployed in the Rhu Ara fields to unlock the potential in the Penyu Basin followed by the development of Diwangsa Cluster.

"We welcome new players who can deliver innovative solutions to ensure the lowest total life cycle cost in developing the discovered resources opportunities available in Malaysia waters. We are pleased to see that the SFA terms have become more attractive to the investors, thus validating the efforts taken to turn Malaysia into a growth hub for the investors."

GROUNDBREAKING ELECTRO-HYDRAULIC SYSTEM WINS VOLVO TECHNOLOGY AWARD

The project strengthens the Group's position as enabler of the transition to renewable sources

Breaking new grounds for hydraulic efficiency in excavators, the Common Pressure Rail Hybrid system by Volvo innovation improving Construction Equipment (Volvo CE), is yet another performance while reducing CO2 emissions in line with Volvo Group's net zero value ambitions by 2040.

The Volvo CE team from Sweden and South Korea has worked closely with Finnish company Norrhydro in the research project, leveraging an idea initially born out of academic collaborations. Today, the innovation has matured into a real-world solution with ongoing customer trials in the field and it is expected to accelerate the introduction of e-mobility across Volvo CE's larger excavator platform. The company anticipates the new technology to be available in the excavator market in a near future.

"This innovation enables Volvo CE to offer its customers a truly unique electro-hydraulic solution, pushing fuel efficiency to new levels. It's demonstrating the passion of our engineers to bring forward customer-oriented solutions and systems that will drive the transformation towards net-zero emissions operations. Also, it's again an example of our strength working in partnerships and achieving amazing results"

Lars Stenqvist, CTO Volvo Group.

How it works

The innovation enables new ways to reduce energy losses in hydraulics. In the new system architecture all the machine's work functions are connected to a hydraulic energy storage via a common pressure rail, comprised by two or more pressure lines. The energy storage, which consists of hydraulic accumulators, enables energy-efficient recovery of kinetic energy and peak power supply. For cylinder-driven functions, so-called "smart actuators" are used to achieve energy-efficient conversion from hydraulic power to a variable force and speed. The system also allows energy recovery and performance increase of the machine's rotating loads, such as the swing function through the introduction of variable hydraulic machines. Thanks to greatly reduced energy losses and the power contribution from hydraulic

accumulators, a smaller power source can be used and the need for cooling is reduced. With a higher available power, cycle times can be shortened, for example when loading a truck, which contributes to both efficiency increases and cost benefits for the customer.

"We are really proud of this recognition, which we share with our collaboration partners", says Kim Heybroek, Volvo CE Emerging Technologies Research Engineer and a member of the winning team. "The potential in the innovation has been a strong driver for us in the project, making it an exciting journey to be part of, as we see the significant benefits it will offer for our customers and help build the world we want to live in."

The Volvo Technology Award is a mark of recognition for outstanding technical advances that contribute to the enhancement of the Volvo Group's high-tech competitiveness and technological expertise. Previous recipients have included world-famous innovations such as the Duo-Prop marine drive, the City Filter used to purify trucks and bus exhausts, Volvo's side airbags (SIPS) and the Electric Site emission free quarry research project.

The winners of the Volvo Technology Award 2021 are:

Kim Heybroek, Sangki Bae, Junwoo Kim, Byeongmo Ko, Donghun Oh, Wonkil Choe, Wontaek Oh and Namgyu Kim.

Completes Builder's Trials for Frank E. Petersen Jr. (DDG 121)

Huntington Ingalls Industries' Ingalls Shipbuilding division announced the successful completion of builder's trials for guided missile destroyer Frank E. Petersen Jr. (DDG 121). The Arleigh Burke-class destroyer spent three days in the Gulf of Mexico testing the ship's combat system, which included firing a missile.

"Ingalls, Navy AEGIS Test Team, the Navy ship's force, the program office, numerous combat systems participating acquisition managers, and Supervisor of Shipbuilding, Conversion and Repair worked together to ensure a successful builder's trial,"

John Fillmore, Ingalls' DDG 51 program manager.

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“A successful builder’s trial sets us up for a final trial prior to delivery. We are proud of the work our shipbuilders have accomplished so far and look forward to finishing strong.”

DDG 121 is named for Frank E. Petersen Jr., who was the U.S. Marine Corps’ first African American aviator and general officer. After entering the Naval Aviation Cadet Program in 1950, Petersen would go on to fly more than 350 combat missions during the Korean and Vietnam wars.

Ingalls has delivered 32 destroyers to the Navy and currently has four more under construction including Lenah Sutcliffe Higbee (DDG 123), Jack H. Lucas (DDG 125), Ted Stevens (DDG 128) and Jeremiah Denton (DDG 129).

Arleigh Burke-class destroyers are highly capable, multi-mission ships and can conduct a variety of operations, from peacetime presence and crisis management, to sea control and power projection — all in support of the United States military strategy. The guided missile destroyers are capable of simultaneously fighting air, surface and subsurface battles. The ship contains a myriad of offensive and defensive weapons designed to support maritime defense well into the 21st century.

Huntington Ingalls Industries is America’s largest military shipbuilding company and a provider of professional services to partners in government and industry.

For more than a century, HII’s Newport News and Ingalls shipbuilding divisions in Virginia and Mississippi have built more ships in more ship classes than any other U.S. naval shipbuilder. HII’s

Honeywell UNITED

A STAR ALLIANCE MEMBER

United, Honeywell Invest in New Clean Tech Venture from Alder Fuels, Powering Biggest Sustainable Fuel Agreement in Aviation History

• United agrees to purchase 1.5 billion gallons of sustainable aviation fuel (SAF) over 20 years - which is one and a half times the size of the rest of the world's airlines' publicly announced SAF commitments combined

• Honeywell first pioneered SAF production technology and will use its proven development process to partner with Alder to commercialize its technology

• Alder to develop first-of-its-kind low-carbon crude technology to accelerate large-scale SAF production

United and Honeywell announced a joint multimillion-dollar investment in Alder Fuels – a cleantech company that is pioneering first-of-its-kind technologies for producing sustainable aviation fuel (SAF) at scale by converting abundant biomass, such as forest and crop waste, into sustainable low-carbon, drop-in replacement crude oil that can be used to produce aviation fuel. When used together across the fuel lifecycle, the Alder technologies, coupled with Honeywell's Ecofining™ process, could have the ability to produce a carbon-negative fuel at spec with today's jet fuel. The goal of the technologies is to produce fuel that is a 100% drop-in replacement for petroleum jet fuel.

As part of the agreement, United is committing to purchase 1.5 billion gallons of SAF from Alder when produced to United's requirements. United's purchase agreement, which is one and a half times the size of the known purchase commitments of all global airlines combined, makes this easily the largest publicly announced SAF agreement in aviation history. United's purchase agreement with Alder also surpasses the previous record set by the airline in 2015 through its investment in Fulcrum BioEnergy with its option to purchase up to 900 million gallons of SAF.

"Since announcing our 100% green commitment in 2020, United has stayed focused on decarbonizing without relying on the use of traditional carbon offsets. Part of that commitment means increasing SAF usage and availability since it's the fastest way to reduce emissions across our fleet. However, to scale SAF as quickly as necessary, we need to look beyond existing solutions and invest in research and development for new pathways like the one Alder is developing," said United CEO Scott Kirby. "United has come further than any other airline making sustainable travel a reality by using SAF to power flights. Our leadership gives customers confidence that they are flying with an airline that recognizes the responsibility we have to help solve climate change."

"As a pioneer of the SAF market with UOP Ecofining™ technology, our work with United and Alder on this new technology will help transform the industry and support the growth of a zero-carbon economy," said Darius Adamczyk, Honeywell chairman and chief executive officer. "This solution will not only advance United's SAF commitment but can help the aviation industry meet its commitments to decouple increases in carbon emissions from growth in passengers."

According to the U.S. Department of Energy (DOE), U.S. forestry residues and agricultural residues alone could provide enough biomass energy to generate more than 17 billion gallons of jet fuel and displace 75% of U.S. aviation fuel consumption. If the U.S. were to broadly adopt regenerative agricultural practices, which capture more carbon in healthier soil compared to traditional methods, the U.S. could generate an additional seven billion gallons of SAF, which would completely replace the U.S.'s current fossil jet fuel consumption.

Alder's technology and demand for its fuel from the aviation industry create a large new market for biomass from regenerative practices. Use of this biomass further enables Alder's production process to be carbon negative over the fuel's lifecycle.

"Aviation poses one of the greatest technology challenges for addressing climate change and SAF has demonstrated the greatest potential. However, there is insufficient raw material to meet demand,"

Bryan Sherbacow, CEO of Alder Fuels and senior advisor to World Energy, the company that owns and operates the world's first SAF refinery.

"Alder's technology revolutionizes SAF production by enabling use of widely available, low-cost and low-carbon feedstock. The industry is now a major step closer to using 100% SAF with our drop-in fuel that accelerates the global transition to a zero-carbon economy."

Prior to founding Alder, Sherbacow built the world's first SAF refinery utilizing Honeywell's technology and subsequently contracted with United, enabling the airline to become the first globally to use SAF in regular operations on a continuous basis. Since then, United has purchased more SAF than any other airline and, with this agreement now, has more than 70% of the airline industry's publicly announced SAF commitments. Alder's research is supported by the U.S. Defense Logistics Agency, the DOE and a partnership with DOE's National Renewable Energy Laboratory (NREL), focused on developing technology to process organic waste and sustainable, non-food plant material into carbon-negative transportation fuels.

Honeywell innovation established the SAF market with its UOP Ecofining process, which is the first technology used to maximize SAF production for commercial aviation. Building on Honeywell's focus to create sustainable technology, Honeywell will utilize its expertise and proven process of developing sustainable fuels alongside Alder, applying proprietary hydroprocessing design to the process to jointly commercialize the technology. Commercialization is expected by 2025. This announcement is a clear example of how Honeywell's Sustainable Technology Solutions business can partner with early-stage companies and help them scale faster, access customers and advance research and development to help drive sustainability at the global level.

United's joint investment in Alder is the latest by United Airlines Ventures, a venture fund launched earlier this year that focuses on startups, upcoming technologies, and sustainability concepts that will complement United's goal of net zero emissions by 2050 -- without relying on traditional carbon offsets. In 2020, United became the first airline to announce a commitment to invest in carbon capture and sequestration and has since followed with investments in electric vertical takeoff and landing aircraft and 19-seat electric aircraft that have the potential to fly customers up to 250 miles before the decade's end.

Alder Fuels

Rockwell Automation and Ansys Partner to Optimize Industrial Operations

Rockwell Automation, Inc. and Ansys announced that the enhanced Studio 5000 Simulation Interface now connects with Ansys digital twins. This gives automation and process engineers new ways to use simulation to improve the design, deployment, and performance of industrial operations.

The Studio 5000 Simulation Interface connects Rockwell Automation industrial control systems with simulation and modeling tools. The latest release of the tool expands that connectivity to Ansys Twin Builder, a leading software used to create simulation-based digital twins, or digital replicas of physical assets. The software uses multi-physics to identify how real-world elements like flow rates, mechanical stresses, and thermal profiles can impact equipment performance and health.

"By connecting a control system to Ansys Twin Builder, users can simulate complex physical processes and give realistic inputs to the control system,"

Julie Robinson, business manager, Rockwell Automation.

"This can provide tremendous insights throughout the equipment lifecycle. For example, running a simulation model in parallel to a physical system during production can reveal opportunities to optimize performance in real time."

Engineers can use digital twins and simulation to improve system design, delivery, and performance by:

- Creating and testing equipment designs in a virtual space to save engineering time and reduce the need to build costly physical prototypes.

- Virtually commissioning equipment to avoid surprises during start-ups at production sites.

- Comparing simulated and actual system performance to identify adjustments that can improve efficiency, output and more.

- Testing process changes in a virtual space, before they're made on a physical system, to boost throughput or other performance aspects.

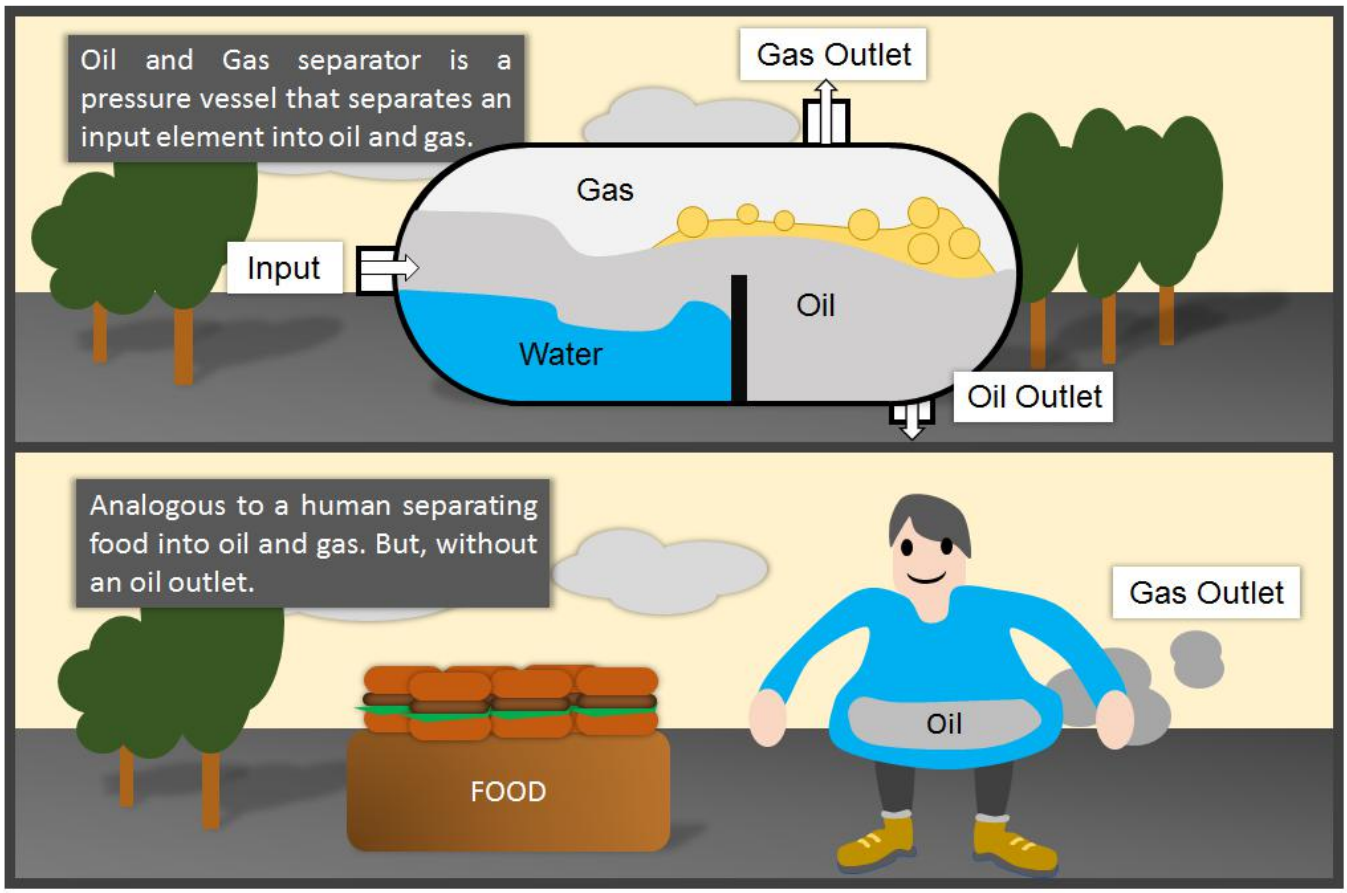
• Calculating the remaining life of components so they can be replaced before they cause unplanned downtime as part of a predictive maintenance strategy.

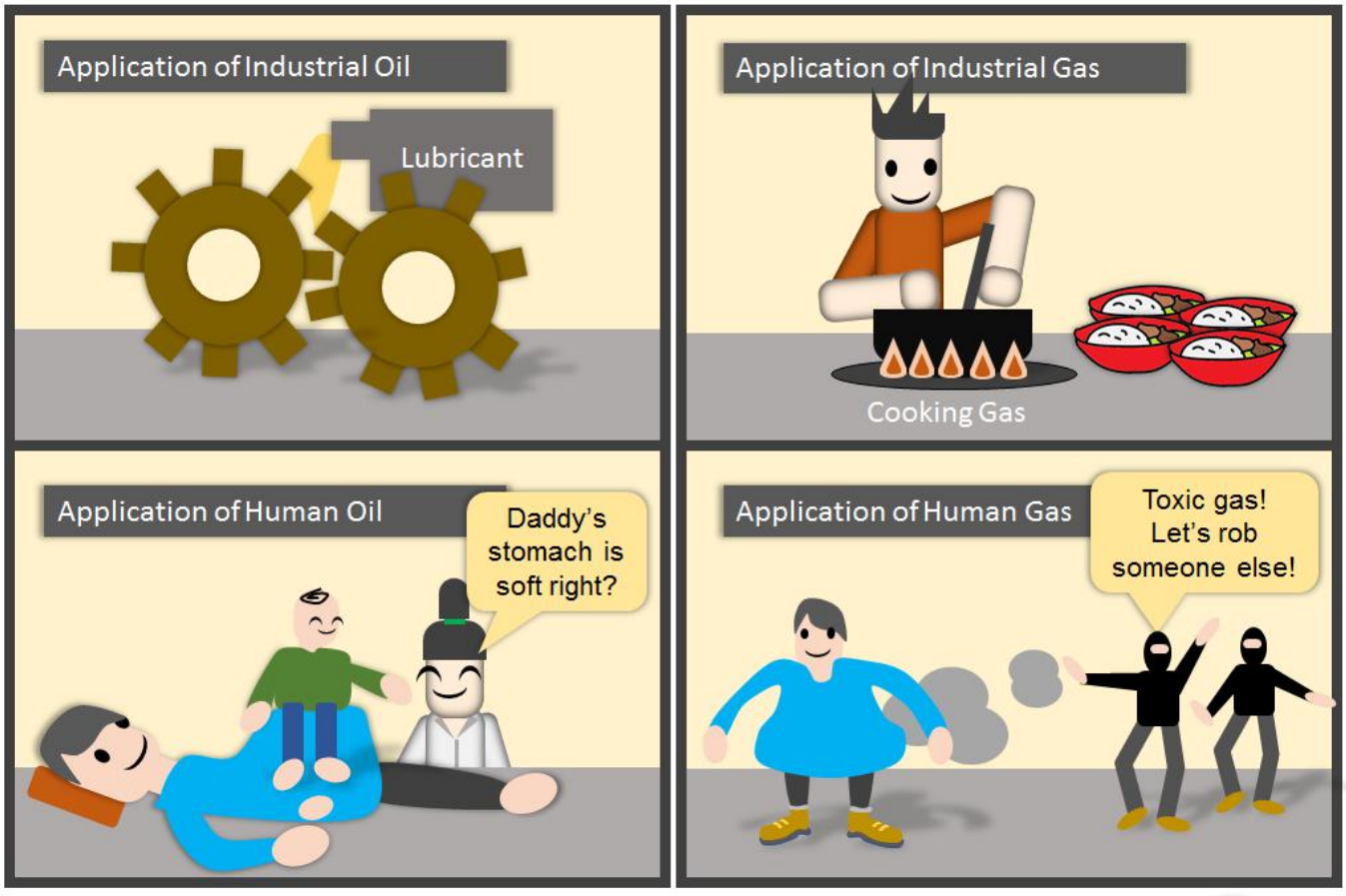
• Providing operator training in a virtual environment, where having equipment available isn't a factor and operators can be trained on uncommon or dangerous scenarios.

"Connecting the digital and physical worlds with Studio 5000 Simulation Interface creates tremendous value for users,"

Shane Emswiler, senior vice president of products, Ansys.

"It can help them go from conceptual designs to physical equipment faster and at a lower cost. It can provide useful new insights during production. For instance, users can apply what-if scenarios to understand the impact of changes on a process. They can create virtual sensors to estimate values that are otherwise too expensive or not possible to get today, and they can predict outcomes like failures that hurt the bottom line."





The Studio 5000 Simulation Interface allows users to connect a digital twin to either an emulated or physical controller. Connecting to an emulated controller can help them optimize production at the design stage before they have a physical controller or equipment. Connecting to a physical controller allows them to create a digital twin of how the equipment should run and compare it against actual performance.

Stäubli and ABB sign memorandum

Stäubli Electrical Connectors has signed a Memorandum of Understanding (MoU) with ABB to collaborate on bringing solutions to market that reduce the greenhouse gas emissions associated with heavy machinery in the mining industry and to lead the way for zero-emission mining operations

Mine electrification is high on the agenda of mining companies as it reduces costs, increases energy efficiency and improves operating permits. In recent years, more and more mining companies have committed to ambitious CO2 targets. To be able to meet these targets, reliable solutions are needed, and this is where our latest collaboration steps in.

Global technology company ABB and Stäubli Electrical connectors, will explore the development of electrification solutions that will meet the demands of industrial applications. The focus will be on mine infrastructure solutions for battery electric vehicles (BEVs). Stäubli will contribute to the collaboration with their highly durable connectors that not only comply to the high power requirements, need for automated and safe operations but also meet approved standards.

"This MoU is another cornerstone of our dedication towards sustainability in mining and to reach a platform which is able to provide new solutions to the market out of collaboration between companies,"

Mehrzad Ashnagaran, ABB's Global Product Line Manager Electrification & Composite Plant.

"Partnering and joining forces amongst domain experts and complementing the offering for the best possible customer experience in terms of productivity and safety while focusing on environmental aspects is what drives us at ABB. We are really looking to this joint approach with Stäubli."

Winnijar Kauz, Stäubli Electrical Connectors' Global Business Head of E-Mobility on the new cooperation: "As a global provider of reliable connectors with a strong commitment to drive innovation, we have many key applications across various industries. Every industry demands unique technological solutions, with mining now developing for a more sustainable future in the long term. Today's mining environments need industrial leaders to collaborate and support the transition to all-electric operations. We look forward to teaming up with ABB to explore and develop technology solutions that will lead the way for emission free mining operations."

The first exciting results of the collaboration between Stäubli and ABB will be unveiled at MinExpo September 13-15, 2021 in Las Vegas, NV on ABBs Booth #8825.

Veltins Brewery chooses sustainable electrification solution from Siemens

- **New brewery building equipped with Siemens power distribution technology for medium and low voltage**
- **Innovative fluorine gas-free medium-voltage switchgear contributes to greater sustainability**
- **Digitalized low-voltage technology increases safety, efficiency and economy in operation**

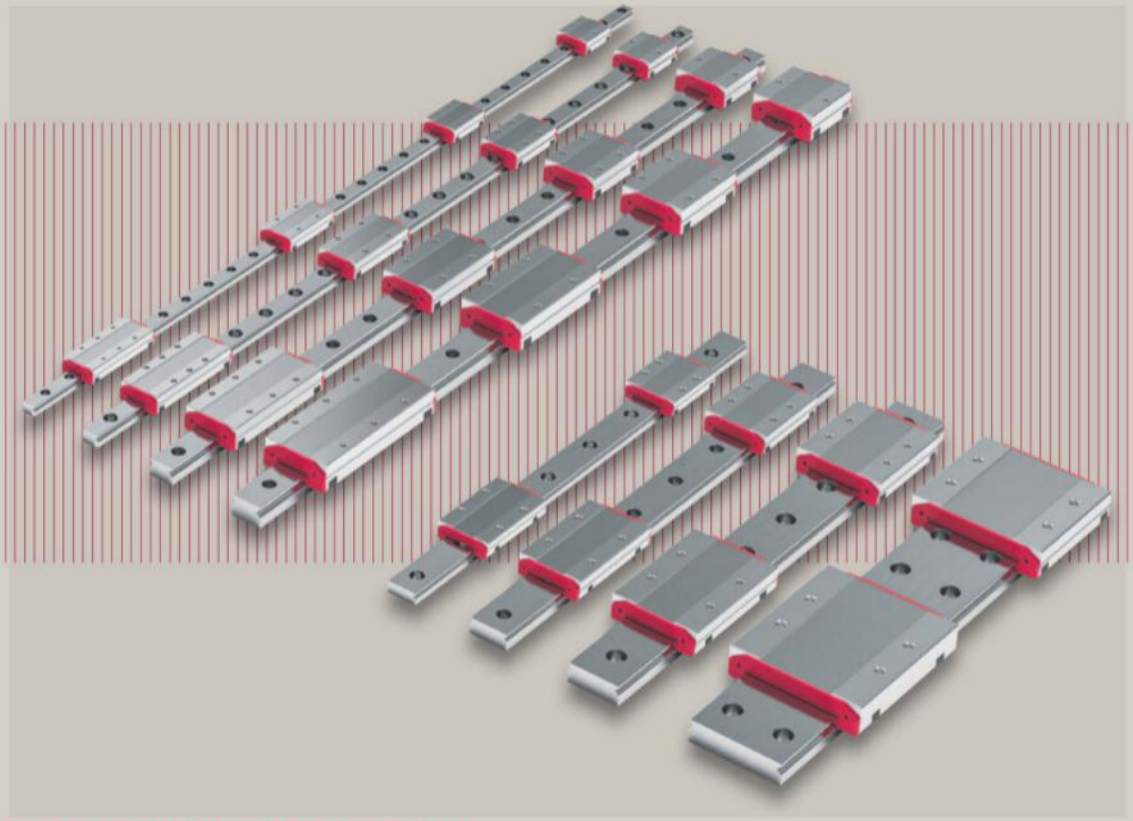
C. & A. Veltins, one of Germany's largest breweries, has set itself the goal of becoming one of the most modern and sustainable breweries in Germany by the time it celebrates its 200th anniversary in 2024. Siemens Smart Infrastructure is supplying technology to ensure the sustainable energy supply of a new building at the company's headquarters in the town of Grevenstein in the Sauerland region, where a new bottling plant will go into operation in 2022. The centerpiece is the new 8DJH 12 blue GIS fluorine gas-free medium-voltage switchgear. It completely eliminates the greenhouse gas sulfur hexafluoride (SF6) as well as other fluorine gases. Instead, the switchgear uses the climate-neutral Clean Air insulation gas, which consists exclusively of natural components of the ambient air. The system is supplemented by low-voltage technology with digital measurement and communication functions for safe and efficient power distribution.

"By opting for environmentally friendly, fluorine gas-free switchgear from Siemens we are extending our sustainability principle to the field of energy supply. This not only guarantees a reliable supply of energy for our new building and bottling plant, but also reduces our carbon footprint and protects the environment,"

Peter Peschmann, technical director at C. & A. Veltins.

«Essentials for the Best!»

SCHNEEBERGER
LINEAR TECHNOLOGY



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"With our blue GIS switchgear, the customer benefits from both cost-effectiveness and excellent environmental compatibility,"

Stephan May, CEO of the Distribution Systems Business Unit at Siemens Smart Infrastructure.

"We take advantage of gas-insulated switchgear technology, but no longer use fluorine gases. Instead, we use Clean Air, a climate-neutral insulating gas."

In the new building at Veltins, Siemens is also installing Sivacon S8 low-voltage switchgear with the new 3WA air circuit breakers as well as the Sivacon 8PS busbar trunking system, which is significantly more flexible and economical because it replaces conventional cabling. The systems and components have full communication capabilities and are able to collect precise energy and condition data and transfer it directly to energy management and IoT systems for visualization and further analysis. Among other things, this makes it possible to identify potential savings and significantly improve operational energy efficiency.

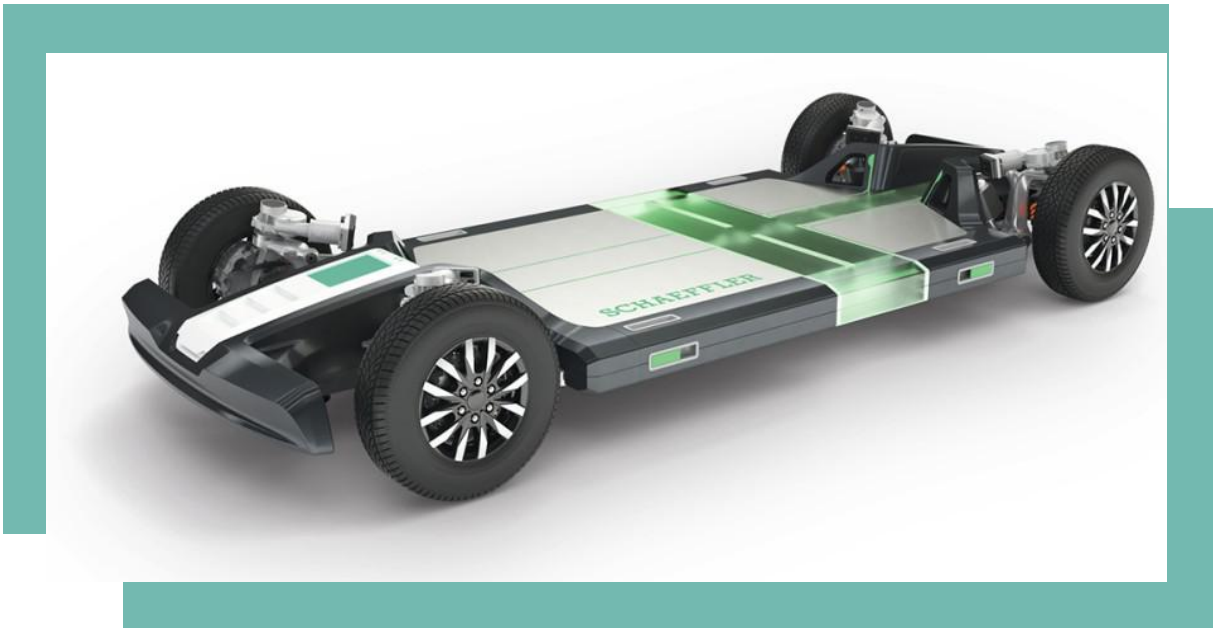
• New brewery building equipped with Siemens power distribution technology for medium and low voltage

• Innovative fluorine gas-free medium-voltage switchgear contributes to greater sustainability

• Digitalized low-voltage technology increases safety, efficiency and economy in operation

Schaeffler and Mobileye to Industrialize Self-Driving Shuttles

The automotive and industrial supplier Schaeffler and Mobileye, an Intel Company and leading provider of automated driving solutions, have agreed on a long-term cooperation. "Rapid regulatory and technological change, increasing urbanization and growing social awareness of mobility are increasing the need for alternative, novel concepts such as autonomous people or logistics movers," says Matthias Zink, CEO Automotive Technologies at Schaeffler AG. "They play a crucial role in sustainable mobility and are a future field in our Roadmap 2025. With the partnership with Mobileye, we want to develop autonomous shuttles to series production."



The rolling chassis from Schaeffler, a modular platform for new mobility concepts, is combined with the Mobileye Drive™ self-driving system. The goal: to develop a new, flexible platform for self-driving shuttles and other vehicle products at full automation level 4 and to offer customers worldwide solutions for Mobility-as-a-Service (MaaS) and Transportation-as-a-Service (TaaS). “Mobileye Drive™ is a versatile, scalable solution that enables any vehicle type to become self-driving. The new and innovative Schaeffler rolling chassis vehicle platform equipped with Mobileye Drive will enable broad deployment of autonomous shuttles and other driverless transportation solutions starting in the next couple of years," says Johann Jungwirth, Vice President of Mobility-as-a-Service at Mobileye.

Autonomous transport solutions from 2023

By combining Mobileye's AV technology with Schaeffler's rolling chassis, both companies can offer an autonomous, highly flexible and adaptable vehicle platform that meets automotive safety standards with the necessary redundancies and thus enables the rapid scaling of autonomous transport solutions from 2023. Mobility service providers and transportation of goods companies will thus pave the way for the introduction of autonomous shuttles economically viable, as operating times and efficiency can be significantly increased.

MURR ELEKTRONIK

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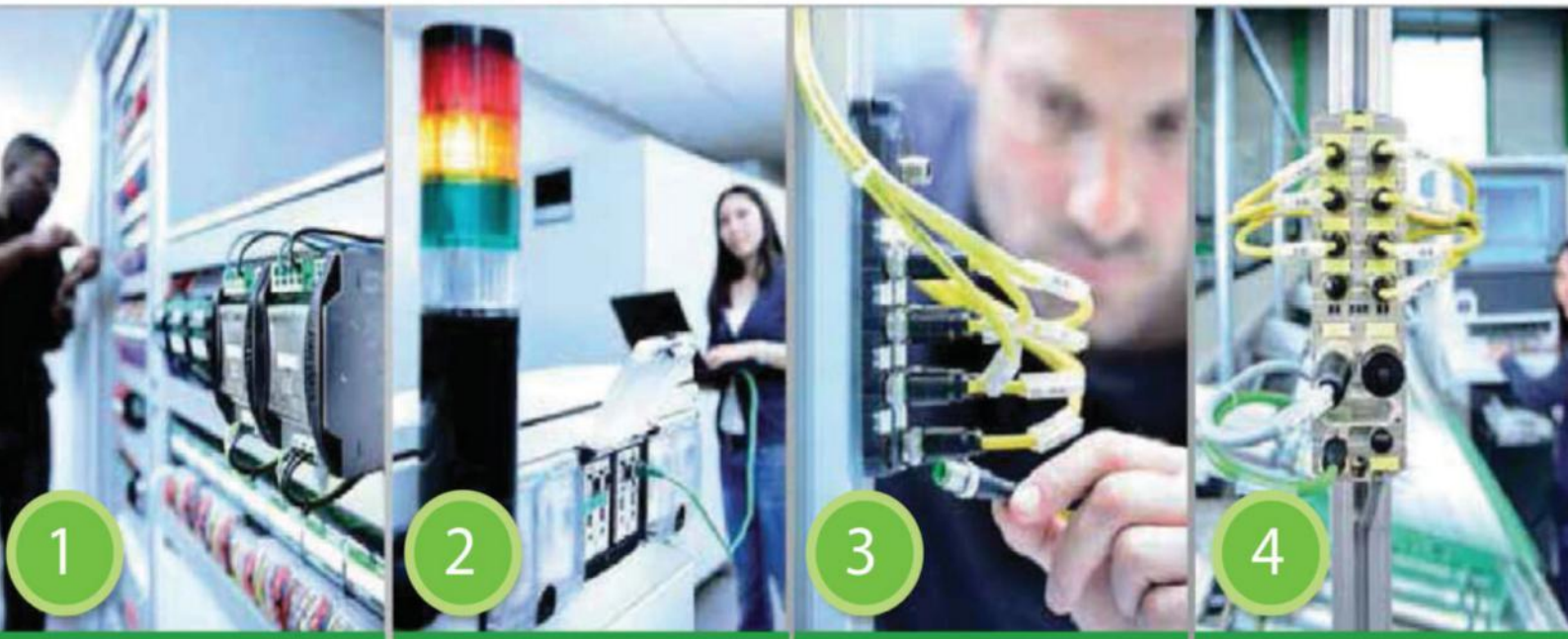

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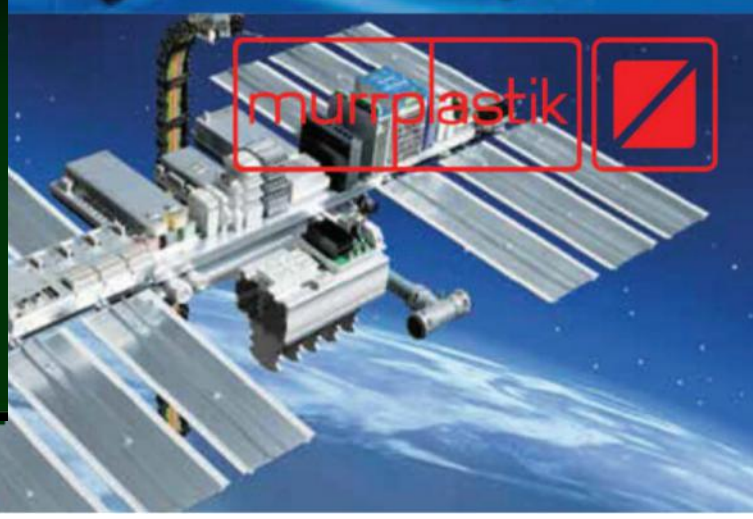
SYSTEMATIC TECHNOLOGY



The Rolling Chassis from Schaeffler is a flexible, scalable platform for new, driverless mobility solutions for the transport of people or goods or for special applications such as mobile charging solutions or pop-up stores on wheels. The modular platform shows the wide range of technologies from Schaeffler and offers a flexible architecture: Regarding steering and drive, a wide variety of variants can be implemented depending on customer requirements – from a simple drivetrain via an e-axis and central steering to the use of four "Schaeffler Corner Modules". The corner modules, which each allow a steering angle of up to 90 degrees, have been further developed in the direction of series production and scalability. They include the wheel hub motor, the wheel suspension including air suspension, which makes it possible to lower the vehicle for entry, the equator for the electromechanical steering and a brake.

The Mobileye Drive™ self-driving system is a turnkey AV solution that delivers safety via two core concepts: Mobileye's formal Responsibility-Sensitive Safety model for the safety of the system's decision-making, and a perception system featuring True Redundancy™ whereby two independent subsystems (cameras and radars+lidars) combine to enable robust perception. The self-driving system can also be deployed without geographical limitation thanks to Mobileye's Road Experience Management™ AV mapping technology through which a proprietary, crowdsourced AV map of the global road network is created and then continuously and automatically updated using data gathered from mass-market advanced driver-assistance systems.

Aramco and P1 Racing Fuels partner with the FIA World Rally Championship to support transition to sustainable fuels

Aramco has today signed Memorandums of Understanding (MoU) with P1 Racing Fuels and WRC Promoter GmbH, the commercial rights owner of the FIA World Rally Championship (WRC), to support the global motorsport series in its purpose-driven transition towards sustainable motorsport and mobility.

In line with Aramco's focus on sustainability and low-carbon fuels, the Company is thrilled to support WRC to achieve their sustainability goals, and is proud to be a chosen technical partner for the championship, which reconfirmed its commitment to 100% sustainable fuels by 2022.

Under the MoUs, Aramco and P1 Racing Fuels will collaborate on the formulation of advanced-generation biofuels and sustainable synthetic fuels derived from captured CO2 and low-carbon hydrogen, which will be used in the WRC. The partnership will also explore the use of low-carbon fuels to power auxiliary on-site generators.

"This is an important milestone for the development of low-carbon fuels that support the drive for more sustainable mobility. Sustainable synthetic fuels can help contribute to a low-carbon energy future, and this partnership demonstrates Aramco's circular carbon approach by testing low-carbon synthetic fuel in one of the most demanding conditions."

Ahmad O. Al-Khowaiter,
CTO of Aramco

"P1 Racing Fuels has a long history of powering progress on the race track, but it doesn't stop there. Developing sustainable fuels for motorsports brings us an important step closer to delivering similar products for everyday motorists - where fully renewable fuels could one day be available at the pump, and work with normal combustion engines with a fraction of the environmental impact."

Martin Popilka, CEO of P1 Racing Fuels

"The technology behind sustainable fuels is changing rapidly. Therefore, we are pleased to have access to Aramco's outstanding technical development team in finding the best available solution. The chosen blend of advanced biofuel and innovative e-fuel components makes WRC a real leader in sustainable motorsports with everyday cars. The WRC is a tremendous platform to develop and validate this innovative fuel in mass-produced vehicles, on real roads and under all circumstances on almost every continent. What we will learn by using this fuel on the WRC stages can ultimately benefit road users all over the world."

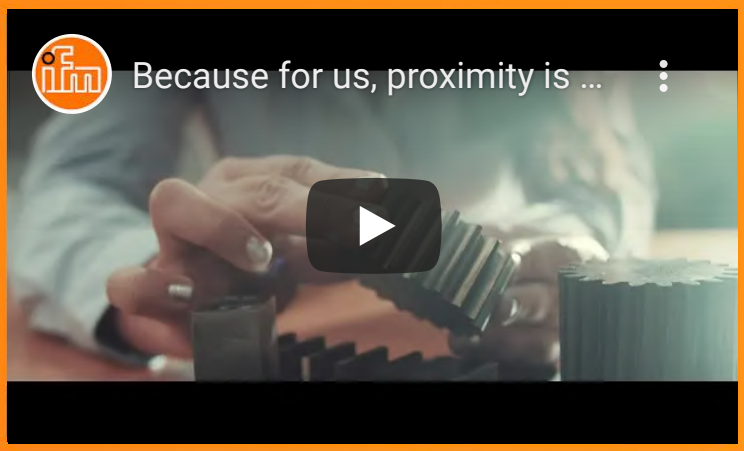
Jona Siebel, CEO of WRC Promoter GmbH

"The FIA has worked tirelessly to turn the hybrid-based Rally1 project from concept to reality via a close cooperation with the competing manufacturers, whose input has been invaluable, and WRC Promoter. At the same time, the FIA technical department has defined the specification of the 100% sustainable fuel that will be mandatory from next year to further underline the FIA's commitment to a more sustainable future with a 360-degree approach. Alongside the collaboration with P1 Racing Fuels, we look forward to welcoming the additional technical expertise that Aramco will bring to the WRC."

Yves Matton, FIA Rally Director

Aramco will leverage in-house technology expertise to explore improving engine efficiencies at the WRC. Working closely with motorsport experts from P1 Racing Fuels, this collaboration will tap into Aramco's network of scientists and engineers located in the Company's global research centers in Dhahran, Paris, Shanghai, and Detroit.

Aramco has significant R&D efforts focused on the development of low-carbon synthetic fuels with plans to pilot their production with partners in Europe and Saudi Arabia over the coming years.



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A passion for Quality

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Present in more than 70 countries, 5,000 direct employees service & support installations with over 100,000 customers, in every industry. Your satisfaction is our goal!

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IFC Marks First-Ever Investment in A Sustainability-Linked Bond Globally with S$675 Million Offering By Pan-Asian Energy and Sustainable Solutions Provider Sembcorp Industries

Boosting renewable energy solutions in Asia and accelerating green growth

The successful launch in Singapore of a sustainability-linked bond (SLB), raising S$675 million for Pan-Asian energy and sustainable solutions provider Sembcorp Industries (Sembcorp), marks the latest phase in the transition to a net-zero future.

Sembcorp, through its wholly-owned subsidiary Sembcorp Financial Services Pte. Ltd., priced its inaugural SLB today, anchored by an investment of S$150 million from IFC. It also marks IFC's first investment globally as an investor in a SLB, with the partnership between Sembcorp and IFC set to support more inclusive economic growth and private sector participation, while fostering sustainable business practices and significant employment opportunities.

Sembcorp's SLB is the first issuance by an energy company in Southeast Asia and the region's largest such issuance to date. Unlike traditional green bonds, SLBs involve issuers pledging to improve their performance against tailor-made ESG (environmental, social and governance) targets.

The ten-and-a-half-year Singapore dollar bond at a coupon rate of 2.66 per cent sets a new pricing benchmark for Sembcorp, strongly supported by high quality institutional investors. Net proceeds from the SLB will be used for the purposes of financing the general corporate working capital requirements of Sembcorp and its subsidiaries (Group), refinancing the Group's existing debt and/or financing or refinancing of the Group's

renewable energy, or potentially, other sustainable projects. Sembcorp has more than 3.3 gigawatts (GW) of renewable energy capacity comprising solar, wind and energy storage solutions in key markets such as Singapore, China, India, UK and Vietnam, with a target to quadruple its installed renewable energy capacity to 10GW by 2025 from 2.6GW in 2020.

"Sustainability is Sembcorp's business, and we are fully committed to transforming our portfolio from brown to green,"

Wong Kim Yin, Group President & CEO of Sembcorp Industries

"The issuance of our inaugural SLB underscores this commitment. We are heartened that IFC has chosen our issuance to be its first investment in a SLB globally. Their support validates our strategy and spurs us on in our drive toward supporting the global energy transition and a low-carbon economy."

Sembcorp's SLB has been issued in accordance with the newly established Sembcorp Sustainable Financing Framework (Framework), which outlines Sembcorp's strategic approach, Key Performance Indicators (KPIs) and Sustainability Performance Targets (SPTs) for its sustainability-linked transactions. The Framework has been reviewed by DNV Business Assurance Singapore Pte Ltd (DNV), which provided a Second Party Opinion on alignment of the Framework with the "Sustainability-Linked Bond Principles 2020" published by the International Capital Market Association (ICMA) and the "Sustainability-Linked Loan Principles 2021" published by the Loan Market Association (LMA), the Asia Pacific Loan Market Association (APLMA) and the Loan Syndications and Trading Association (LSTA). DBS Bank Ltd. and United Overseas Bank Limited are the joint lead managers and bookrunners for the issuance and the offering of the SLB.

The interest rate of the SLB will be subject to a step-up margin of 0.25% from the first interest payment date on or after April 1, 2026 if the stated SPT of greenhouse gas emissions intensity reduction to 0.40 tonnes of carbon dioxide equivalent per megawatt hour (tCO2e/MWh) or lower is not achieved by December 31, 2025.

"Sustainable growth, decarbonisation, and energy security are key themes for both developed and emerging markets globally, but they should not be seen as mutually exclusive,"

Alfonso Garcia Mora, IFC Vice President for Asia and the Pacific

"With the success of this bond issuance, investors have made their position on the climate crisis very clear and are continuing to shift capital to align their portfolios with net-zero targets."

Besides being aligned with the Paris Agreement, the investment from IFC is also in keeping with the World Bank Group's Climate Change Action Plan (CCAP) (2021-2025). Under this plan, IFC has committed to align all new real sector operations with the objectives of the Paris Agreement by July 1, 2025 and set the target of reaching 35 percent financing for climate on average over the next five years. In addition, IFC will intensify its efforts to create bankable investment opportunities and to mobilise private financing towards decarbonising key sectors as outlined in the CCAP.

Schneider Electric Calls for Urgent Action in the Race to Decarbonize by Accelerating Net Zero Pathways

- **Innovation Summit World Tour 2021 urges rapid acceleration of carbon emission reduction to reach 2050 net zero ambition**
- **Expansion of consulting services for meaningful sustainability progress**
- **Call to act 3-5 times faster and halve emissions this decade, with smart, green electricity and next-generation automation**

The world can accelerate urgent climate action and halve carbon dioxide (CO_2) emissions by 2030, according to Schneider Electric, the leader in the digital transformation of energy management and automation, recognized as the World's Most Sustainable Corporation in 2021 by Corporate Knights. Kicking off the Innovation Summit World Tour 2021, Schneider Electric Chairman and CEO Jean-Pascal Tricoire's keynote advocates achievable pathways to net zero set out in the "The 2030 imperative: A race against time" report from the Schneider Electric Sustainability Research Institute.

Schneider Electric's flagship annual Innovation Summit World Tour (October 12-November 12) will address global climate challenges and guide customers, partners, regulators, and policymakers on rapidly reducing emissions to decarbonize the world's economy in this decisive decade. Attendees will experience Schneider Electric's digital and sustainable innovation and learn more about Electricity 4.0 and Next-generation automation.

Urgent need to act fast to decarbonize

Tricoire's Innovation Summit World Tour keynote urges attendees to adopt critical decarbonization measures and offers Schneider Electric's own research as a blueprint to stay within a global warming trajectory of 1.5°C degrees. This report details the need to reduce emissions by 30-50 percent this decade, compared to current levels. Missing this makes it virtually impossible to limit temperature rise to a 1.5°C degree threshold as outlined by the Intergovernmental Panel for Climate Change (IPCC).

The Schneider Electric Sustainability Research Institute modelling shows how 10$GtCO_2$/y can be realistically and affordably abated by 2030. The report focused on a subset of global greenhouse gas emissions. Out of 50$GtCO_2e$/y, "The 2030 Imperative" scenario finds a 30% (10$GtCO_2e$/y) abatement opportunity from a 30$GtCO_2$/y baseline of all energy-related emissions, a significant acceleration from current pledges (ranging around 3$GtCO_2e$/y, which is 10% of the emissions reduction target). There remains however around 20$GtCO_2e$/y of non-energy related emissions which is not covered in this report's modelling.

Schneider Electric is calling for a 3-5 times greater effort from governments and corporates. The Institute believes the only realistic roadmap for success is to deploy proven digital technologies alongside increased electrification as the fastest way to decarbonize buildings, transport, and industry. This approach buys time to address hard-to-abate sectors. Its modelling clearly shows alternative pathways will place too high a burden on consumers.

"Despite increased momentum around sustainability and more companies adopting ambitious targets to tackle climate change, this research reveals how we need to speed up. At Schneider Electric, we are uniquely part of the solution. To support organizations in their quest to decarbonize at pace and deliver on their climate commitments, we are accelerating the expansion of our global sustainability consulting services business to meet the increasing demand for meaningful progress on energy transition and climate action goals,"

Jean-Pascal Tricoire, Chairman and CEO, Schneider Electric.

"What organizations require today is a trusted partner who combines strategic planning and target setting with a proven track record of solutions implementation to deliver faster, tangible sustainable outcomes. Having successfully overcome many sustainability challenges ourselves, and in so doing, achieved world-leading digital and electric solutions in our own facilities, we are well-positioned to help others go faster and further."

Strategies and solutions to decarbonize value chains

Building on its sustainability leadership and the ambition of the 2021-2025 Schneider Sustainability Index, Schneider Electric is accelerating its global sustainability consulting business and expand on a 10-year track record of success in energy and sustainability services.

Today, Schneider Electric is the world's leader in energy efficiency, energy management, renewable energy procurement, carbon reporting, climate risk assessment, and supply chain decarbonization, providing software and consulting services to more than 30% of the Fortune 500. Customers include Johnson & Johnson, Walmart, Faurecia, Kellogg, Takeda, Velux Group, Unilever, and T-Mobile, among others.

Increasing demand for Schneider's "ambition + action" advisory services is behind this expansion, including:

• Climate action consulting, and affiliated supply chain decarbonization and climate risk assessmen

• Communications services, including ESG reporting/ratings and reputational and sustainability claims,
• Circularity and traceability services,
• ESG modules for the award-winning EcoStruxure™ Resource Advisor platform to track societal and governance metrics.

Being part of the solution through digital disruption

As part of its ambition to drive sustainable innovation and build net zero pathways, Schneider Electric helps customers in many sectors to innovate and move to open, interoperable, digital, and simplified systems and smarter ways of doing business. At Innovation Summit World Tour, Schneider Electric is unveiling digital innovation for carbon abatement in homes, buildings, data centers, power grids, and industries.

Electricity 4.0: Powering the New Electric World with Smart Green Energy

Today, we are witnessing the convergence of digital and electric at scale with software. Electric makes energy green and the best vector for decarbonization. Digital makes energy smart to drive efficiency and eliminate waste. This convergence delivers 'Electricity 4.0', the fuel for a New Electric World.

• Data Centers: The new APC™ Smart-UPS™ Ultra 5kW is the industry's first 5kW Uninterruptable Power Supply (UPS), designed to deliver more power, flexibility, and intelligent monitoring in

• Smart Homes: Today, Schneider is announcing a series of smart sustainable home solutions, including Wiser, that help fight energy waste. By 2050, households are expected to be the single largest consumer of electricity, and the biggest contributor of CO2 emissions with as much as 34% generated by homes.
• Resilient Digital Grids: Schneider's range of pure air SF6-free technology for net zero grids is extended with the RM AirSeT Ring Main Unit and Modular Switchgear and the MCSeT Active Medium Voltage Air Insulated Distribution Switchboard.
• Smart Electrical Distribution: Rethinking Schneider's Low Voltage TeSys Giga, Canalis Busbar, PrismaSeT Active, New Gen ComPacT, TransferPacT and EcoStruxure Power™ digital products will deliver a simpler, more sustainable, safe and secure user experience for installer and service partners to enhance the resiliency of the world's growing digital economy, as part of the Partnerships of the Future program.

Industries of the Future: Resilient and Sustainable with Next-generation Automation.

Step changes in efficiency and agility can be achieved through artificial intelligence, digital twin technology, human insight supported by advanced analytics, and vendor-agnostic industrial software—including Performance Intelligence from AVEVA.

• EcoStruxure™ Automation Expert 21.2 provides water and wastewater plants with complete life cycle management. The world's first software-centric automation system seamlessly integrates IT and OT services, to boost security, increase system longevity, and easily evolve over time. As a universal automation solution, EcoStruxure™ Automation Expert can be implemented with existing hardware. The virtualized controller can run on any Windows or Linux edge computing device, providing industrial enterprises with unprecedented flexibility. Digital collaboration of this sort has the potential to unlock more than $100 billion in value for industries.

• EcoStruxure Machine increases efficiency for machine builders and shortens their development time. With the new Lexium MC12 multi carrier for transporting, grouping and positioning products, OEMs can achieve greater productivity and unprecedented flexibility with up to 40% savings on investment costs and 50% faster machine installation and commissioning. Combined with digital twin technology, the new multi carrier also reduces machine design and time-to-market by up to 30%.

Offshore wind: New Ocean Grid project in the North Sea

The Norwegian Minister of Trade and Industry, Iselin Nybø, announced today that the Ocean Grid project will get financial support of 82.7 million NOK, through the Green Platform scheme.

The project will develop new technology, knowledge and solutions to enable a profitable development of offshore wind on the Norwegian continental shelf. It will look particularly at the way offshore wind will be connected to the grid. The work will touch on both bottom-fixed and floating wind farms, and will in the long term enable the creation of green jobs and increased export revenues.

The project partners will also bring their own financial contributions to the table, raising the total to 125.5 million NOK for the development of the offshore grid. Both the supply industry and energy companies will participate actively in the project, together with the research institutions. The project will span over three years.

New cable design

"Our objective is to realize offshore wind on a large scale. We have to build wind farms in a cost-effective way, and we of course need to get the power all the way to the customers. It's crucial to our success that the energy companies, research institutions and suppliers collaborate towards this goal,"

Florian Schuchert, Vice President of Offshore Wind Solutions at Equinor

The Ocean Grid project will also address the issue of market design and the regulatory framework linked to the development and operation of an offshore grid to connect large offshore wind farms. It will develop Norwegian technology and a supply industry to provide new cable designs, subsea technology and floating converter stations. Ocean Grid also has a research component, led by SINTEF, that will solve specific research challenges.

"This project will develop technology and solutions that are essential to succeed with offshore wind. It will lay the foundation for a profitable offshore wind development in Norway, and technology that can provide increased exports and new green jobs,"

Chief Scientist at SINTEF,
John Olav Tande.

Unique position

Europe has a plan of installing 300 GW of offshore wind capacity by 2050. The Norwegian industry is world leading when it comes to sea and subsea technology, developed over five decades of oil and gas extraction. Norway is therefore in a unique position to build upon this expertise and take a significant portion of this new market.

“This project is important and on point to develop the right solutions and new technologies that will enable profitable offshore wind in Norway. This will lay the groundwork for new concepts, new jobs and a new supplier industry that can compete internationally,” says the responsible for offshore wind at Fred. Olsen Renewables, Lars Bender, who will also act as chairman of the project's board.

SCG’s noteworthy contribution to Thailand’s solar energy prospects

Amid the COVID-19, mobility slowed down as more people stayed at home. Undeniably, working from home and the semi-lockdown measures resulted in higher household expenses, especially the electricity bill which some households suffered a 30-50% increase.

Homeowners are beginning to seek alternatives to tackle the rising electricity cost with solar power

“At present, solar panels or solar roof installations for electricity production are cheaper than what we pay for transmission line electricity. For instance, a medium-sized single-family home with two air-conditioners and other electrical appliances such as the refrigerator and television will spend about 3,500-4,500 Baht per month on electricity. In this setting, they will be able to reduce the expenses by 1,400-1,900 Baht per month.”

Mr. Mongkol Hengrojanasophon,
Vice President, SCG Chemicals Business.

Towards Net Zero

Although in its early years in the solar power business, SCG has extensively researched and carried out the implementations internally. Recently, the R&D team rolled out innovations with durable and cost-saving features that are accredited and accepted by various organizations.

Mr. Mongkol further elaborates that SCG's goal is sustainability in business operations, yet we are facing climate change issues that worsen to a global climate emergency. Discussions of this matter were ongoing for years from within the corporate and recently, at the end of 2020, SCG announced its advancement to be a net zero organization by 2050, aligning with assertions for the Paris Agreement international treaty. This begins by promoting employees' awareness mindsets on the effects of climate emergency, plant machinery upgrades for the Cement-Building Materials, Chemicals, Packaging Business, and extending to the Bangsue headquarters. Moreover, renewable energy is utilized, with solar power taking the lead.

"We are dedicated to the efficient use of power, thus, we explored solar power from within the organization. This brought about expertise, knowledge of the pros and cons, which contributed to the development of Thailand's first Floating Solar. To date, over 30 projects have acquired the Floating Solar for installation along with a 25-years warranty. The Floating Solar's buoys can be recycled into PCR plastic pellets. They have a generation capacity of 38 megawatts, thus, reducing GHG emissions by over 26,000 tons per year. Additionally, installed SCG Solar Roof Solutions have a generation capacity of 13 megawatts which reduces GHG emission by 7,500 tons per year."

Mr. Mongkol discusses.

Nevertheless, the impression of many still perceive solar cells as costly, rather inaccessible, and involves complex technologies. Mr. Mongkol confirms that today's business landscape has greatly shifted. In the past decade, the price of solar panels decreased by over 70-80%. Therefore, the idea of expensive and aloof solar panels is replaced by cheaper and accessible items from innovative solar power R&D.

Incentives triggering homeowners to turn to rooftop solar cells is the government's home electricity

surplus buy-back scheme. This is matched with higher daytime electricity demand in the past 1-2 years because of COVID-19.

Moreover, the industrial sector, industrial estates, businesses, agricultural sector, and governmental sector also voice higher demands for solar power installations to save cost.

SCG for solar power solutions

Owing to the diverse demands and installation locations on rooftops, on land, and on water, SCG views two main customer sectors.

Owing to the diverse demands and installation locations on rooftops, on land, and on water, SCG views two main customer sectors.

1. The business sector consisting of industrial plants and industrial estates that seek total solutions to alleviate electricity costs for the business owners. Moreover, some businesses own vacant spaces such as ponds, etc., and invest in the Floating Solar to reduce the evaporation rate and help with water conservation.

2. The household sector including homeowners and SMEs who increased daytime power consumption during the past year, resulting in an average increase in the

electricity bill of 30-50%. Homeowners now seek solutions to ease the cost by installing rooftop solar panels. Aside from the decrease in the bill, the price for the government's purchase of surplus power, which used to be 1.68 Baht per kWh, has now reached 2.2 Baht per kWh. Thus, installing solar roofs has caught more attention from the public.

Mr. Mongkol further shares that SCG values quality and service, thus, we design business models that meet customer needs. For instance, for industrial plants, SCG provides teams of engineers as experienced energy consultants. This ensures optimization of the system, making the roof installations in the industrial sector enjoy a payback period of only 5-6 years.

"The main concern that SCG observed about solar roof installations is worries of how to buy and install. As SCG is determined to provide total solutions, we have engineers who survey the location and determine how many solar panels can be installed and how many kWh of electricity it can generate. We offer tier 1 solar panels with finely selected, trustable technologies. This helps us rest assured that we can assist customers throughout the product's lifespan. Also, we facilitate all permit applications and electricity sales approval. Most importantly, a solar-on-mobile tracking system is available along with a 25-years warranty for the panels and their efficiency. The benefits are prevalent as payback period is 7-10 years, afterward, consumers just enjoy the profit."

Mr. Mongkol Hengrojanasophon, Vice President, SCG Chemicals Business.

Prospects of Thailand's solar power

Nonetheless, considering the legal obstacles, Mr. Mongkol points out that there remain to be some limitations. An example is with the industrial plant sector wherein the electricity generator and user must share the premises. However, some plants want solar roofs but have no space while some plants have filled their roof space with the installation and can generate electricity exceeding their demand. If the government allows purchases across areas, it shall promote more solar energy generation.

To motivation the public sector, some suggestions are tax exemption from installation costs, accumulated carbon credit for sales, and better communication that can help speed up its accessibility.

"Aside from COVID-19, a recent megatrend is the carbon-neutral stance. This refers to achieving net zero carbon dioxide emissions with Thailand as part of the scheme. Many yearn for solar power but are obstructed by the inability to access it. We believe solar power is the answer, all renewable energy is the key."

Mr. Mongkol Hengrojanasophon, Vice President, SCG Chemicals Business.

"Looking to the future, I picture smaller "power plants". This is already happening in western countries, in Europe and the USA. I believe that Asia will adopt it as well, especially in Thailand where we are among the regional leaders in renewable energy."

Mr. Mongkol summarizes.

Solar power for the public is now accessible. We encourage all sectors, the public, industries, and the government to join hands for the preeminent value that serves the environment.

HARTING T1 Industrial - The standard for the IIoT Single pair

Single Pair Ethernet (SPE) will revolutionize the industry. It has never been so easy to connect small sensors to the Internet. With the HARTING T1 Industrial, we recognized the trend towards one-pair cabling, defined standards in consultation with users, and have now implemented interfaces in series production. Three important steps that show our users: SPE is not just a short-term appearance but an investment-safe standard for IIOT at the field level.

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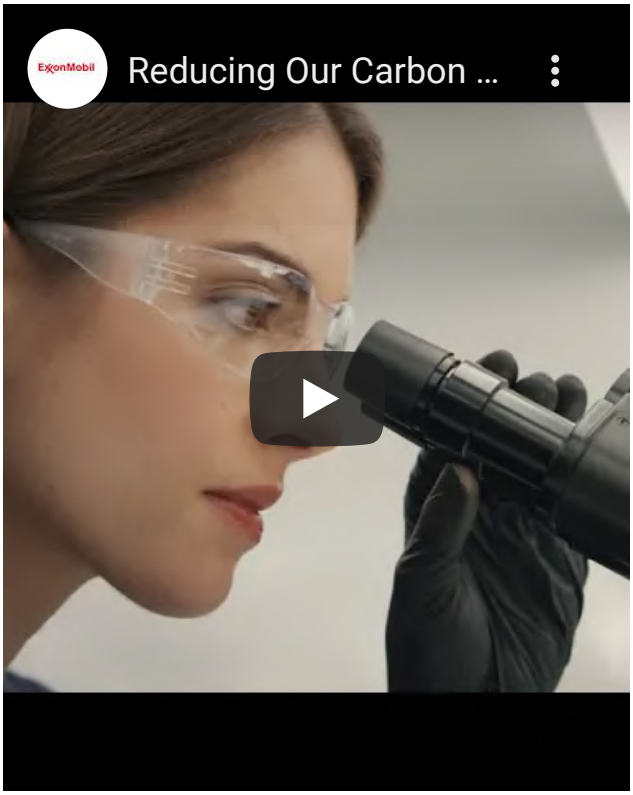
Carbon capture and storage gains wide industry support in Houston

• Eleven companies support large-scale deployment of carbon capture and storage to help decarbonize industrial facilities; discussions ongoing with others

• Collective efforts could capture and store approximately 50 million metric tons of CO2 per year by 2030; 100 million by 2040

• Companies bring collective expertise as industry leaders with diverse capabilities



Eleven companies have expressed interest in supporting the large-scale deployment of carbon capture and storage (CCS) technology in Houston. Calpine, Chevron, Dow, ExxonMobil, INEOS, Linde, LyondellBasell, Marathon Petroleum, NRG Energy, Phillips 66 and Valero have agreed to begin discussing plans that could lead to capturing and safely storing up to 50 million metric tons of CO2 per year by 2030 and about 100 million metric tons by 2040.

The companies plan to help address industrial CO2 emissions in one of the largest concentrated sources in the United States. Collectively, the 11 companies are considering using CCS technology at facilities that generate electricity and manufacture products society uses every day, such as plastics, motor fuels and packaging.

If CCS technology is fully implemented at the Houston-area facilities these 11 companies operate, nearly 75 million metric tons of CO2 could be captured and stored per year by 2040. There are ongoing discussions with other companies that have industrial operations in the area to add even more CO2 capture capacity. They could announce their support at a later date and add further momentum toward the city of Houston's ambitions to be carbon neutral by 2050.

"Houston can achieve our net zero goals by working together, and it's exciting to see so many companies have already come together to talk about making Houston the world leader in carbon capture and storage,"

Sylvester Turner,
Mayor of Houston

"We're reimagining what it means to be the energy capital of the world, and applying proven technology to reduce emissions is one of the best ways to get started."

Wide-scale deployment of CCS in the Houston area will require the collective support of industry, communities and government. If appropriate policies and regulations are put in place, CCS could generate tens of thousands of new jobs, protect current jobs and reduce emissions at a lower cost to society than many other widely available technologies. The 11 companies will continue to advocate for policies that enable the long-term commercial viability of new, expanded and existing CCS investments in Texas.

ExxonMobil

CCS is the process of capturing CO2 from industrial activity that would otherwise be released into the atmosphere and injecting it into deep underground geologic formations for safe, secure and permanent storage. With supportive regulations, CO2 from the Houston industrial area could be safely stored in the U.S. Gulf Coast region in formations thousands of feet below the surface or seabed. The U.S. Department of Energy estimates that storage capacity along the U.S. Gulf Coast is enough to hold 500 billion metric tons of CO2 — more than 130 years of the country's total industrial and power generation emissions, based on 2018 data.

Although renewables will continue to play an important role in a lower-carbon energy future, CCS is one of the few proven technologies that could enable some industry sectors to decarbonize, such as manufacturing and heavy industry. The International Energy Agency projects CCS could mitigate up to 15 percent of global emissions by 2040, and the U.N. Intergovernmental Panel on Climate Change (IPCC) estimates global decarbonization efforts could be twice as costly without CCS.

Singapore to have first electric ferry service in 2023, run by Shell

Singapore will have its first fleet of electric ferries in 2023, operated by Shell to ply between the mainland and Pulau Bukom.

The oil giant has awarded a contract to home-grown boat builder Penguin International to design, build and operate at least three fully electric ferries.

These battery-operated 200-seat single-deck vessels are expected to set sail in the first half of 2023. They will transport workers to and from Shell's Energy and Chemicals Park on Pulau Bukom, replacing the diesel-powered ferries currently used.

Shell would not say how much the project costs, but a Nikkei news article on a recent proposed Thai project using ferries of a similar size cited a price tag of nearly S$2 million per vessel - or about two-thirds costlier than a diesel equivalent.

The Shell ferries are powered by a lithium-ion battery system with a capacity of 1.2MWh. They can attain a speed of over 20 knots (37kmh) with zero on-site emission and almost no audible noise.

When berthed at Shell Bukom, the ferries will be charged via a combination of fast charging during peak hours, and slow charging during off-peak hours and overnight.

Advance Canvas Industries Pte Ltd

Fabric bellows provide maximum protection in rugged industrial environments and prevent foreign particles from entering the hydraulic or pneumatic systems of the precision equipment inside.

Special Advantages:

- Safety
- Flexibility
- Durability
- Dust-proof
- Heat and Cold Resistant
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Applications:

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- Industrial robots, automated machines, scissors lift table
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Email: adcanvas@adcanvas.com.sg
Website: www.adcanvas.com.sg

"Shipping's future will involve different parts of the sector using different fuels, and electrification is a solution to decarbonise short voyages."

Mr Nick Potter, general manager of Shell Shipping and Maritime, Asia Pacific & Middle East

"Switching to zero-emission, fully electric ferries is part of Shell's ambition to help accelerate progress towards net-zero emissions in the shipping sector."

Penguin International managing director James Tham said the company is partnering Australian marine engineering firm Incat Crowther and Singapore-based energy systems consultancy Razor Blunt Labs to build the vessels.

The Shell ferries will ply a route of about 5.5km, carrying around 3,000 passengers a day.

Earlier this year, the world's largest electric ferry was launched in Norway. According to online electrification newsletter Electrive.com, the 139.2m vessel has room for 600 passengers and 200 cars. In Thailand, an electric ferry service, plying the Chao Phraya River in Bangkok, was launched in December last year.

In Singapore, ad hoc electric river cruise vessels have been in use since 2007 - 10 years before electric cars started taking off.

In April (2021), Shell said it would trial hydrogen fuel cell ships here. These are vessels powered by electricity generated via a chemical process using stored hydrogen and oxygen in the atmosphere.

PETRONAS and ENEOS Expand Energy Partnership To Include Hydrogen

PETRONAS, through its subsidiary PETRONAS Gas & New Energy Sdn Bhd (PGNESB), has signed a Memorandum of Understanding (MoU) with ENEOS Corporation (ENEOS) to jointly develop a competitive, clean hydrogen supply chain between Malaysia and Japan, and to explore other hydrogen opportunities.

The MoU will see both parties embark on a technical-commercial joint-study of a hydrogen supply chain which includes hydrogen production and its transportation in methylcyclohexane (MCH) form, where hydrogen is converted from its original gaseous state into a liquid form to enable large volume deliveries.

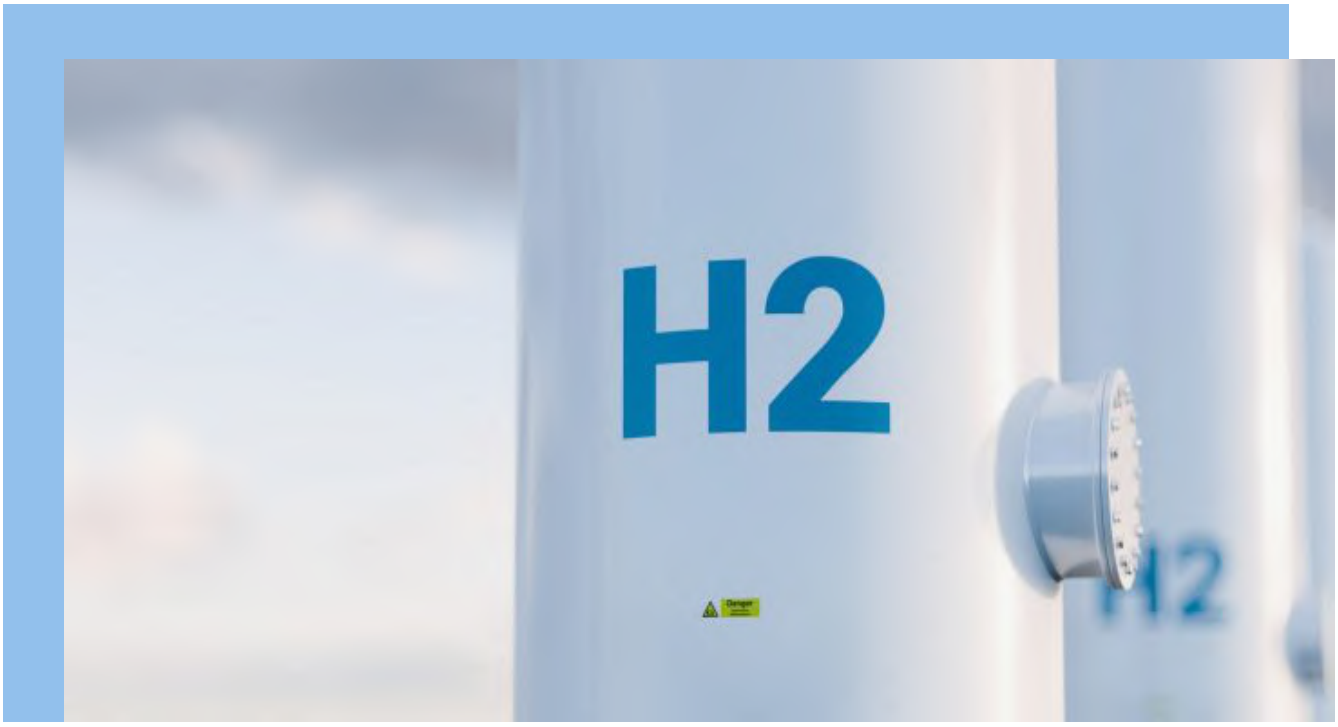
PETRONAS and ENEOS will also explore low carbon hydrogen production from PETRONAS' petrochemical facilities and in the future, green hydrogen produced by renewable energy.

"We are proud to expand our three-decade long energy partnership with ENEOS to include hydrogen, on top of what we have established in the liquefied natural gas (LNG) space. More importantly, this partnership is a testament of how industry collaboration can help accelerate our shared aspiration towards a low carbon future,"

PETRONAS Gas + New Energy Executive Vice President and Chief Executive Officer Adnan Zainal Abidin.

"With emerging clean energy sources like hydrogen, innovation and collaboration with partners in technological development are key, as they contribute towards achieving cost competitiveness and scalability for wider use across businesses and industries," he added.

The development of liquid organic hydrogen carrier (LOHC) technology such as



MCH is fast gaining traction due to its chemically stable nature that allows for long-term storage and long-distance transport. Moreover, the use of LOHC leverages on existing conventional oil and petrochemicals infrastructure which heavily reduces the need to develop new assets, thus making it a viable option for established energy players to implement.

For this project with PETRONAS, ENEOS has applied for funding from the Japanese Government's Green Innovation Fund which sponsors decarbonisation projects and initiatives. While in Malaysia, the development of a hydrogen-based economy is set to complement future growth as the country prepares to transition towards a low carbon economy.

The MoU stems from both PETRONAS' and ENEOS' common aspiration of achieving net zero carbon emissions by 2050. In 2020, PETRONAS announced its intent to achieve Net Zero Carbon Emissions by 2050 as part of its holistic approach towards sustainability, while ENEOS is working towards achieving its carbon neutral ambition via its Environmental Vision 2040.

PETRONAS already produces low carbon hydrogen from its facilities and will soon explore the commercial production of green hydrogen. PETRONAS is well-poised to be a competitive hydrogen solutions provider due to its inherent geographical advantage, in addition to the expanding renewables portfolio, strong partnerships with customers and technology partners.

Schaeffler presents chainless electric drive system “Free Drive” for bicycles

- “Bike-by-wire” technology offers potential for new business areas in the field of micromobility
- Free Drive further demonstrates the company's status as preferred mobility partner in the field of electrified drives
- Robust system provides maximum flexibility in the vehicle architecture with even less wear

Networked, flexible, sustainable, and environmentally friendly: New mobility trends are placing high demands on products and technology. Schaeffler adopts an holistic approach to movement and offers solutions to meet all customer requirements, including

The chainless drive system is a joint development with two-wheel electric drive specialist Heinzmann GmbH & Co. KG, which dispenses with the mechanical connection between the generator and motor, thus enabling completely new bicycle architectures and pedal configurations combined with an even lower requirement for wear parts. “Schaeffler is the preferred partner for mobility solutions of the future and is demonstrating this status once again with the innovative Free Drive for e-bikes,” says Matthias Zink, CEO Automotive Technologies, Schaeffler AG. “The development is proof of our transformation into a leading supplier of electrified drives. Our decades of expertise in the field of vehicle mechatronics, which we are now also transferring to the two-wheel segment, have assisted us in this development. The e-bike market is growing steadily and offers Schaeffler, as e-mobility partner, further business potential.” Schaeffler already has many years of experience in the e-bike segment and most recently presented the mechatronic automatic gearshift system VELOMATIC in 2016.

One system for all applications

The central component of the Free Drive system is the Schaeffler generator, which sets the constant resistance on the pedal while simultaneously absorbing the rider's pedaling power. The regenerative solution is a serial hybrid drive that converts the mechanical energy generated during pedaling into electric energy, which in turn is converted back into mechanical energy in the wheel hub motor. Excess energy is stored in the battery. As with cars, all system components communicate with each other via a CAN connection. The complete, optimally matched system sold by Heinzmann GmbH & Co. KG, which generates a continuous output of 250 watts, consists of a pedal generator, drive motor, battery powerpack, and human-machine interface (HMI).

"The Free Drive system combines Heinzmann's long-standing drive and industry expertise with Schaeffler's system and mechatronics expertise,"

Peter Mérimèche, Managing Director Electric Drives at Heinzmann GmbH & Co. KG.

"Regardless of whether the system is used in 2-, 3-, or 4-wheel applications, the absence of a mechanical connection between the generator and motor means that Free Drive can provide maximum flexibility in the bicycle architecture and a freely configurable pedaling sensation, which is tailored to the requirements of the bicycle and the needs of the rider, while ensuring minimal wear,"

Dr. Jochen Schröder, President of the E-Mobility Division. The compact dimensions of the Free Drive system permit a standard distance of 138 millimeters between the two pedals.

The Free Drive system can be specified for various applications, irrespective of the manufacturer. For fleet operators, Free Drive offers an ergonomic, low-maintenance, and robust system with low operating and maintenance costs, as wear parts and peripheral chain equipment are not required. Dr. Jochen Schröder: “With the expansion of the portfolio in the bicycle segment, Schaeffler is not only stepping up its commitment to the fast-growing e-bike market but is also substantiating its own claim to help shape future movement with a pioneering spirit.”

Leading innovation: MingYang Smart Energy launches MySE 16.0-242, the world's largest offshore Hybrid Drive wind turbine

Offshore wind is undergoing transformational improvement as a key solution to the energy transition. The continuous iteration and evolution of wind turbine technology have enabled developers to venture into deeper waters and to tap further wind resources. MingYang Smart Energy is always motivated to drive this trend through innovation, and hasreached a new milestone with the introduction of the new MySE 16.0-242, the world's largest Hybrid Drive wind turbine.

Designed for high-wind IEC IB including typhoon-class IEC TC, the powerful MySE 16.0-242 features an exceptional nameplate capacity of 16MW, a 242-meter diameter rotor, 118-meter long blades, and a staggering 46000m2 swept area equivalent of more than six soccer fields.

With industry's largest rotor and highest nominal rating, MySE 16.0-242 is set to move the boundaries of wind energy production even further. A single MySE 16.0-242 turbine can generate 80000MWh of electricity every year, enough to power more than 20000 households. In comparison, it produces 45% more energy than MingYang's previous turbine model, the MySE 11.0-203.

The environmental benefit is also considerable: compared to coal-fired power generation, one MySE 16.0-242 can eliminate more than 1.6 million tonnes of CO2 emissions over the course of its designed 25-year lifespan, making it a strong contributor to achieving the goal of carbon neutrality.

Extending the legacy super-compact designand Hybrid-Drive concept,

MySE 16.0-242 builds on MingYang's deep understanding and expertise gained over multiple smaller, light-weight offshore models, ranging from 5.5MW, 6.45MW, 7.25MW, 8.3MWto 11MW series.

The nacelle weight of the MySE 16.0-242 is competitively low at less than 37 tonnes per MW. Compared to a heavier nacelle, its modest head mass allows for more efficient use of the tower and foundation construction, resulting in fewer purchased materials and logistics.

Proven MingYang's Hybrid-Drive transmission technologies, particularly the medium-speed planetary gearbox with load sharing and forced high precision main bearing lubrication, have been fully optimized and inherited to ensure the robustness and efficiency of this new turbine, aswell as deliver excellent economic performance on both bottom-fixed and floating system applications.

In addition, MySE 16.0-242 provides many other distinctive advantages by adopting novel offshore-dedicated features and "best practice" technologies.

To begin, as a new feature over previous models, all power electronics and MV-transformer have been relocated up tower intothe nacelle, simplifying cabling and enhancing system maintenance convenience.

Secondly, an air-tight design protects the nacelle from harsh salt spray corrosion while yet allowing for internal naturalair cooling, resulting in an ideal operational environment for reliable operation within the nacelle.

In summary, the MySE 16.0-242 is the start of the MingYang's new 15MW+ offshore product platform. In the future, it is planned to grow into a portfolio of model variants that can adapt to various offshore settings, ranging from the typhoon-prone South China Sea to the constantly windy North Sea in Europe.

"The launch of our new largest wind turbine, MySE 16.0-242, is an apt illustration of the three essential drivers to technology evolution – demand, combinationand iteration,"

Qiying Zhang, President and CTO of Ming Yang Smart Energy

who continues: "In response to demand for anti-typhoon wind turbines in coastal Guangdong, MingYang systematically develops high-quality products by collaborating with global supply chain partners and integrating cutting-edge technologies from industries such as aerospace, materials, and big data."

"Over the years, we have gained over 10GW cumulative track record and iteration experience with Hybrid-Drive technology. These enable us to have a rapid learning curve in product R&D and position uswell to become an offshore wind leader," he says.

MingYang is committed to growing itsglobal presence and serving customers in all mainstream offshore wind markets including Europe, the Americas and Asia-Pacific. As part of the key global strategies, MingYang established the business and engineering center in Hamburg, Germany and is also exploring developing overseas manufacturing facilities.

With the launch of MySE 16.0-242,MingYang, a company at the forefront of innovation, has set a new benchmark ofoffshore wind technology and scale, and taken another step forward in our mission to benefit the world by reducing levelized cost of energy. MySE 16.0-242, which was recently certified by DNV and China General Certification Center(CGC) for design, is scheduled for full prototype rollout in 2022, to be followed by prototype installation in the first half of 2023 and commercial production in the first half of 2024.

IndianOil launches SERVO Greenmile and SERVO Raftaar lubricants specifically designed for BS-VI vehicles

To help reduce emissions, improve performance, and provide longer drain potential

IndianOil launched two new premium lubricants - SERVO Greenmile and SERVO Raftaar, specifically designed for BS-VI vehicles to help reduce emissions and improve engine performance.

These novel and eco-friendly lubricants will help reduce carbon footprint and meet the stringent specifications for the most advanced petrol & diesel vehicles. SERVO Greenmile meets SAE 5W-30 & API SN requirements and helps reduce carbon dioxide by up to 10 %, while SERVO Raftaar meets SAE 15W-40 & API CK-4 requirements, and also helps reduce carbon footprint by 10 %.

Launching the products, Mr S M Vaidya, Chairman, IndianOil, said,

"At IndianOil, we recognise that the expansion of the bouquet of our green offerings is essential to enhance our business competitiveness in a market that is now being driven by sustainable priorities. Most of our recent product launches mark our unwavering focus on going green while achieving performance improvements."

"The newly launched SERVO Greenmile and SERVO Raftaar reflect IndianOil's strong environmental conscience and our focus on innovation. The two new eco-friendly engine oils will significantly reduce the carbon footprint of vehicle users. SERVO Greenmile is premium engine oil for new generation petrol cars and SUVs, whereas SERVO Raftaar will enhance the driving experience for diesel vehicles while meeting the latest national and international standards," added Mr. Vaidya.

SERVO Greenmile is premium engine oil for new generation petrol cars & SUVs, meeting the latest national & international standards. The oil is tailor-made for BS-VI vehicles and is suitable for BS-IV and older model vehicles as well. With modern vehicles having smaller engines and operating under much severe conditions, SERVO Greenmile is a longer life oil designed to provide improved high-temperature deposit protection for pistons, more stringent sludge control, enhanced emission control system compatibility, seal compatibility, and protection of engines operating on ethanol-blended fuels.

SERVO Raftaar is premium engine oil for new generation diesel vehicles, meeting the latest national & international standards.

Currently, BS-VI diesel vehicles employ after-treatment devices such as Diesel Particulate Filters (DPF) & Selective Catalytic Reduction (SCR), to reduce PM & NOx. These after-treatment devices contain catalysts that can be poisoned if the engine oil contains higher amounts of sulphated ash, phosphorous & sulphur (SAPS). Thus, engine oils with very stringent specifications have been mandated for BS-VI vehicles. SERVO Raftaar is one such product from IndianOil, meeting the requirements of API CK4, the most stringent standard for diesel engine oils. SERVO Raftaar also provides excellent protection against wear and deposits leading to excellent engine cleanliness. The oil has superior anti-oxidation properties and control on oil consumption.

New Cat® 568 takes timber production to new heights

The new Cat® 568 Forest Machine features several design upgrades that are sure to lift the production of loggers and those with less time in the woods.

"The 568 has earned its reputation for moving the biggest timber with terrific power and reliability," said Giacomo Bottone, worldwide director for Caterpillar's forestry and medium excavator family. "The Next Generation 568 will build on that by being even more productive with added benefits of greater comfort and safety. Plus, owners will spend a lot less time and money on maintenance."

Powered by a proven Cat 9.3B engine, the machine's new electrohydraulic control system generates 10% greater swing torque and 14% more drawbar pull to make quick work of heavy logs. Smart mode automatically matches engine and hydraulic power to working conditions to help do that work with up to 5% less fuel consumption.

With cold-start capability of -25° F (-32° C) and high ambient temperatures reaching 126° F (52° C), the 568 is capable of working year-round. It will operate without derating at altitudes up to 9,842 ft (3,000 m).

Safety and comfort

The new Certified Forestry cab with its reinforced structure and large 1.25-in (32-mm) thick polycarbonate windshield enhances operator safety. Available in a choice of rear or side entry, the cab's interior space is 25% larger, allowing most operators to stand without hitting their head. Field of view from the standard heated and cooled seat is 50% better due to narrower cab pillars, larger panoramic windows, and a flat engine hood.

A standard rearview camera enhances visibility as do three available cab risers – 22 in (558 mm), 48 in (1 219 mm), and 72 in (1829 mm). The cab tilts with hydraulic assist for easy transport.

Operators have multiple options for starting the 568's engine, including an easy-to-reach push button, Bluetooth key fob, or unique Operator ID function; Operator ID allows each operator to quickly program and store their own machine settings and attachment function preferences. The large 10-in (254-m) high-resolution touchscreen monitor delivers intuitive navigation and includes a digital version of the operator's manual for quick reference. The available Cat® PL161 Attachment Locator assists in finding work tools within a range of 200 ft (60 m), even if covered by overgrowth or debris.

Lower maintenance costs

Compared to the previous model, the Next Generation 568 will consume 65 fewer filters over the course of 12,000 hours, which contributes to lowering maintenance costs by up to 15%.

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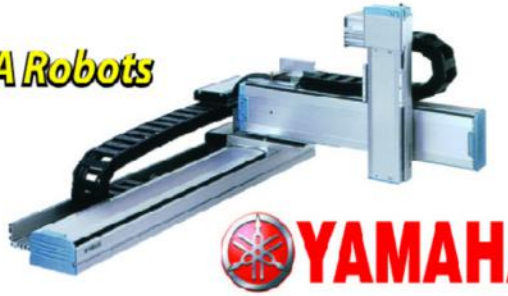

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Kingservo AC Servo System

"Our new electrohydraulic control system eliminates the need for a pilot filter and pilot oil altogether,"

Bottone

Fuel filters feature a synchronized 1,000-hour change interval – double the service life of the previous model. A new hydraulic oil return filter improves filtration and delivers a 3,000-hour service life, which is 50% longer than previous designs. The high-efficiency cooling fan runs only when necessary, and reversing intervals are programmable to enable the fan to keep the radiator cores clean without interrupting work.

Modern technology

Product Link™ technology captures critical operating data, fault codes, and machine location information to boost fleet management efficiency. Remote Troubleshoot analyzes the data in real time and can save a service trip to the jobsite. Also, owners can be sure the 568 is operating with the most current version of software with standard Remote Flash, which updates machine software around the owner's production schedule.

"The Next Generation 568 is perfect for loggers who need to move heavy logs more efficiently, comfortably, and safely," said Bottone. "When you add in a Cat dealer network committed to forestry, you get a winning combination of machine and support that simply can't be beat in the woods."

New Holland launches new Roll-Bar 125 fixed chamber round baler

New Holland Agriculture has introduced the new Roll-Bar 125 baler, which carries over the perfect price-performance balance that is the hallmark of the BR6090 and combines it with a host of new features. Available in two versions, Rotor Feeder and Rotor Cutter, the new baler introduces a new, modern styling with a large side shield that provides easy access for maintenance operations. The Roll-Bar 125 stands out for its excellent flexibility: the combination of large floor roll, starter roll and the high tensile steel bale rotation bars of the proven Roll-Bar bale chamber system ensures early core formation and positive rolling action in a wide range of crops – from dry straw to wet silage – and conditions.

"The best-selling fixed chamber baler on the market has a worthy successor in the Roll-Bar 125, which remains true to its strong heritage DNA. With new additional features and options, it is the right choice for farmers who are looking for a robust, simple and diverse baler, which feels home in all major crops and conditions – from dry straw up to wet silage."

Felix Ramuenke,
Global Product
Manager for Large
Square Balers & Fixed
Chamber Round Balers

The most visible new feature of the Roll-Bar 125 is the side shield introduced with the new styling. Its robust weld structure ensures durability, while the top door hinges, wide opening and gas strut supports provide easy access to service points for maintenance. It also provides protected space for storing spare net rolls. The flowing lines of the new styling are highlighted by the new decals. The main frame of the baler has been modified and a shock absorber has been added on both sides between the main frame and the tailgate to ensure a smooth closing. The front lights have been repositioned to accommodate the new-design side shields.

Under the hood, the new baler introduces improvements that deliver greater durability and reduce maintenance costs: high-grade drive chains with chromized pins and hardened plates, which have a longer life cycle, and new sealed type bearings that prevent dust contamination. A well- proven Hydraulic Rotor Reverser with a free-run clutch is now available on Rotor Feeder models, for easy unplugging when there is a rotor blockage.

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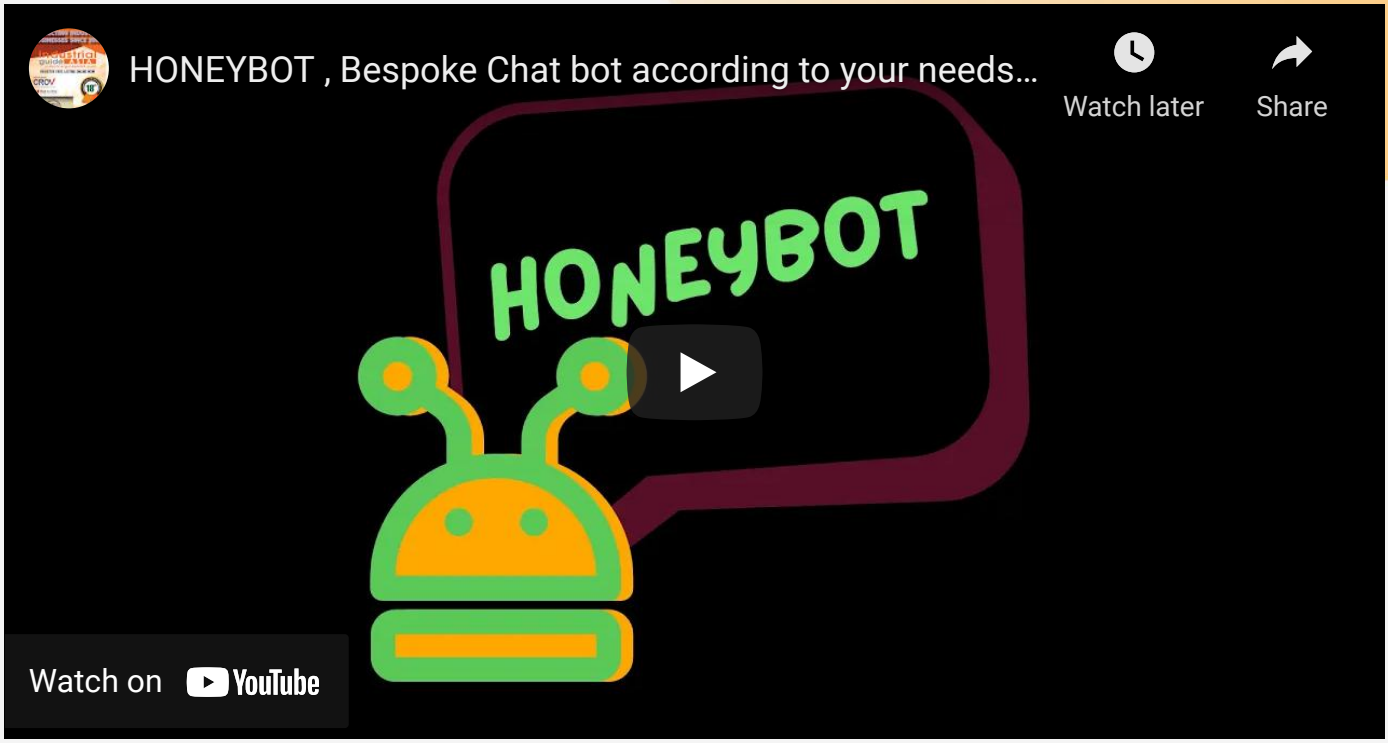

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Siemens Gamesa pioneers wind circularity: launch of world's first recyclable wind turbine blade for commercial use offshore

- Milestone for the global wind industry: Siemens Gamesa launches the RecyclableBlade, the world's first wind turbine blade that can be recycled at the end of its lifecycle

- This breakthrough is a crucial step towards Siemens Gamesa's ambitious goal to make turbines fully recyclable by 2040

- First six RecyclableBlades already produced at Siemens Gamesa's blade manufacturing plant in Aalborg, Denmark

- Siemens Gamesa has already reached agreements with 3 of its major customers: Siemens Gamesa is working closely with RWE to install and pilot the innovative recyclable blades at the Kaskasi offshore wind power plant in Germany for the first time; with EDF Renewables with the aim to deploy several sets of RecyclableBlade at a future offshore project; with wpd with the intention to install sets of the RecyclableBlade at one of their future offshore wind power plants

Wind power is one of the cornerstones in the quest to tackle the climate emergency. With more than 200 GW of new offshore capacity projected by the Global Wind Energy Council to be installed by 2030, it is critical to quickly introduce recyclable solutions. Siemens Gamesa is leading the way for a sustainable future with the RecyclableBlade, the world's first recyclable wind turbine blades ready for commercial use offshore. With this technology, separation of the materials in the blade is possible at the end of its lifetime, enabling recycling into new applications and thereby defines the next milestone in sustainability.

The first six 81-meter long RecyclableBlades have been produced at the Siemens Gamesa blade factory in Aalborg, Denmark.

"The time to tackle climate emergency is now, and we need to do it in a holistic way. In pioneering wind circularity – where elements contribute to a circular economy of the wind industry – we have reached a major milestone in a society that puts care for the environment at its heart. The RecyclableBlade is another tangible example of how Siemens Gamesa is leading technological development in the wind industry,"

Andreas Nauen, CEO of Siemens Gamesa.

Many components of a wind turbine, such as the tower and nacelle components have established recycling practices. Until now, the composite materials used in wind

turbine blades have been more challenging to recycle. Built on proven, reliable processes, the Siemens Gamesa RecyclableBlade breaks this mould and is the first of its kind, enabling recycling at the end of its lifecycle, and sets the path to a future where the full recyclability of projects will be a market requirement.

First deployments

Siemens Gamesa is committed with RWE to install and monitor the world's first wind turbines with recyclable blades in Germany at the Kaskasi offshore wind power plant. Current plans are for the project to be producing energy from 2022 onwards.

"We are pleased that our offshore wind farm Kaskasi is able to provide a fantastic facility for testing innovations; here we are preparing to test special steel collars and to use an improved installation method for foundations. Now, Kaskasi installs the world's first recyclable wind turbine blade manufactured by Siemens Gamesa. This is a significant step in advancing the sustainability of wind turbines to the next level".

Sven Utermöhlen, CEO Wind Offshore, RWE Renewables

turbine blades have been more challenging to recycle. Built on proven, reliable processes, the Siemens Gamesa RecyclableBlade breaks this mould and is the first of its kind, enabling recycling at the end of its lifecycle, and sets the path to a future where the full recyclability of projects will be a market requirement.

"We are very enthusiastic to collaborate with industrial players, such as Siemens Gamesa, to contribute to the progress of the recycling technology solutions in the wind energy sector. EDF Renewables' team is fully mobilized to develop this pioneer technology with its suppliers with the aim to continuously improve the environmental sustainability of our projects. This agreement is in line with EDF Group Raison d'être: to conciliate the production of lowcarbon electricity that benefits the climate and the reduction of local environmental impacts."

Bruno Bensasson, EDF Group Senior Executive Vice-President Renewable Energies and Chairman and Chief Executive Officer of EDF Renewables

Siemens Gamesa is working with wpd with the intention to install sets of the RecyclableBlade at one of their future offshore wind power plants.

" For the last 20 years, wpd actively contributed to the sustainable development of the offshore wind industry. Through this cooperation in the recycling technology program of Siemens Gamesa, we're making another step forward for the industry, which makes us enthusiastic regarding sustainability of the supply chain in the future".

Achim Berge Olsen, CEO of wpd offshore and COO of wpd group

Technological advancement

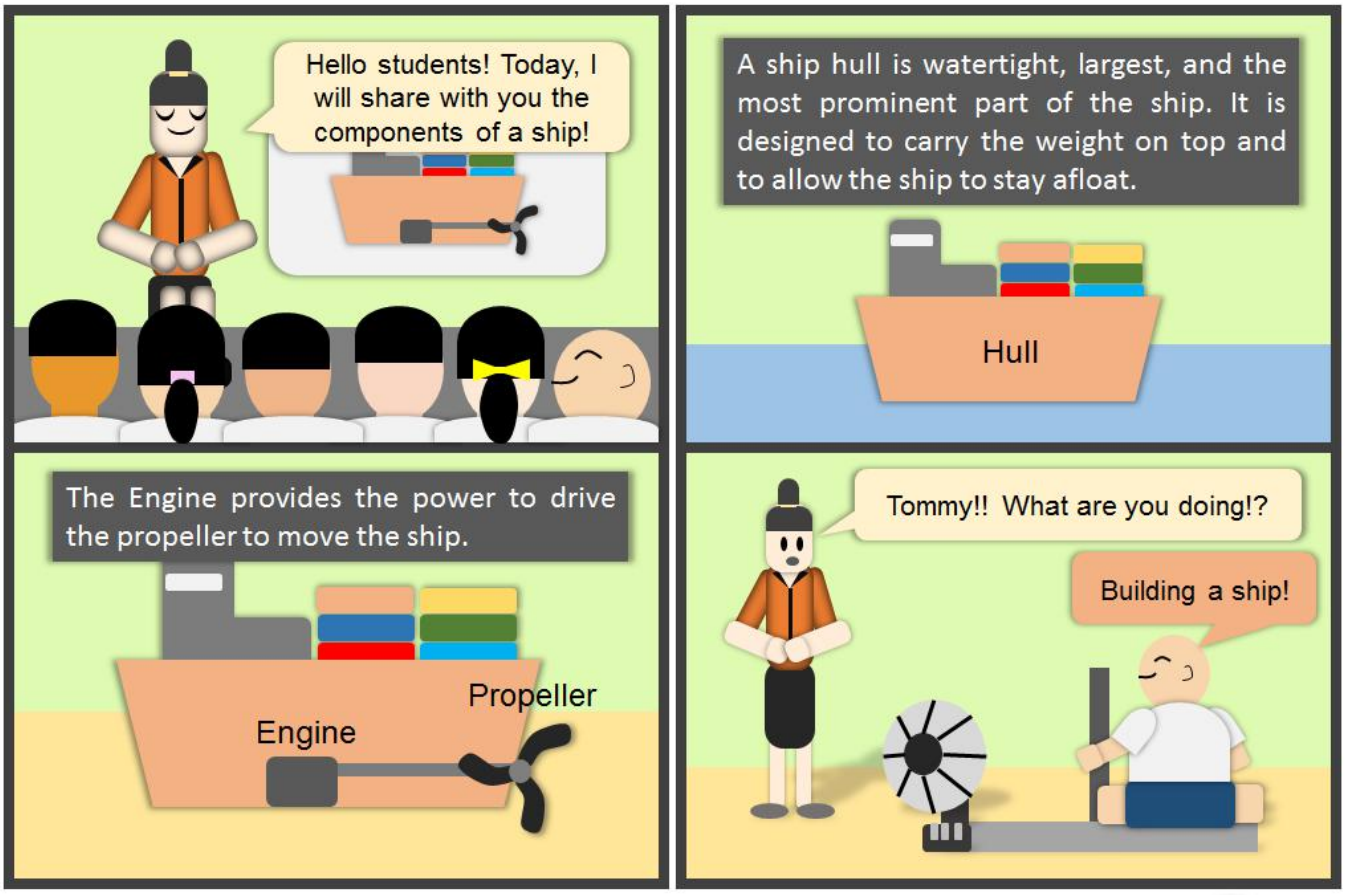
Siemens Gamesa wind turbine blades are made from a combination of materials cast together with resin to form a strong and flexible lightweight structure. The chemical structure of this new resin type makes it possible to efficiently separate the resin from the other components at end of the blade's working life. This mild process protects the properties of the materials in the blade, in contrast to other existing ways of recycling conventional wind turbine blades. The materials can then be reused in new applications after separation. Siemens Gamesa offshore customers will now have the unique possibility to choose the RecyclableBlade as an option for their future projects.

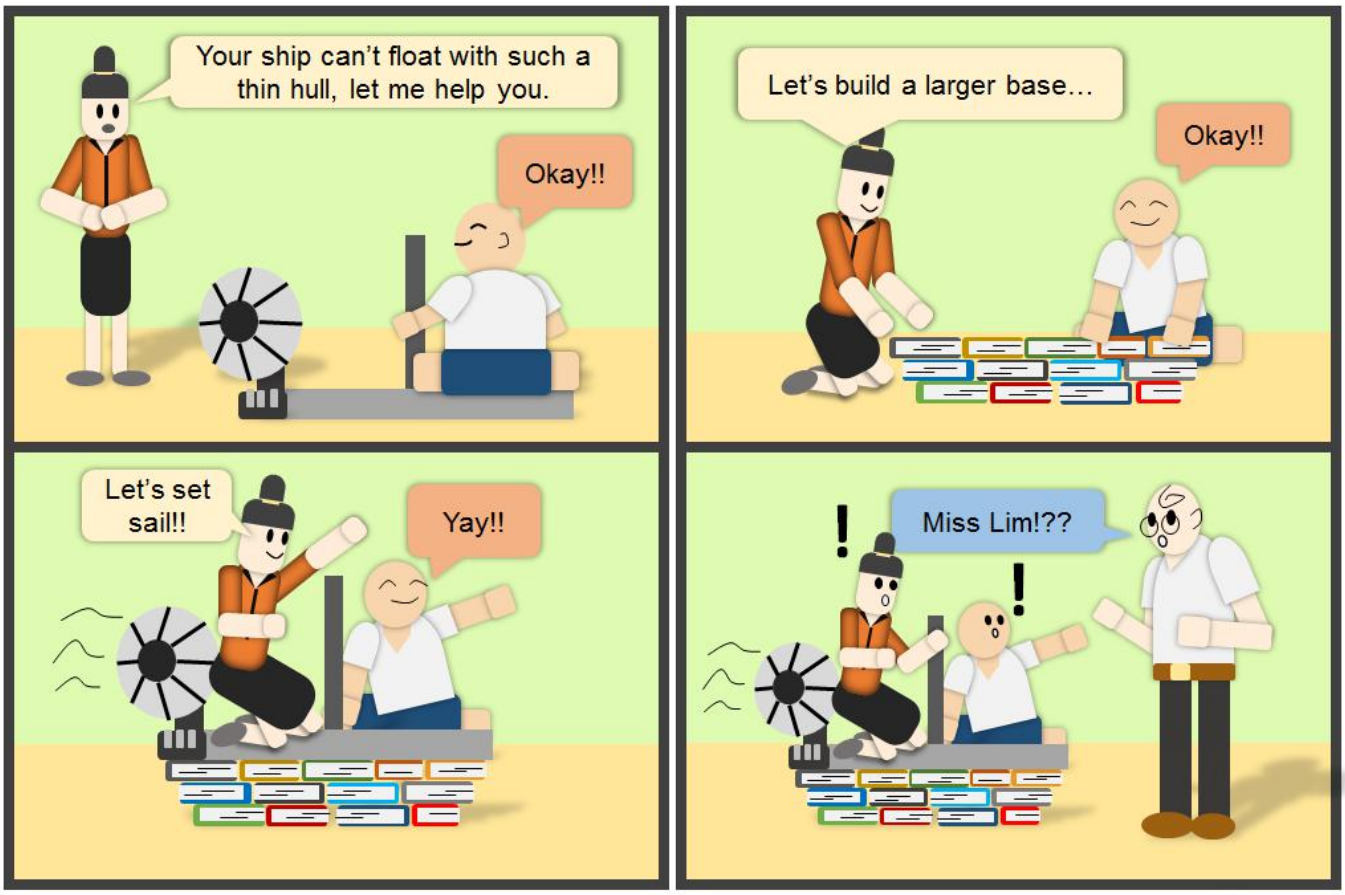
Fully recyclable wind turbine by 2040

Siemens Gamesa recently launched an ambitious Sustainability Vision towards 2040, pushing the boundaries of sustainability to create a better future for generations to come. Under this umbrella, the company announced an ambitious goal to make turbines fully recyclable by 2040.

"Our aspiration is to produce wind turbines that can generate renewable electricity for 20-30 years. When they reach the end of their useful life, we can separate the materials and use them for new relevant applications. The RecyclableBlade is a great step in that direction and well ahead of our 2040 goal,"

Gregorio Acero, Head of Quality Management & Health, Safety, and Environment at Siemens Gamesa.





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Process Instruments

Fluke Process Instruments Debuts New Datapaq® Furnace Tracking Systems for Demanding Heat Treat Applications

Fluke Process Instruments, a global leader in infrared imaging and thermal profiling solutions for industrial applications, releases the latest Datapaq® Furnace Tracker System – complete with the TP6 data logger, thermal barriers and intuitive software.

The Datapaq Furnace Tracker System is designed to be used repeatedly, in-process in the most hostile manufacturing environments, providing accurate and reliable through-process temperature surveys. Each system can help users improve process performance, decrease downtime, reduce temperature uniformity survey (TUS) reporting times and more.

The first component of the system is the Datapaq® TP6 Data Logger, which can withstand the longest, most-demanding operating conditions. The Datapaq TP6 features a 316-grade, stainless-steel case and a IP67 rating, making it water resistant . This datalogger is available with either 10 or 20 thermocouple inputs and can be specified for use with base or noble metal thermocouples.

The latest thermal barrier models are ideal for high-temperature heat treat processes and have been designed to provide maximum thermal protection – including applications such as vacuum and controlled atmosphere, slab reheat and solution aging, among others. The new patented quenchable thermal barriers eliminate the need for fiber blankets. Fluke Process Instruments also offers bespoke

design services to create a solution that specifically fits a customer's process.

To complete the system, Fluke Process Instruments offers the Datapaq Insight™ Software which transforms raw data into actionable analytics, clear user interface, context sensitive help screens and assistance options for infrequent users. Three software options are available and the complimentary Datapaq Insight for mobile is offered for free. This mobile application allows users to reset, download and analyze right on the factory floor and check thermocouple operation before a thermal profile run. The advanced TUS software also provides full temperature profiles and traceable reports for industry regulations like AMS2750 and CQi-9.

"The latest Datapaq Furnace Tracker System offers customers a robust solution that is designed for harsh environments like quenching and high temperatures,"

Rob Hornsblow, Product Manager at Fluke Process Instruments

"Whether users are working with raw materials or finished products, measuring product and atmosphere temperatures throughout the furnace is critical in ensuring both product quality and process efficiency. Datapaq continues to provide real-time, repeatable temperature data that can help improve performance and system accuracy, decrease downtime and much more."

"We've really focused on what customers wanted in when engineering this new system and we are excited to introduce the patented quenchable thermal barriers, an IP67 rated data logger and the Insight for Mobile application that will allows users to check thermocouple operation before each run".

Automotive cleaning chemicals manufacturer turns to Optidrive for mixer solution

Mexico-based Margrey, which manufacturers chemicals and products used for cleaning and detailing in the automotive sector, was struggling to find a variable frequency drive (VFD) capable of handling the high start-up current and demanding mixing application.

"The mixer motor needed to reach 75HP. However, the density and volume of the liquids being mixed placed high levels of stress on the mixer blades at start-up,"

Marcus Silva, Invertek Drives Head of Sales in Latin America.

"This meant a high-powered motor and VFD was needed to handle the start-up current required."

InnovationCom, a sales partner of Invertek Drives, worked with Margrey in Jalisco to develop a solution. They identified the Optidrive P2 as a VFD more than suited to the application. It would control a 480V, 3 Phase, 7.5HP motor.

High current at start-up and a range of densities during the mixing process

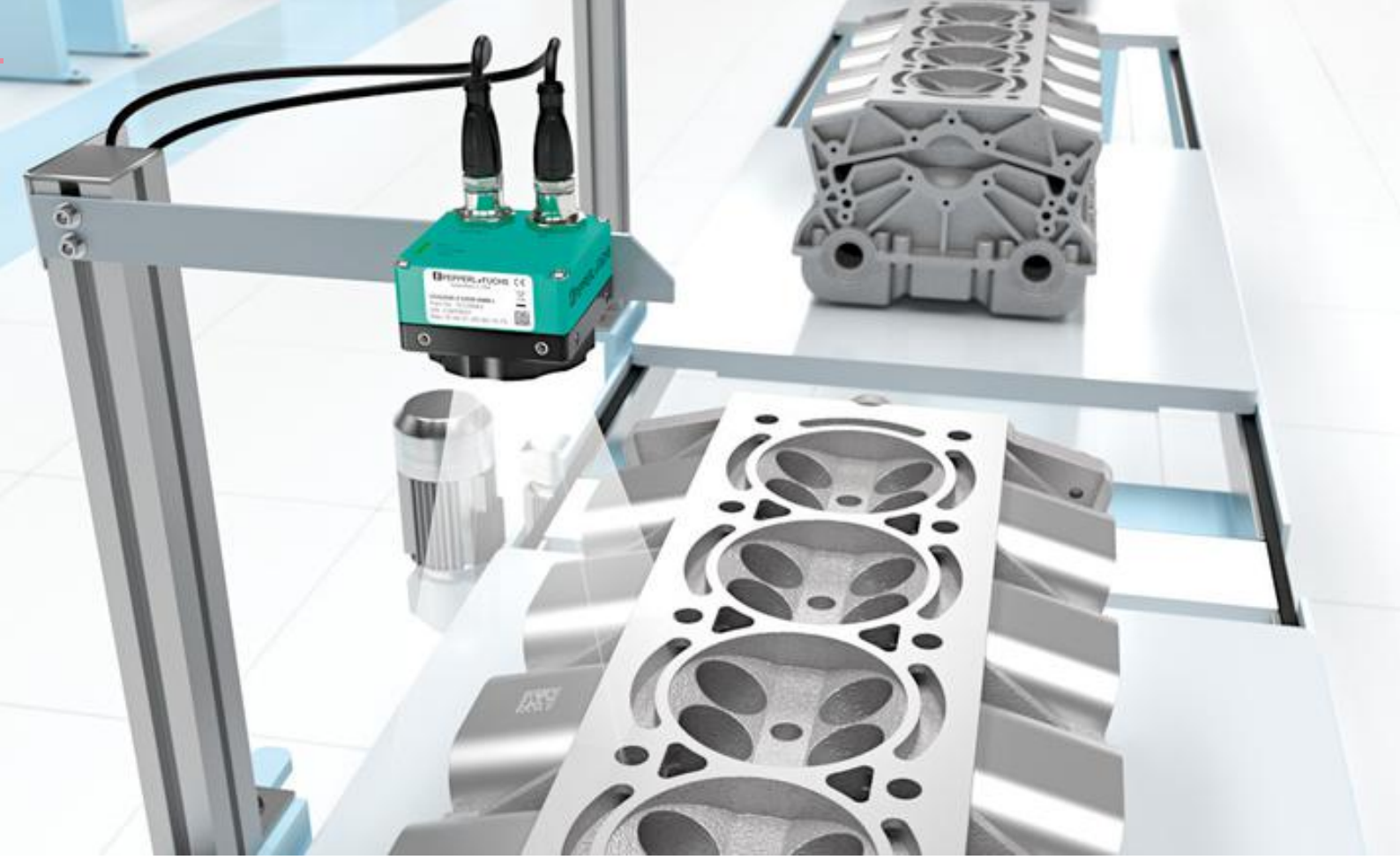
"The agitator mixes a range of substances with different densities. So, it was important to have complete control at all stages of the mixing process, from start-up with a high-current, through to variable speed control during each stage of the mixing process, or where additional substances are added," added Marcus.

"In addition, the enclosure protection of the drive, due to the environment it was operating in, and its physical size were also important factors. They wanted a drive that could be easily installed into an existing cabinet on the mixer. A combination of these meant the company was struggling to identify a suitable VFD."

One of the most powerful drives in its class

The Optidrive P2 is one of the most powerful VFDs in its class. It combines high performance with ease of use. It can handle 150% overload for 60 seconds. In this instance, an IP55 rated, Frame Size 6 with 110A, 380V-480V, 3PH input was chosen.

"The customer was impressed with the speed of the installation and commissioning, something the Optidrive range is well known for. Its ability to handle the large capacity and powerful motors without any problems was also a major plus for the business which has been able to continue production without any issues," added Marcus.



Identification at the Highest Level with the New Universal Code Reader Series VOS Ident

Identification tasks for code readers in factory automation are enormously diverse. Whether standstill or high-speed, printed or directly marked codes, large distance, or minimum code size—the VOS Ident offers the perfect solution for a wide variety of application requirements. As an expansion of the VOS universal vision sensor series, the VOS Ident series devices are specialized in reliably reading all common 1-D and 2-D codes, including lasered/needled codes (DPM).

Due to powerful functions and their extensive adaptability, the VOS Ident sensors master even highly complex and individual applications. They are suitable for both small and large distances from 70 mm up to 2 m. The VOS Ident devices not only impress with their large scanning ranges, they also reliably read extremely small codes with a module size of up to 0.1 millimeters.

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Multifunctional and Flexible in Use

The intuitive user interface of the VOS Ident sensors ensures optimal workflows and easy handling of the devices. Depending on the application requirements, multiple sensors can be combined. Additional reading windows can be created via multiwindow, with up to 64 codes being recognized in each window using the multicode function. This function is very useful in the field of electronics manufacturing, for example. The printed circuit boards used there have codes of different types in different positions which are reliably detected due to multicode reading. The VOS Ident series also offers the option of code quality output based on ISO 15415, ISO 16022 and ISO/IEC TR 29158 (AIM DPM).

Additionally, all devices allow convenient remote access and storage of up to 32 jobs. Image storage is possible both on the sensor and on the FTP server. The sensors can be easily integrated into programmable logic controllers and PCs via common interfaces such as Ethernet TCP/IP, PROFINET IO, EtherNet/IP™, RS-232 and I/Os. Moreover, the output string can be customized and integrated into the system using the Vision Configurator operating software. The inputs and outputs of the devices can also be flexibly defined.

VOS Ident Portfolio at a Glance

Just as diverse as their features are the designs and application areas of the VOS Ident sensors. The VOS2000-I offers a resolution of 1.2 megapixels and features integrated white illumination as well as several lenses for the detection of large and small fields of view. The VOS5000-I, on the other hand, has a resolution of 5.2 megapixels and therefore enables code reading at an especially large scanning range. For maximum flexibility, both code readers are also available as C-mount variants. Pepperl+Fuchs offers a complete portfolio of external illumination and lenses for

this purpose. The illumination is simply attached to the code reader and controlled through it—no additional power supply is required. The sensors in the VOS Ident series can master any identification task—from track-and-trace applications in the automotive industry to demanding applications in warehousing and materials handling technology, such as multipage reading on cartons and trays at standstill or high speeds.

Highlights of the VOS Ident Sensor Series

- Reliable reading of 1-D and 2-D codes at large distances from 70 mm up to 2 m
- Multifunctional: parameterization of up to 32 jobs, match code, multicode, output string formatting and multiwindow as well as multisensor mode
- Flexibly adaptable hardware and software
- Interfaces: Ethernet TCP/IP, PROFINET IO, EtherNet/IP™, RS-232 and I/Os.
- Code quality output based on ISO 15415, ISO 16022, ISO/IEC TR 29158 (AIM DPM)
- Extensive accessory portfolio of external lighting sources and lenses

ROKBAK REVEALED: THE NEW NAME FOR TEREX TRUCKS

Articulated hauler specialist Terex Trucks rebrands as Rokbak and announces its vision for an exciting new future. The Scottish manufacturer unveiled the new brand at a digital launch event on September 1, attended by dealers, customers, media, and Volvo Group colleagues from around the world.

Rokbak is the new name for Terex Trucks, with the new brand representing the continuation of its strong hauling heritage with a future-focused vision. Throughout the last four decades, the company has never wavered in its promise to customers to deliver powerful and reliable articulated haulers – and that legacy remains front and centre within the new brand. At the same time, the Rokbak name represents an exciting new future and reflects the significant advances the organization has made in recent years as well as its new strategic priorities.

"Our company has an incredible history and a proud heritage,"

Paul Douglas, Managing Director.

"Seven years ago, we became a member of the Volvo Group, which allowed us to make major improvements in every part of our business. Millions of pounds have been invested in improving our products, modernising our facilities, expanding our network, and developing our people. It has been a process of continual evolution. That's why we feel it's right to recognize this evolution with a new brand name to launch an exciting new chapter in our history. And we'll keep investing to further improve our machines for our customers."

ARTICULATED HAULERS THAT DON'T BUCKLE UNDER PRESSURE

The significant investments and improvements in the company's articulated haulers in recent times have ensured they remain among the most robust and reliable machines around. Now, with their foundation in the predecessor models from Terex Trucks, the 28-tonne payload RA30 and 38-tonne payload RA40 from Rokbak are the most productive and efficient articulated haulers the company has ever made.

As part of the new brand launch, the machines now come in Rokbak colours and livery.

While maintaining the experienced design, craft and precision that are synonymous with the company's haulers, the RA30 and RA40 deliver better fuel economy, lower emissions, improved safety, and greater durability. With a tough design that's built to last, the haulers power through hard work with ease, boosting customers' productivity no matter how tough the conditions.

"We're very excited to reveal our new brand, and of course our haulers are the shop window," Paul Douglas

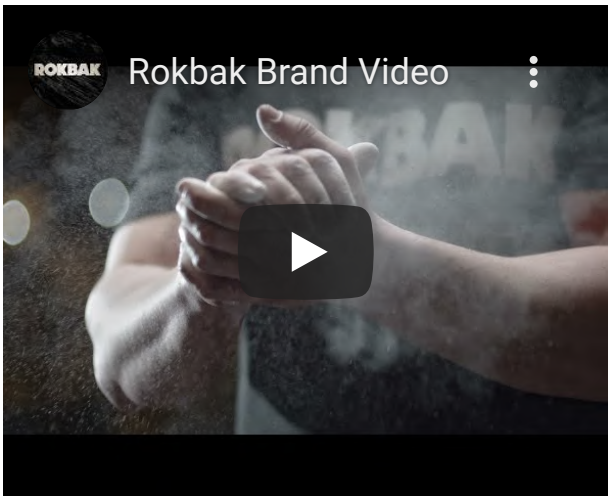
"Rokbak stands for power, performance and reliability. We already have a very healthy order book for the new brand, and we want to further expand our reputation, dealer network and market share. We're still the same skilled, experienced, and passionate team, committed to making rock-solid haulers every day. But we also have a clear vision for where we want to go and who we want to be."

ROKBAK HAS YOUR BACK

As part of the Volvo Group, Rokbak has experienced steady evolution over the past seven years. While this has taken place across the board, it is particularly prominent in four key areas: product design, sustainability, safety, and people.

In product design, the company has introduced Stage V engines for better fuel efficiency and operation for customers. Other improvements include a new transmission on the 28-tonne (30.9-ton) machine, the introduction of the Haul Track telematics, and a stronger focus on operator wellbeing and safety. In terms of sustainability, the company's manufacturing plant has shifted to 100% renewable energy as well as operating within Science-Based Targets and ISO standards, plus targeting CO_2 emission reductions.

The focus on safety has been emphasised in all areas, but particularly on its employees. Changes in processes at the factory have seen a stronger concentration on maintaining employee safety while simultaneously delivering high standards and low downtime. For the company's people at the heart of Rokbak, there is a continual focus on professional development, keeping the team at the forefront of skill and expertise.



Similarly, Dealer Operating Standards and training ensures the expanded dealer network continues to deliver the highest levels of service.

"We are proud and excited to have the modernized Rokbak brand continue as a fundamental part of our organization,"

Melker Jernberg, President Volvo CE and Executive Vice President Volvo Group.

"We believe in a sustainable future, innovation and the power of our people and we see that all encapsulated in Rokbak. At the same time, the company has its own personality, heritage and loyal customer base and it will be exciting to see the brand evolve further as it sets out on this new stage of its journey."

The Caterpillar Underground MINExpo display offers insights into the diesel electric drive design of the Cat® R2900 XE LHD

Built on the company's most popular load haul dump (LHD) platforms, the Cat® R2900 XE LHD will feature a diesel electric drive system that delivers high productivity, smooth and quick machine response, and improved digging and tramming performance. Employing a high-efficiency electric drive system, the R2900 XE will reduce fuel consumption to help customers achieve their goals for lower greenhouse gas emissions and total cost of ownership.

Allowing MINExpo 2021 attendees to see inside the new diesel electric drive design, slated for commercial availability in 2023, an R2900 XE drivetrain is a part of the Caterpillar Underground display. The exhibit emphasizes the model's high-efficiency Switch Reluctance (SR) electric drive system and redesigned axles, wheel and brake groups.

Superior productivity, less fuel

Increasing payload more than 9% over the Cat R2900G, the R2900 XE offers an 18.5-tonne (40,785-lb) rated loading and tramming payload for a 3- to 4-pass match with the Cat AD63 truck. The electric drive system delivers 52% faster acceleration and improved machine response, while reducing fuel consumption by more than 30% in many applications. The redesigned lift arm and components geometry, combined with load-sensing hydraulics and new bucket geometry, increase the R2900 XE's breakout force by 35%.

The machine's high-efficiency SR electric drive system replaces a mechanical transmission to deliver improved power and faster cycle times compared to the R2900G, with variable speed control and implemented virtual gears for machine controllability. With no driveline or powertrain shock loads, the diesel electric LHD offers smooth directional changes. Programmable speed management improves operator efficiency and reduces fatigue, while automatic retarding controls help to maintain speed on grade. Steering and transmission integrated control (STIC™) maximizes loader responsiveness with a single lever that combines directional selection, virtual gears and steering into a single lever.

Built for the global market, the Cat C15 engine powering the R2900 XE comes in configurations to meet a range of emissions regulations, including EU Stage V and U.S. EPA Tier 4 Final. Its Stage II- and Tier 2-equivalent Ventilation Reduction (VR) engine configuration can be equipped with diesel particulate filters to reduce diesel particulate matter. The diesel electric design enables the engine to operate at a lower 1,600 rpm to reduce fuel burn, heat generation and exhaust emissions, while increasing power. Mines have the option of equipping the loader with a high-efficiency radiator.

Improved technology and hydraulics

The R2900 XE features Autodig to optimize loading and traction control to maximize tire life. The machine easily integrates available technologies to further increase operating efficiency and productivity with factory-ready Cat MineStar™ for Underground. Scalable levels of remote operation from line of sight to full automation help to increase production efficiency and operator safety. Standard Product Link Elite delivers machine health monitoring to improve uptime availability.

The diesel electric LHD's lift and tilt system includes variable piston pumps for higher flow rates, faster cycle times and powerful lift forces. Load sensing hydraulic piston pumps deliver the exact flow and pressure required for hydraulic functions to improve efficiency and reduce heat. Improving cycle times and operator comfort, optional ride control dampens the lift circuit to reduce fore and aft pitch.

Durability and ease of maintenance

The R2900 XE is built for long life and easy maintenance. It leverages the heavy structure rear design of the R1700 to further enhance long-term durability. Improvements to the brakes, axles, auto retarder, frame and articulation increases machine longevity and operating reliability. Its electric drive system has fewer moving parts than mechanical transmissions to reduce service requirements, provide easy maintenance and extend maintenance intervals.

Careful Policy Design Could Unlock Massive Rooftop Solar Market Around the World

• New BloombergNEF and Schneider Electric report finds rooftop solar market still largely untapped with potential to exceed 2,000 gigawatts of solar and 1,000 gigawatt-hours of energy storage by 2050

Customer-sited solar is a major untapped opportunity, which could see 167 million households and 23 million businesses worldwide hosting their own clean power generation by 2050, according to a joint report by research firm BloombergNEF (BNEF) and Schneider Electric. These deployments will unlock major decarbonization benefits, but policy and tariff design will be critical to enable them.

The report 'Realizing the Potential of Customer-Sited Solar' finds that rapidly falling costs of solar technology have already made it economical for homes and businesses to generate their own power in some markets. In Australia, for example, the payback period for households investing in solar has been favorable, at less than 10 years, since 2013. As a result, adoption has already taken off, with more than 2.5 gigawatts of residential solar added in 2020 alone.

These solar installations can generate economic returns for the hosting homes and businesses, as well as wider benefits in terms of carbon emissions reductions, peak load reductions, and employment opportunities.

Kick-starting the market

Experience shows that solar adoption mainly occurs when there is an economic case for the households and businesses investing in the technology, usually in the form of high internal rates of return (IRR) or short payback periods. In regions where the economics have not yet reached such tipping points, policy makers are introducing targeted incentives to create favorable market conditions and bring forward deployment.

One such example is France, where existing incentives mean that

residential solar can earn internal rates of return of around 18.5% (a five-year payback), and commercial installations achieve 10.4% IRR (or a nine-year payback). This has stimulated gradual growth in the market, to about 500 megawatts of installations in 2020.

A key consideration at the early stage of market development is to avoid an unsustainable boom. Policy designs should account for the fact that solar costs will continue to fall over time, and moderate support to reflect these changing dynamics.

Solar for new-build homes and businesses

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A key consideration at the early stage of market development is to avoid an unsustainable boom. Policy designs should account for the fact that solar costs will continue to fall over time, and moderate support to reflect these changing dynamics.

Introducing energy storage and flexibility

As solar markets develop and mature, policy makers and regulators must gradually shift their emphasis toward unlocking flexibility and encouraging the adoption of energy storage. This is because high levels of solar adoption can lead to excess energy production during the day, while also possibly destabilizing the power grid. At this stage, the addition of energy storage becomes valuable, as it allows the renewable electricity to be stored for use during evening hours.

Tools to encourage energy storage include adjusted export rates (the payments offered to solar owners when they export energy to the grid), time-of-use retail electricity rates (which reflect the lower generation costs of solar during the daytime), enabling payments for storage to provide grid services (sometimes called aggregation payments), and implementation of demand charges (primarily for business customers). These levers are generally meant to make rates more reflective of generation and grid costs but are also likely to encourage energy storage.

In California, for example, reducing export rates to 35% of retail tariffs, while it would damage the economics of solar overall, would shift the emphasis over to solar systems paired with storage, which would still generate a 13% IRR. For commercial and industrial installations, adding so-called aggregation payments for batteries would boost IRRs to 22.8%, making solar-plus-storage a more attractive option than solar alone.

Optiq Schlumberger Fiber-Optic Solutions Launched

Fiber-optic sensing solutions redefine measurement acquisition and reduce carbon emissions in multiple domains across energy industry

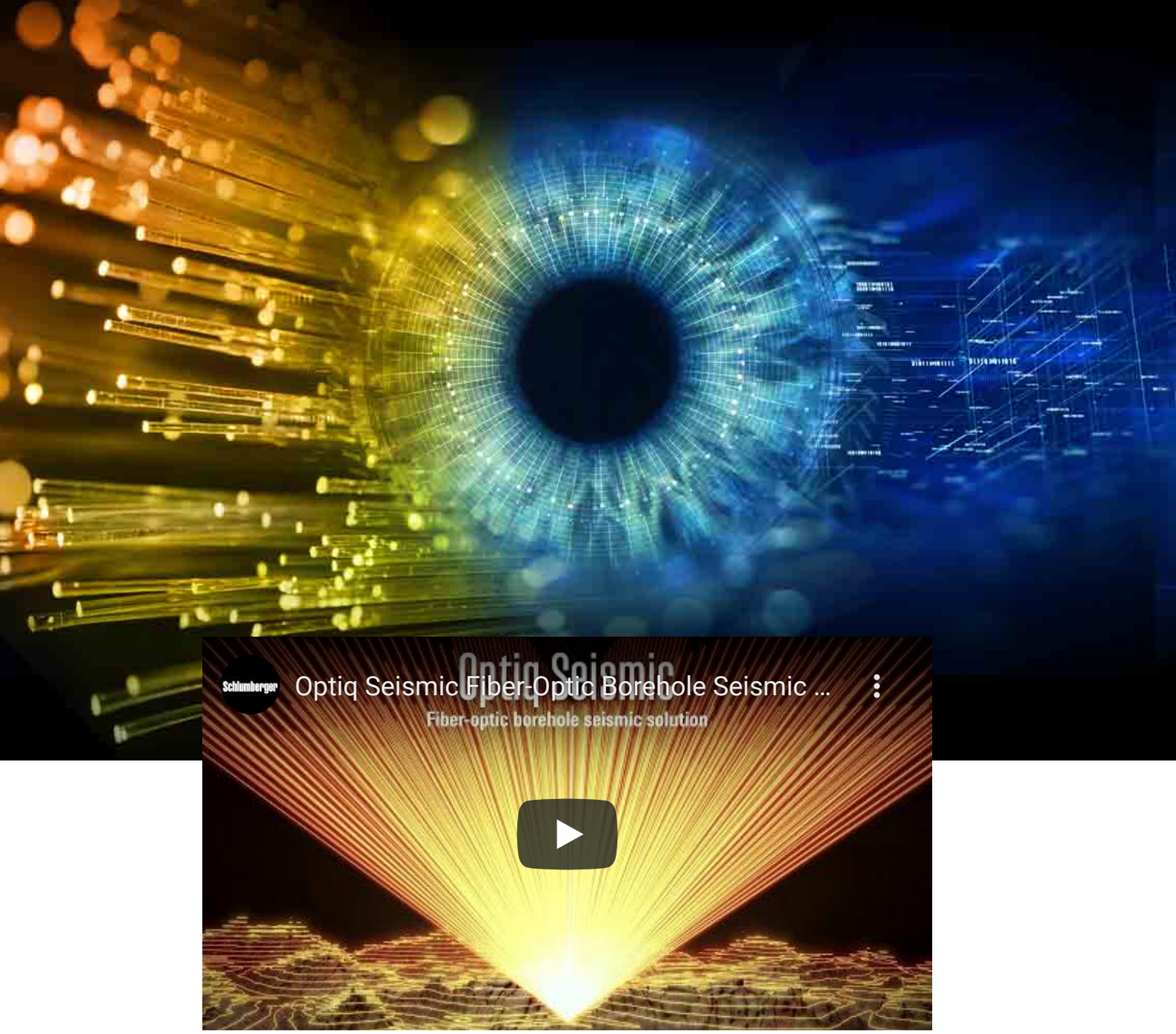
Schlumberger announced today the launch of Optiq* Schlumberger fiber-optic solutions, which deliver multidomain distributed sensing capabilities for a wide range of applications and environments across the energy industry. Optiq solutions provide continuous and instantaneous measurements, and when coupled with Schlumberger's broad digital offering, deliver actionable insights leading to greater operational performance, efficiency, and reduced environmental impact.

"With our recent technological advancements, we have improved access to fiber-optic solutions, enabling the energy industry to harness the full power of this game-changing technology,"

Gregorio Acero, Head of Quality Management & Health, Safety, and Environment at Siemens Gamesa.

"Optiq solutions are providing customers with greater subsurface understanding and improved production systems performance—all while reducing operational footprint and carbon intensity."

Optiq solutions now span the full range of deployment options: permanently installed behind casing or on tubing, exiting through dry or subsea trees, along pipelines, and on to other midstream and downstream infrastructure; or temporarily deployed via Schlumberger fiber-optic coiled tubing, slickline, or wireline conveyances. Integrated with Schlumberger's leading digital capabilities—including intelligent end-to-end workflows, edge processing, and cloud-native applications—Optiq solutions enable the large volumes of data associated with fiber-optic measurements to be processed up to 18 times quicker than current industry practices and unlock a range of applications from borehole seismic to production and



Optiq solutions are represented within the Schlumberger Transition Technologies* portfolio, which helps customers minimize emissions and reduce energy consumption while simultaneously driving efficiency, reliability and performance. For example, the Optiq Seismic* fiber-optic borehole seismic solution reduces data acquisition time by up to 99%, significantly reducing associated energy consumption and carbon emissions. The Optiq Seismic solution has been used to acquire more than 70 vertical seismic profiles (VSPs) in more than 17 countries. In the Gulf of Mexico, the solution was used to record 3D VSPs in four producing wells, saving 88 days of acquisition time and reducing CO_2e emissions by estimated 7,537 metric tons when compared to conventional methods.

Additionally, Optiq solutions are being used to improve subsurface understanding for carbon capture and storage and new energy applications such as optimizing geothermal energy production systems.

Komatsu introduces concept autonomous water truck -In development vehicle planned for commercially availability in 2022-

Komatsu Ltd. (President and CEO: Hiroyuki Ogawa) has been trialing an autonomous water truck, based on its proven Autonomous Haulage System (AHS). The technology on the concept HD785-7 truck autonomously controls both the truck's movement and water disbursement through the same platform.

Komatsu is working to introduce the HD785-based autonomous water truck as a commercial offering in 2022 to help enhance safety and productivity in mines. Komatsu's AHS enables the water truck to travel autonomously on a pre-defined haul road and work cooperatively with other autonomous trucks and staffed equipment. The system controls the amount of water disbursed, according to the vehicle speed and haul road inclination, and also manages the watering history to avoid overwatering.

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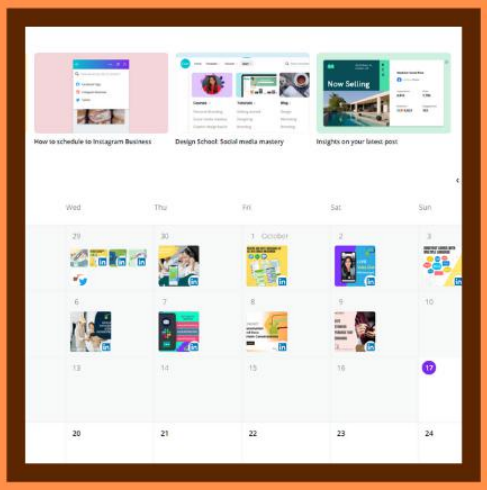

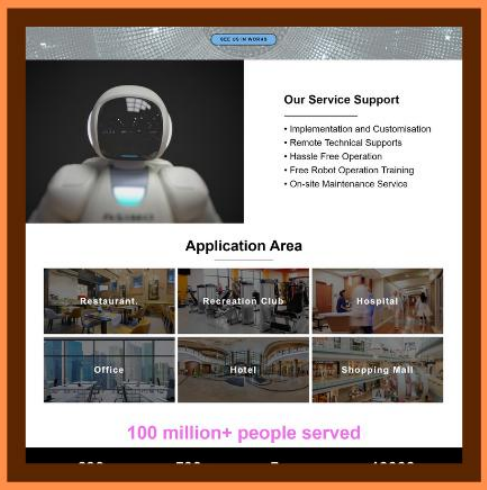

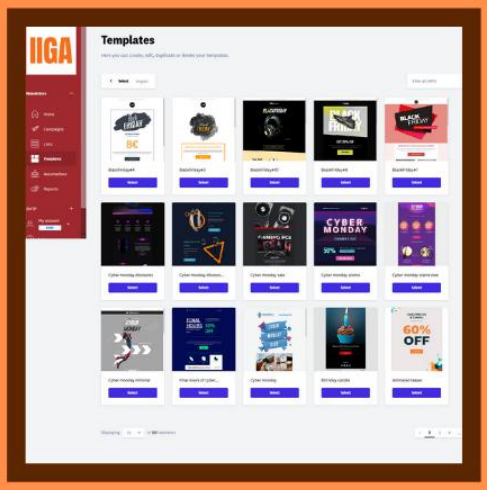

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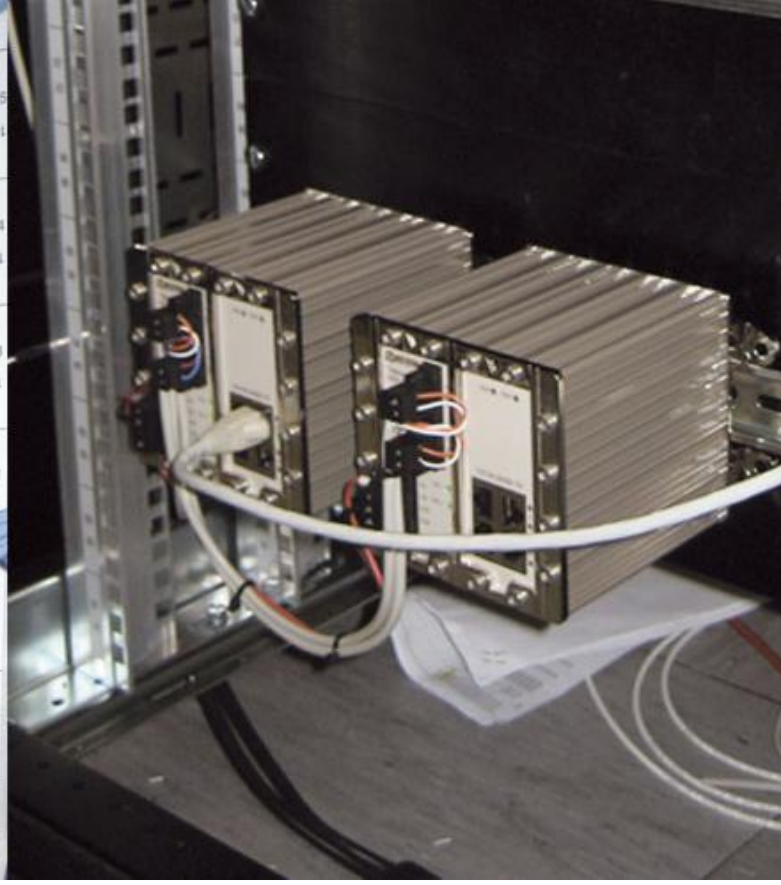
Amsterdam gas and energy distribution

Alliander is one of the biggest energy suppliers in the Netherlands with 2,5 million customers in the Netherlands and Belgium. They generate electricity (20TWh yearly, green and grey) and distribute it, as well as gas to a major part of the Dutch domestic and industrial market.In a project to upgrade a gas distribution control and monitoring SCADA system in Amsterdam, Westermo Wolverine Ethernet extenders were selected as they could provide a cost-effective, and resilient network solution using existing cable infrastructure.

One of the divisions of Alliander is Liandon. This engineering and project management division were contracted to provide a telemetry system for the gas network in Amsterdam.

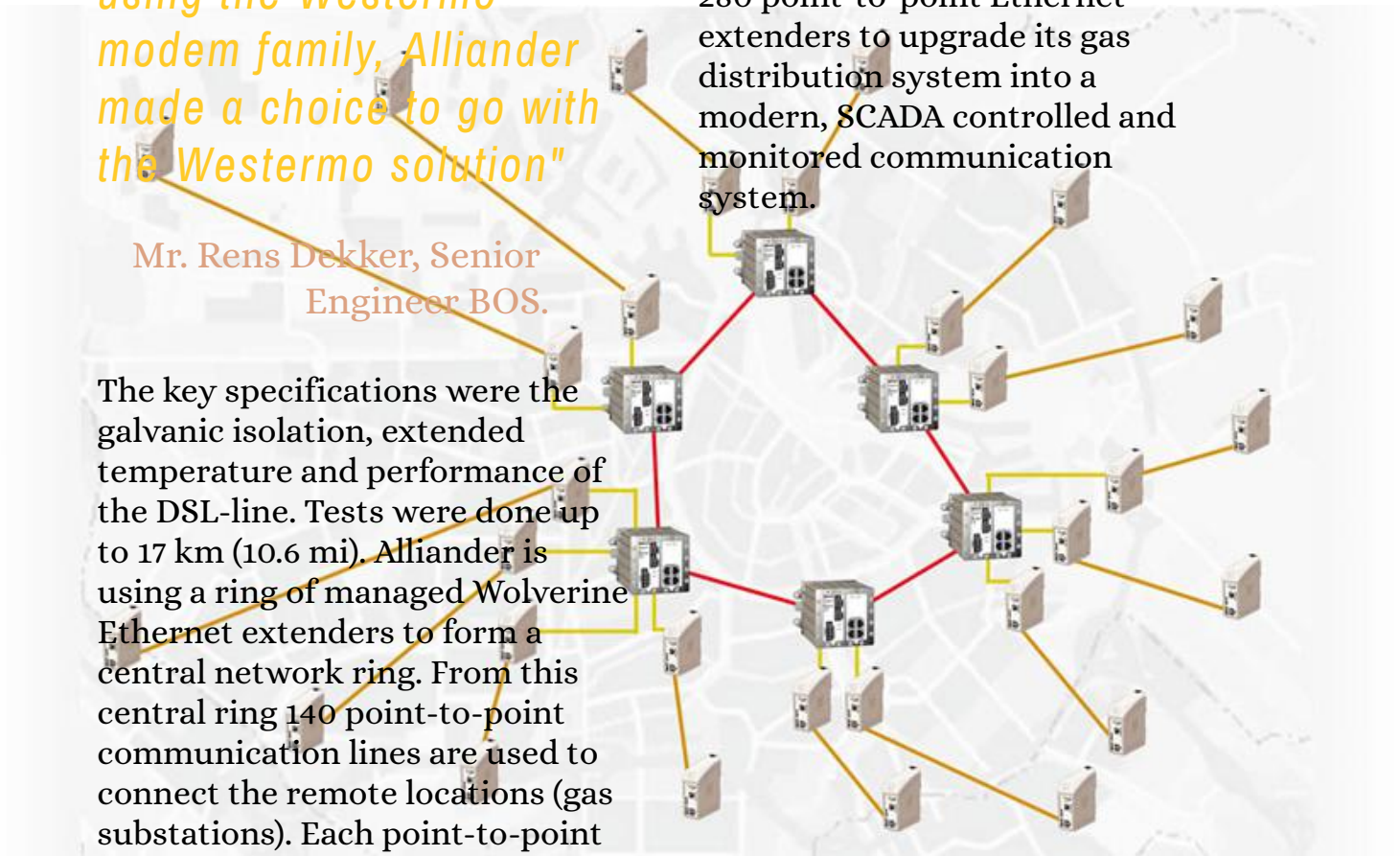
Amsterdam has a large number of gas-substations where Alliander can regulate the gas distribution network for the Dutch capital. There was however a requirement to not only regulate, but also monitor in real-time usage, alarms and flow measurement. With this information Alliander can deliver better services to their customers and reduce cost. For the remote telemetry unit Alliander chose a new RTU, the D05-MCU-IEC from Data watt Telecontrol Systems that utilizes the Ethernet based IEC 60870-5-104 communication protocol. Using fibre-optic cabling for the Ethernet communications would have been the logical choice because many of the Ethernet links would exceed the maximum 100 m (328 ft) range for UTP cable. Fibre would however be too expensive and nearly impossible to install in a short time frame and in a crowded city. The solution was simple; make use of the existing copper cabling which already existed in Alliander's own telecom and signalling cable network.



"After some successful tests with the Wolverine Ethernet extenders and our previous experiences using the Westermo modem family, Alliander made a choice to go with the Westermo solution"

Mr. Rens Dekker, Senior Engineer BOS.

The key specifications were the galvanic isolation, extended temperature and performance of the DSL-line. Tests were done up to 17 km (10.6 mi). Alliander is using a ring of managed Wolverine Ethernet extenders to form a central network ring. From this central ring 140 point-to-point communication lines are used to connect the remote locations (gas substations). Each point-to-point link consists of two point-to-point Wolverine Ethernet extenders to extend the Ethernet link up to a maximum of 12 km (7.5 mi). In total Alliander will install 6 managed Wolvering Ethernet extenders and 280 point-to-point Ethernet extenders to upgrade its gas distribution system into a modern, SCADA controlled and monitored communication system.



PONANT's polar explorer reaches North Pole with ABB technology, setting new standards for cruise

• Le Commandant Charcot makes history with ABB's Azipod® propulsion as the first exploration cruise vessel to reach the North Pole
• The vessel is built with respect to environment and features the largest energy storage system ever installed on a cruise ship for maximum sustainability

The hybrid-electric exploration cruise vessel Le Commandant Charcot became the first vessel of its kind to reach the geographic North Pole on September 6, 2021, as it was completing the sea trials in preparation for welcoming guests for the maiden voyage later this year.

Equipped with Azipod® propulsion technology, the luxury cruise ship produces minimal noise and vibrations to provide a comfortable passenger experience. Moreover, the ship's energy storage system, supplied and integrated by ABB, is the largest ever delivered to a vessel of its kind at almost five megawatt hours, allowing the engines to be switched off for silent, emissions-free cruising.

Le Commandant Charcot will also be available to the scientific community contributing to the global efforts in the study and preservation of the Poles and oceans. The vessel is equipped with measurement instruments, and features science labs as well as a moon pool for taking samples, with all of the equipment designed to meet the requirements of academic research. With that, Le Commandant Charcot offers a platform for observation, research and analysis to scientists around the world, enabling them to study remote areas by regularly collecting data in these zones.

"ABB designed both the Azipod® propulsion units and the energy storage system to meet the precise operational requirements of Le Commandant Charcot,"

Mathieu Petiteau, Director, Newbuilding and R&D, PONANT

"As well as ensuring a high level of passenger comfort, the vessel is capable of cruising in zero-emissions mode while exploring remote locations. Thanks to the Azipod® system's maneuverability, the ship will also be able to navigate smoothly and safely through icy waters."

"Azipod® propulsion has become the preferred solution for exploration cruise vessels operating in highly sensitive and demanding marine environments. We are proud to have been chosen by PONANT and look forward to seeing Le Commandant Charcot in action for the years to come," said Dick Björkqvist, Global Segment Manager, Cruise, ABB Marine & Ports.

With the electric drive motor situated in a submerged pod outside the ship hull, the Azipod® system can rotate 360 degrees, significantly increasing maneuverability and operating efficiency of a vessel and cutting fuel consumption by up to 20 percent compared to conventional shaftline systems. Since its launch 30 years ago, Azipod® propulsion has saved a total of over 1,000,000 tons of fuel in the passenger cruise segment alone. Options for Azipod® propulsion range from 1 to 22 megawatts, and its technology plays a key role in ABB's strong position for environmentally friendly electric propulsion.

Le Commandant Charcot is the first cruise ship with the ability to sail in 'double-acting mode', meaning it can navigate stern-first in ice conditions to improve safety and complete cruises in a timely and efficient manner. In addition, the Azipod® system allows the vessel to be brought to a complete stop in 50 percent less time than a ship with a traditional shaftline set-up.

The vessel's emphasis on safety is further reflected in its connectivity to the ABB Ability™ Collaborative Operations infrastructure. With round-the-clock access to a worldwide network of ABB experts, Le Commandant Charcot will benefit from remote equipment monitoring and diagnostics for enhanced passenger and ship safety – services that are particularly important for vessels operating in the farthest reaches of the globe.

ABB's scope of supply for this pioneering vessel also includes power generation and distribution technology, propulsion-control and remote-control systems and a Power and Energy Management System (PEMS™). Through the PEMS™, Le Commandant Charcot will optimize the use of its hybrid power sup-ply – comprising the main power source, liquefied

natural gas, and the energy storage system – to ensure optimal engine load with reduced fuel consumption and emissions. The ship also features ABB's Power2 two-stage turbocharging solution, further increasing fuel savings by up to five percent.

"With yet another high-spec passenger vessel delivered to its owner featuring ABB integrated power and propulsion technology, we are rapidly expanding our portfolio in this segment,"

Juha Koskela, Division President, ABB Marine & Ports

"Le Commandant Charcot perfectly demonstrates the benefits of our electric, digital and connected solutions for this kind of ship, offering a blueprint for other expedition vessels to follow."

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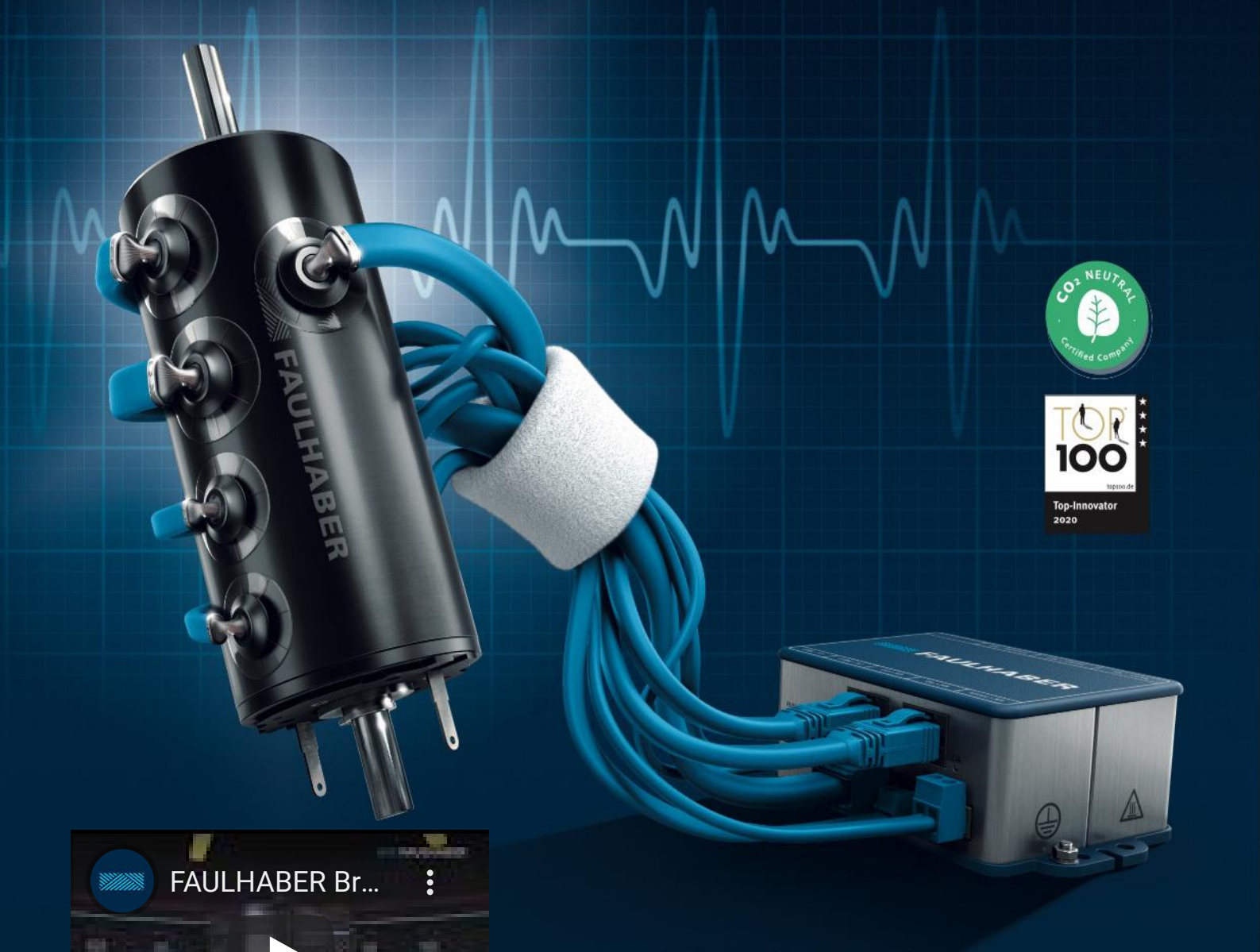

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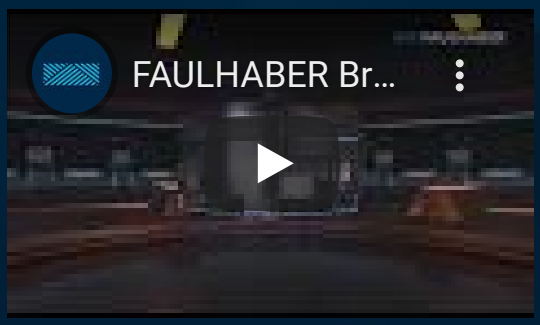

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WE CREATE MOTION

Digitizing Oil and Gas Production

Automation is an important answer to the industry's upstream challenges.

The rapid progress of technology such as big data and analytics, sensors, and control systems offers oil and gas companies the chance to automate high-cost, dangerous, or error-prone tasks. Most oil and gas operators are starting to capture these opportunities and would do well to accelerate their efforts. Companies that successfully employ automation can significantly improve their bottom line.

While automation offers many potential benefits in the upstream value chain of exploration, development, and production, some of the biggest opportunities are in production operations, such as reducing unplanned downtime. Given the oil and gas industry's substantial increases in upstream capital investment, optimizing production efficiency1 is essential. Automation creates several opportunities to that end: maximizing asset and well integrity (by which we mean optimizing production without compromising health, safety, and the environment), increasing field recovery, and improving oil throughput.

With the substantial production volumes of offshore production platforms, even small improvements in production efficiency will have meaningful financial impact, as additional throughput translates directly into more revenue. In the low-volume regimes of current unconventional mature assets—oil sands, for example—carefully targeted automation steps can cut

costs and, more important, can also improve the reliability of production equipment, leading to higher revenues that can extend an asset's economic life.

Industry challenges

Our benchmarking analysis of North Sea offshore platforms illustrates the efficiency challenge that many oil and gas companies face. Research shows that average production efficiency dropped in the past decade, while the performance gap between industry leaders and other companies widened, from 22 percentage points in 2000 to around 40 percentage points in 2012.

Benchmarking data also illustrate the broad opportunity for improvement. Best-in-class players do not incur higher costs to improve production efficiency, and high performance is not linked to a specific asset type or the maturity of assets. Instead, companies with high production efficiency are often similar in their quality of operations, approach to eliminating equipment defects, equipment choices, and planning and execution of shutdowns. While our benchmarking focuses on North Sea offshore platforms, we expect to see similar patterns in other regions.

Regardless of location, most oil and gas companies also face issues that complicate efforts to achieve sustained production-efficiency improvements. We believe further automation can play a major role in addressing the following industry-wide challenges.

More complex operations. Increasing volume and complexity in hostile, remote locations (for example, arctic, offshore, and deepwater) require reliable remote and automated or semiautomated operations, and logistics optimized for efficiency. Mature assets with declining production need very efficient maintenance schedules to keep production profitable.

Zero tolerance for health, safety, and environmental incidents. This is a nonnegotiable imperative. Recent industry experience has shown that in the current highly regulated environment, such incidents can threaten not only profitability but also the very existence of an operator. Automated production control, monitoring the condition of the equipment, and predictive shutdown systems are now basic requirements to prevent or mitigate catastrophic events in geographically dispersed remote operations.

The talent and experience gap. The industry is in the most dramatic demographic shift in its history, commonly referred to as "the big crew change." Thousands of petrotechnical professionals will be retiring soon, resulting in a knowledge and experience crisis for the industry. Retention and recruitment are unlikely to fill the gap completely. This development drives efforts to codify many routine analysis and decision-support processes and, where possible, to automate them.

The automation imperative

Automation is not without its own challenges. Today's intelligent oil field is flush with digitally enabled wired systems, equipment, and components. A typical offshore production platform can have more than 40,000 data tags, not all connected or used. Converting this complex flood of data into better business and operating decisions requires new, carefully designed capabilities for data manipulation, analysis, and presentation, as well as tools to support decision making.

The impact of addressing these automation challenges can be material. Judging by our benchmarking research, improving production efficiency by ten percentage points can yield up to $220 million to $260 million bottom-line impact on a single brownfield asset. For declining assets, automation could extend field life in an economically viable way. The potential could be even more significant for greenfield assets, where required instrumentation can be included from the start as part of the design. However, operators and drilling contractors are not the only players looking for a share of the production-efficiency gains in oil and gas.

"We expect industry leaders to increasingly adopt automation in upstream production operations, leading to improved efficiency. As a result, the performance gap with industry laggards could widen further. To illustrate how oil and gas companies can unlock the value of automation, we analyzed production maintenance, where the opportunity is particularly attractive."

Applying automation to maintenance

There are many ways in which automating maintenance can improve production efficiency. For example, radio-frequency-identification tagging of equipment, along with the use of other sensors, can help track activity. Tracking, in turn, enables applications that can monitor the condition of equipment and support predictive maintenance and automated operations shutdowns. These applications minimize risk of catastrophic failures and process disruptions, while maximizing equipment reliability and production efficiency.

But unlocking the value of automation in maintenance isn't only about having lots of data. Some companies struggle to maintain data quality across their IT networks. Others are not good enough at aggregating data and conducting meaningful analyses. Yet others experience challenges in turning analysis into action. That's why many oil and gas operators need to identify the information shortfalls or leakages that occur when capturing data from processes, systems, and data stores and move them to where operational and business decisions are made. Having identified the leakages, they must then address them by improving the automation of their data flows.

Many forms of leakage impair automation in maintenance. One example is having only isolated data availability from individual equipment components, as opposed

to more network-based availability. Another is having only equipment-level profiles of components at risk, as opposed to comprehensive coverage at the asset level. A third example is to only catalog critical equipment failures rather than conduct extensive root-cause analysis of them.

Automated support of real-time decisions and actions to reduce planned and unplanned downtime require the following elements.

Data capture. This involves automated hardware sensors and manual data capture by engineers. Both should be deployed based on a detailed analysis of use cases, which are a method for gathering the functional requirements of applications.4 Hardware sensors should help ensure sufficient coverage of data, as well as provide redundancy (that is, data backups) for high-value measurements of equipment-performance data. High-precision hardware sensors are usually more costly than low-precision sensors and should be used only in critical cases. Manual data capture is useful when parts of assets are not yet equipped to monitor and measure performance or for inspections and failure analysis. Using regulatory-certified handheld electronic devices for manual data capture improves data accuracy, consistency, and availability.

Data infrastructure and data management. Data infrastructure—ranging from transactional data in relational (such as enterprise-resource-planning) databases to data

n Apache Hadoop or similar big data analytics platforms—should allow companies to couple data from disparate sources of equipment and manual capture to aid decision-support analytics. Streaming of real-time data in situations requiring immediate data availability also needs infrastructure support. Technology choices should be made on an individual basis by evaluating the data flow and asking several questions: Is the volume of data high? Is it real time or batch? Are the data unstructured or structured? For example, for unstructured data processing, a solution like Apache Hadoop is more relevant than traditional relational databases.

Data analytics. Industry leaders are using analytical models to predict failures of critical equipment components. The next level of sophistication includes connecting all the parts of the end-to-end production value chain to optimize the balance between production and downstream stages, for example, by adapting upstream production levels to account for expected future demand shifts in downstream retail. It also includes using simulations to test failure scenarios in platform operations and employing text mining for analysis of unstructured input from engineers and operators.

Data visualization and staff training. Software applications are needed that present data and insights in a way that is closely tied to priority operational and business decisions. One example is knowledge systems that suggest actions to maintenance engineers who take into account previous repair approaches as well as

Success factors for automating oil and gas production

McKinsey & Company

Companies that have successfully pursued automation programs for production efficiency have employed several effective approaches.

Building multidisciplinary teams

Successful automation programs have staff with backgrounds ranging from process automation, process-domain expertise (for example, in maintenance), data management, and cybersecurity to interface design. These multidisciplinary teams include representatives from every aspect of the organization's IT function. Sometimes the teams also include equipment vendors.

Differentiating greenfield and brownfield automation

In greenfield automation programs, the digital processes are built in during project development to ready the technology for future advances, taking into account the five-to seven-year life cycle of these projects. For brownfield programs, companies develop overlays (for example, upgrades of wireless and mobile) that pull the required data flow out of the platform to support analytics units. This approach helps to avoid being locked in by technology choices from the past. Some companies use a library of reusable software components to achieve economies of scale across offshore platforms. In our experience, this library approach is preferred to mandating a single, centrally developed overlay across platforms.

Thinking big, piloting small, scaling fast

Companies with successful programs think in terms of total life-cycle costs and economics. They build a digitization team and make automation part of a corporate digitization program. Their automation programs are integrated with all aspects of their complex organizations, work processes, and human behaviors. Industry experience and prudent risk management dictate that this level of complexity be thoroughly tested and proved in small-scale pilot implementations. Once the concept is proved, rapid scaling is needed to secure the payoff. Such a scale-up requires tools and capabilities in technology-enabled transformation, change, and risk management.

CONSTRUCTION EQUIPMENT ECONOMIC OUTLOOK: STABILITY IS ON THE HORIZON

Fiscal stimulus has played a pivotal role in helping the U.S. economy recover.

Over the next couple of years, though, additional proposals carry a lot of potential for the construction industry in particular.

"We've included the American Jobs Plan (AJP) in our economic forecast,"

Mark Killion, Director of U.S Industry at Oxford Economics

"That is a significant assumption. There is a big infrastructure component to the AJP that could offer a lot of fuel for growth."

With respect to the public health situation, how the next several months play out will also impact the next couple of years. Oxford Economics' baseline forecast calls for 7.3% GDP growth in 2022. If vaccines show limited effectiveness against COVID-19 variants, growth may be just under 3%. If inflation persists, growth might be just under 6%. If all stars align and a "consumer boom" ensues, growth could jump to nearly 10%.

AEM offers a variety of business intelligence products designed to provide key industry insights, macroeconomic trends and industry data for a distinct competitive advantage.

Infrastructure deal Would Fuel Spending Across the Board

Focusing on just the manufacturing and construction sectors of the economy, model simulations indicate that the AJP could help raise output by 3.5% by the end of 2023.

The AJP would drive a significant increase in non-residential infrastructure spending.

"The private, local, state and federal sectors are all expected to boom away with double-digit growth at least through next year and 2023,"

Killion

Federal spending would take the most dramatic upward turn. Annual percentage increases from 2022 through 2025 are anticipated to be 29.4%, 26%, 12.5% and 2.5%, respectively. That's a total increase of 70% over a four-year period. Contrast that with the period of 2015-2019, when federal spending increased just 4.8%. State and local infrastructure spending would also get a big lift from the AJP. Growth of 33% is expected over the next four years. Funding from the private sector is expected to grow 37%.

"Manufacturers of construction machinery have had some pretty good pricing power. The parts sector has also started to turn up a bit. Inflation has been a problem, but manufacturers have had a good ability to maintain some margin and pass some of the rise onto customers."

Mark Killion, Director of U.S Industry at Oxford Economics

Construction for Commerce Offers Mixed Outlook

If the AJP is signed into law, the prognosis for infrastructure spending looks good from every direction. By contrast, Killion said construction spending for business and commerce offers a mixed outlook.

Some sectors have benefited from increased government funding, including health care and education. Others, such as office buildings, have not fared well. Some sectors, including warehouses and transportation facilities, have benefited from private funding.

"That's why the business sector as a whole has looked pretty decent, but the outlook remains quite mixed,"

Killon

Total PiP (put in place) construction for business and commerce was flat this year. Growth of 2.9% is expected next year, followed by 7.5%, 5.4% and 3.5% from 2023-2025.

"Construction spending in this sector appears to be following the pattern of business investment in general,"

Killion pointed out

The next two years could be especially strong at the federal level. Growth of roughly 15% is expected in both 2022 and 2023. State and local spending is also expected to strengthen to roughly 8% growth each year. Private sector funding is expected to remain flat next year before seeing a solid uptick of 6.6% in 2023.

Robust Residential Pipeline is Plugged

The housing market has been building up growth over the past couple of years. In 2020, private residential spending was largely driven by new single-family homes and existing home improvements. Looking forward through 2026, the most growth will come from single-family home construction.

Pricing and Demand Continue to Rise

U.S. home pricing isn't the only thing on the rise. According to Killion, manufacturing inflation pressures have also been high, though they may have reached their peak.

With demand continuing to cruise along, more AEM members are now indicating inventory levels that are too low. Roughly 45% say levels have been falling over the past several months.

"When a company says inventory is too low, it generally means it is not on purpose and that production must increase rapidly,"

Duyck pointed out

"Manufacturers of construction machinery have had some pretty good pricing power," he said. "The parts sector has also started to turn up a bit. Inflation has been a problem, but manufacturers have had a good ability to maintain some margin and pass some of the rise onto customers."

Strong demand continues from key sectors that purchase construction equipment. As a result, industrial production of construction machinery has rapidly increased since late-2020, now surpassing its pre-pandemic level.

"Production still isn't at the highs we saw over the past decade, though," Killion pointed out. "So, there is still room to run."

Inventories Drop, Backlogs Grow

The Global Picture

While inflation has hit pretty much everywhere, construction machinery prices have been especially high on the global market. As Killion pointed out, trade prices in the U.S. are up to near 2012 levels. Much like with agriculture equipment, both import prices and export prices have risen since mid-2020. Export prices, however, continue to climb and far exceed import prices.

Nonetheless, expanding global markets are still expected to support growth in the U.S. construction equipment industry. Total global spending on mining and construction machinery is expected to finish at a 21.5% gain this year, followed by 4.1% in 2022 and 2.8% in 2023.

Top 10

Oil & Gas Industry

Trends & Innovations in 2021

2086 startups & emerging companies analyzed

Top 10 Oil & Gas Industry Trends & Innovations in 2021

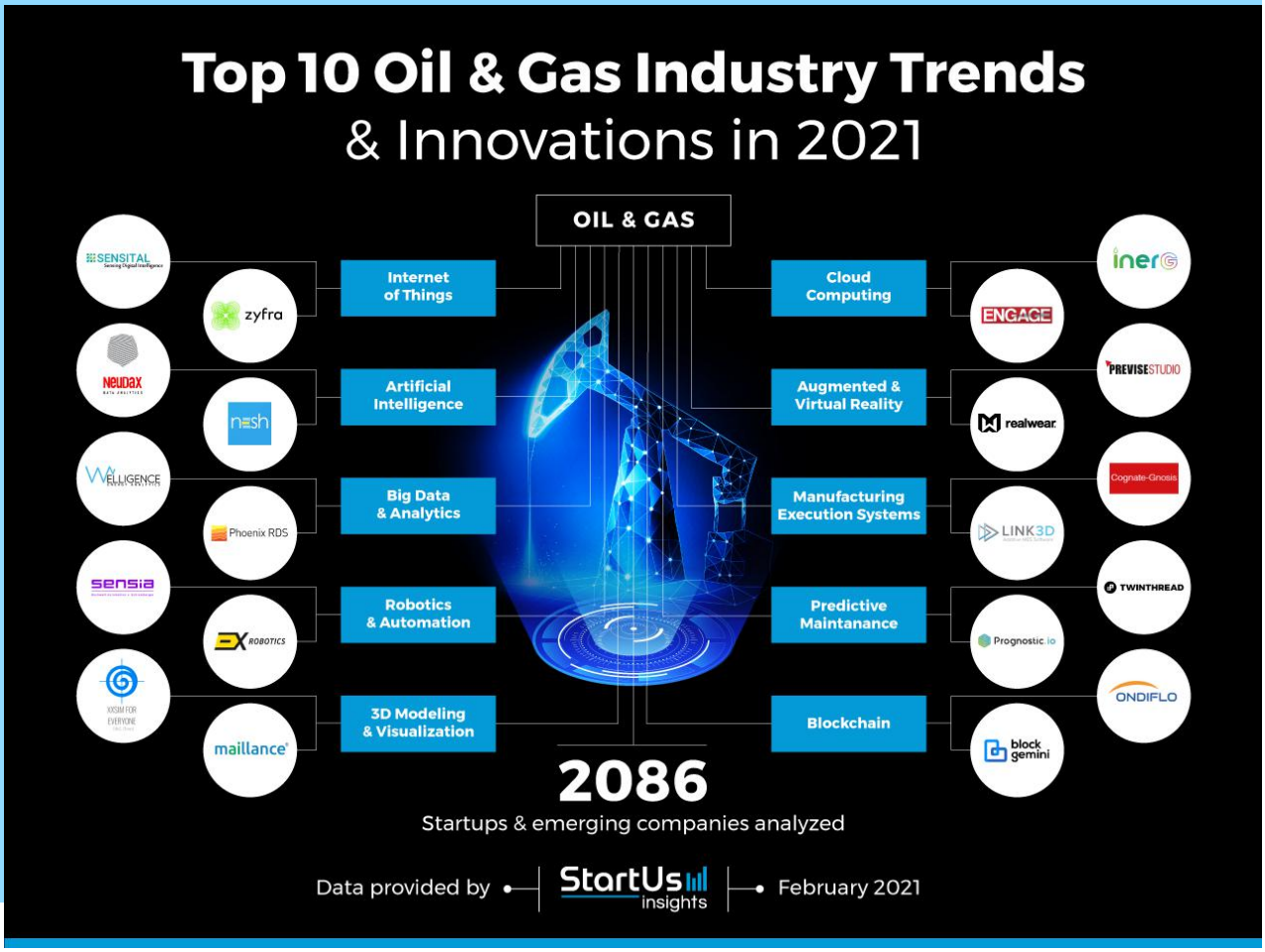
The housing market has been building up growth over the past couple of years. In 2020, private residential spending was largely driven by new single-family homes and existing home improvements. Looking forward through 2026, the most growth will come from single-family home construction.

Innovation Map outlines the Top 10 Oil & Gas Industry Trends & 20 Promising Startups

For this in-depth research on the Top Oil & Gas Industry Trends & Startups, we analyzed a sample of 2.086 global startups and scaleups. The result of this research is data-driven innovation intelligence that improves strategic decision-making by giving you an overview of emerging technologies & startups in the oil & gas industry. These insights are derived by working with our Big Data & Artificial Intelligence-powered StartUs Insights Discovery Platform, covering 2.093.000+ startups & scaleups globally. The platform quickly delivers an exhaustive overview of emerging technologies within a specific field as well as identifies relevant startups & scaleups early on.

Tree Map reveals the Impact of the Top 10 Oil & Gas Industry Trends

Based on the Oil & Gas Innovation Map, the Tree Map below illustrates the impact of the Top 10 Oil & Gas



Industry Trends. The internet of things (IoT) and artificial intelligence (AI) form the broadest oil & gas industry trends, with most of the other top 10 trends utilizing IoT and AI to improve oil & gas processes. Big data analytics, cloud technology, predictive maintenance, and manufacturing execution systems offer vital data management and analysis tools that significantly impact overall operational efficiency. Further, AI also enables robotic applications in oil rigs and refine oil well imaging processes. Oil & gas startups also develop Blockchain solutions to offer visibility and transparency across the entire oil & gas value chain. Finally, augmented and virtual reality technologies improve worker safety and enable remote operations, as well as virtual training and maintenance operations.

Global Startup Heat Map covers 2.086 Oil & Gas Startups & Scaleups

The Global Startup Heat Map below highlights the global distribution of the 2.086 exemplary startups & scaleups that we analyzed for this research. Created through the StartUs Insights Discovery Platform, the Heat Map reveals that Europe & the US are home to most of these companies while we also observe increased activity in India as well Singapore.

Top 10 Oil & Gas Industry Trends in 2021

1. Internet of Things (IoT)

The oil and gas industry utilizes IoT to improve production, optimize equipment, ensure worker safety, and monitor remote areas. Sensors placed inside wells, blowout preventers (BOP), and choke valves enable real-time data collection. Using this data, O&G companies identify faulty equipment quickly, helping field engineers predict and react quickly. IoT solutions allow oil and gas facilities to minimize maintenance costs and gain detailed visibility into their equipment or processes.

2. Artificial Intelligence

The oil & gas industry increasingly applies AI and data science to solve complex problems in upstream, midstream, and downstream operations. AI-enabled platforms support decision-making with insights from predictive, prescriptive, and cognitive analytics. In this way, AI helps petroleum engineers and oil & gas industry managers discover and implement new exploration & production ideas on the field to increase ROI.

3. Big Data & Analytics

Everyday operations in the oil & gas industry generate large volumes of unstructured data. Big data platforms help the industry's data analysts draw insights from production and performance data. This is also useful for engineers looking to optimize production and ensure the safety of reservoirs. Further, historical data of previous operations better train and test AI-driven algorithms and models. By using big data analytics, the oil and gas industry derives more value from everyday decisions to reduce operational costs and the industry's carbon emissions.

4. Robotics & Automation

Often, oil & gas operators work in complex and rugged environments, posing a significant risk to human safety. To address this risk, the oil industry is adapting to robotics solutions that increase workplace safety as well as the speed of operations. Robots are also useful for inspection, surveying, and industrial automation in oil rigs and refineries. Robotics and process automation not only speeds up

operations but reduces the manpower requirement, in turn, increasing efficiency and reducing human-induced errors.

5. 3D Modeling & Visualization

3D modeling & high-quality visualizations help create realistic representations of subsurface reservoirs and other O&G equipment. In combination with historical production data, 3D modeling simulates the production and injection phases during a reservoir's lifecycle. This helps to predict risks that impact the safety of the reservoir. Based on the data, oil & gas engineers optimize the production and operations planning. Further, 3D modeling and visualization lowers costs and reduces risks while increasing performance for the oil and gas assets.

6. Cloud Computing

Cloud computing is capable of storing and processing data on remote servers, freeing up expensive local memory and computing capacities. The oil and gas industry generates enormous amounts of data in its daily activities. Using cloud technology and software applications boosts oil & gas efficiency, security, scalability, and also eases digital transformation. Cloud-native tools, such as 'as-a-service' platforms – platform, storage, infrastructure, data, and more – enable advanced analytics, informative visual dashboards, and remotely accessible real-time insights.

7. Reality Technologies

Immersive technology includes augmented reality (AR), virtual reality (VR), mixed reality (MR), and extended reality (XR). In the oil and gas industry, AR/VR animations boost efficiency and reduce errors by showing real-time information about equipment, tools, and parts. For example, exploration & production (E&P) companies use reality solutions for remote monitoring, downhole imaging, and virtual training. Further, startups combine real and virtual environments to enable human-machine interactions using wearables and smartphone alerts.

8. Manufacturing Execution Systems (MES)

MES integrates manufacturing facilities, operational technologies, such as supervisory control and data acquisition (SCADA), and computing systems, to control the production process. As oil & gas equipment manufacturing processes are complex, engineers seek solutions to monitor and control the continuous operational processes. MES offers intelligent architecture for manufacturing systems with integrated control for the oil and gas industry that ensures faster, safer, and reliable oilfield production systems.

9. Predictive Maintenance

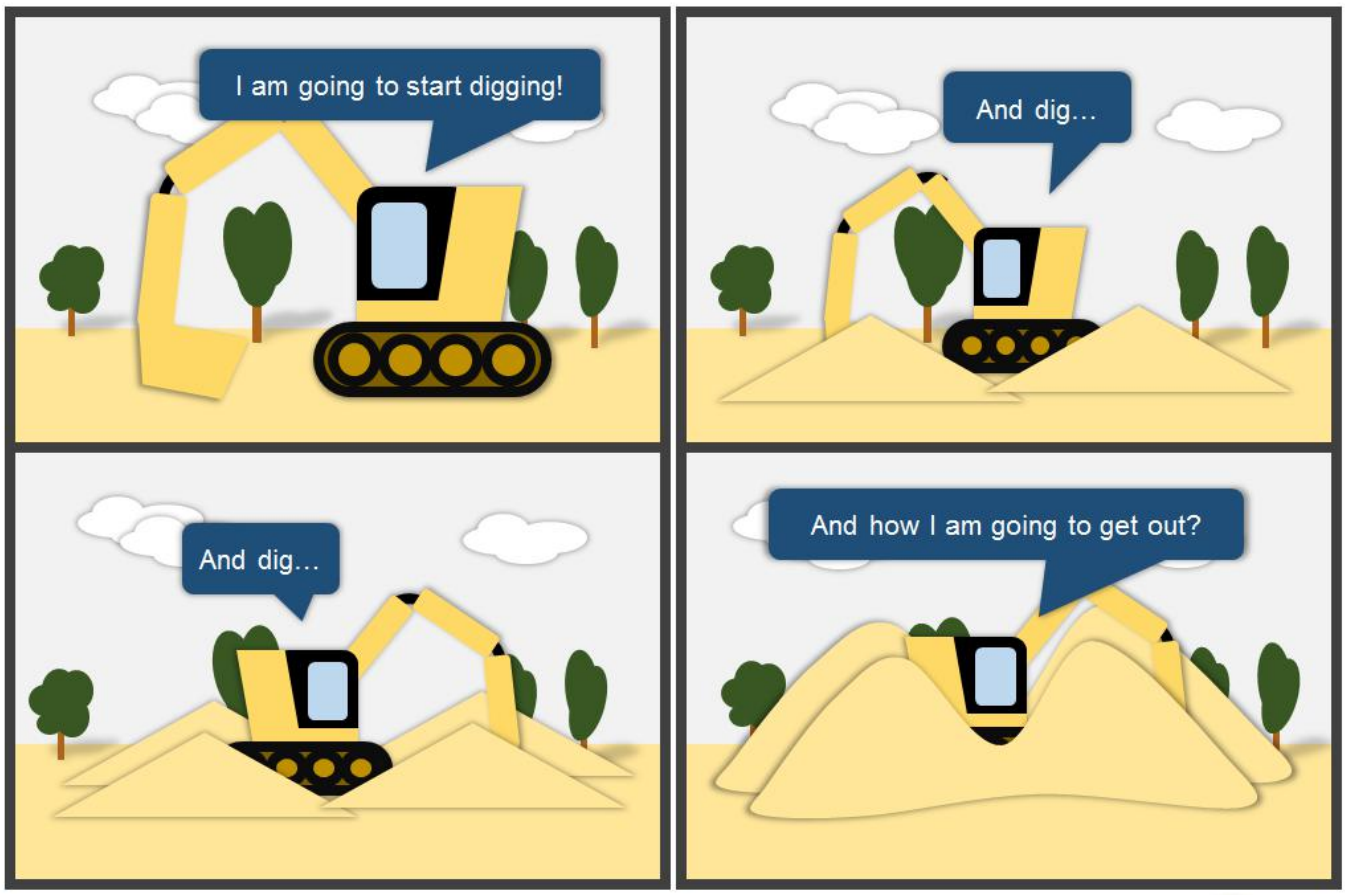
Predictive maintenance and operations include gathering data from sensors in field installations and integrating them with machine learning algorithms. This enables engineers to quickly assess equipment conditions and offer timely maintenance solutions. Predictive operations, coupled with software platforms, further enable granular part visualizations, allowing O&G operators to predict potential failures. Moreover, predictive maintenance finds applications across all upstream, midstream, and downstream operations. These solutions improve safety, extend the life of installations, and reduce costs associated with operations and maintenance.

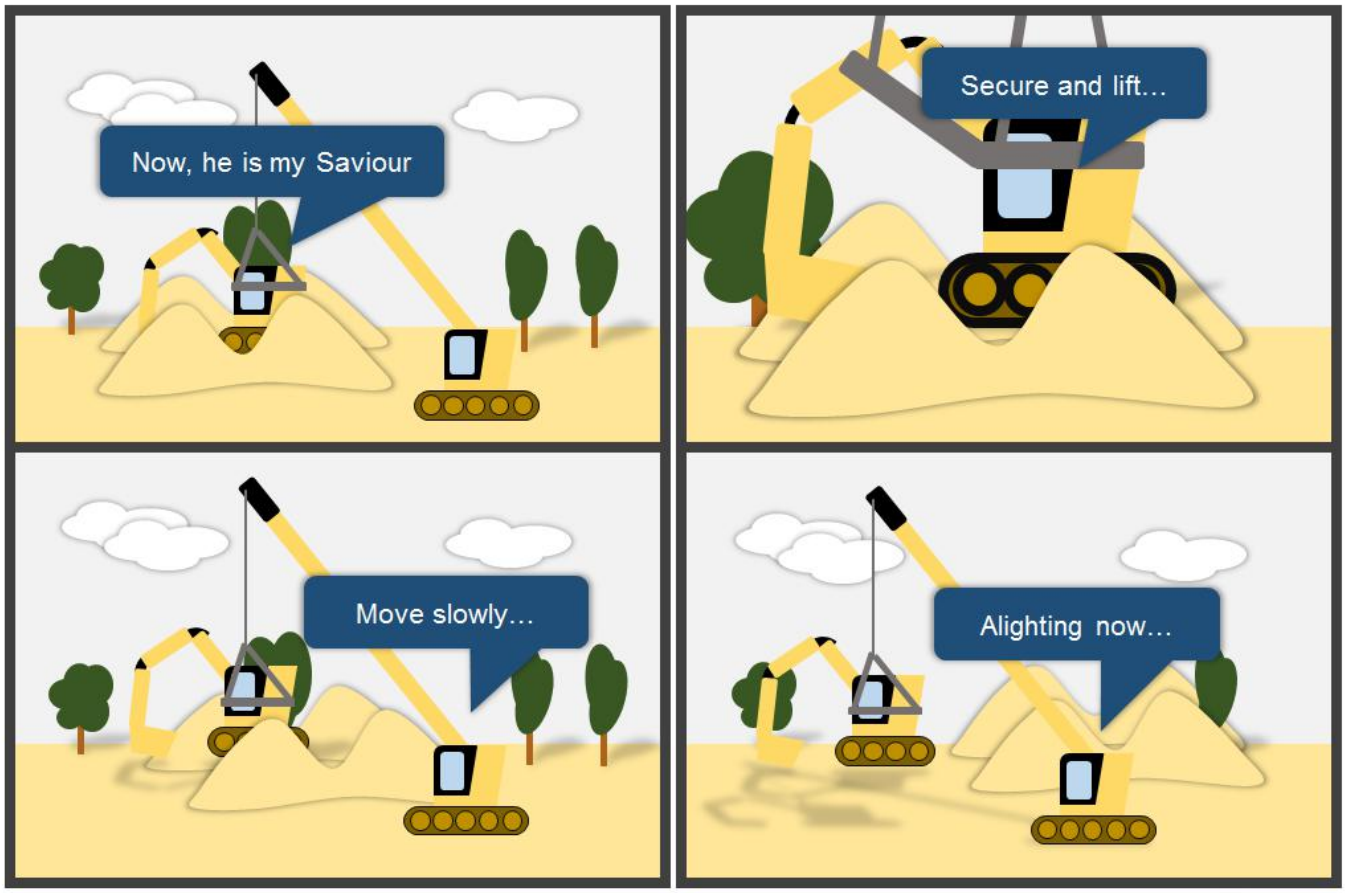
10. Blockchain

Blockchain is increasingly penetrating various industrial operations including, oil and gas. Smart contracts provide much-needed security and transparency of oil & gas documents and operations. Distributed ledgers verify contractors, employees, and maintain smart contracts. Further, Blockchain allows oil and gas companies to automate invoices, post-trade settlements, and joint venture accounting. Blockchain is also useful for hydrocarbon fleet tracking, trading, retail B2C, intragroup billing.

Discover all Oil & Gas Technologies & Startups

The oil & gas industry utilizes these innovations and trends to increase the efficiency of operations and worker while reducing costs. The inspection of offshore rigs and onshore equipment is now easier using drones and predictive maintenance. Further, digital twin technology bridges the gap between physical and virtual spaces that enables engineers to remotely work in harsh environments. Adapting to these new technologies helps oil and gas operators and companies address emerging challenges and move forward. Further, the COVID-19 pandemic has pushed industrial companies to rethink the everyday workplace.





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22 MINS WITH By Kaori Kitamura

Mr. Eugene Ng Peng Guan

Vice President of Strategy and Business Development

What are some of the most important factors to consider when formulating a sustainability plan?

When formulating a sustainability plan, businesses should first understand their footprint. Only after grasping their environmental impact, can companies understand what changes need to be made. With better knowledge of which parts of their value chain contribute the most significantly to carbon emissions, companies can set realistic, achievable targets in these areas.

Another important factor to consider when formulating a sustainability plan is the need to account for the long run and potential changes in industry circumstances. Companies have to understand that changes and developments in the industry may occur along the way, as such there is a need for the sustainability plan to account for this.

What would your approach be to helping Natsteel navigate these considerations?

In all that we do, NatSteel strives to be a company that is forward-thinking and we are constantly looking for new ways to improve the sustainability and eco-friendliness of our processes. NatSteel keeps abreast of developments in the industry, and we are kept up to date of upcoming technologies which we can implement in our practices. With all these in mind, we can be sure that any sustainability plans that we formulate are for the long-term and can be carried out realistically.

What do you think is the biggest barrier to achieving a sustainable future?

Globally, steel is inextricably linked with economic growth and prosperity and it has enabled our modern way of living. However at the same time, the steel industry has a huge environmental impact, in terms of carbon emissions and the amount of resources steel production takes up. Steel production requires the utilisation of a large amount of energy and water.

However, the extent of environmental impact depends greatly on the type of technology used in steel production, and this technology has improved throughout the years. We have been using an electric arc furnace which is more environmentally-friendly compared to blast furnace technology.

What is Natsteel doing to reduce the environmental impact of its manufacturing process?

As part of NatSteel's culture, we have been driving energy-saving project initiatives. With our electric arc furnace technology, scrap is first heated before being lowered into the furnace. This cuts the power use in steel production by a significant amount.

NatSteel also endorses the use of green steel, by using recycling metal scrap to produce steel. Singapore generates 1.2mil MT of scrap a year. NatSteel collect these scraps from all parts of Singapore, and we process them through our furnaces to produce steel. The steel that is produced goes back into much of the infrastructure that is built in Singapore, such as HDBs, condominiums, highways and MRTs, hence in a sense it is a cyclical economy because of our practices.

We also recently introduced a stronger type of steel to be used in construction, which is Grade 600. By using a stronger type of steel, this mean construction projects will be using less steel which translates to lower emission and resource required during the manufacturing process.

What are the advantages of using Grade 600 materials in Singapore's current infrastructure?

Grade 600 is a high strength reinforcement steel, already approved by BCA, and used in Singapore for the construction of Residential, Commercial, Industrial and Infrastructure projects. With its 20% superior yield strength over the commonly used Grade 500 steel, Grade 600 is gaining traction in Singapore's construction industry today.

For construction projects, this means potential steel savings of up to 20% and ease of rebar congestion which improves construction quality. This also means Shorten reinforcement fixing time and reduced manpower required on site for steel fixing.

For developers, stronger steel translate to thinner walls, columns and beams. This means we can have more usable spaces within buildings. Especially since Singapore is such a small country with relatively less land space for buildings, it is important that we maximise the use of the land space we have.

A few projects using Grade 600 are Kim Chuan Depot Extension, Jurong Port Ready-Mixed Concrete Port-Centric Ecosystem, One Pearl Bank, Jurong Innovation District and Punggol Digital District.

What have been the key challenges for NatSteel in recent years?

NatSteel is also constantly looking for how else we can save power and energy, and how we can run more efficiently. Using our electric arc furnaces as an example, one of the main resources that we need is electricity. At the same time, the cost of electricity is much higher in Singapore than in most other parts of the world. Yet, we have to be competitive against other steel mills, hence this has become one of the driving forces for us to find ways on how we can make steel in a cleaner and cheaper way.

Another challenge is getting customers to make the switch to Grade 600 and cleaner materials.

NatSteel
A Tata Steel Enterprise

With most of the construction that happens in Singapore, there lacks a significant differentiation between the use of green steel and other conventional steel. We have been trying to increase the demand for green steel and shift our customers towards its use, and are still currently in the midst of doing so.

How will Natsteel maintain its competitiveness despite being the only steel mill in Singapore and that to say facing a very strong competition in this region?

In Singapore, NatSteel is focusing more on value add services, in line with Government's push for integrated digital delivery in the construction sector.

The Building Information Modelling (BIM), is a technology that improves productivity and integration across various stakeholders along the entire construction value chain. Our BIM specialists collaborate closely with stakeholders to produce BIM rebar requirements in a 3D model of the construction project. With accurate reinforcement information, this will improves the cycle time the in planning process and reduces errors.

We also rolled out NiCE (NatSteel Integrated Customer Experience), a portal for our customers to make orders, view real-time delivery schedule and a cloud-based document portal, similar to any internet banking portal you use today. This digital transformation allows customers to cut back on paper usage, get real time information, access to digital documents and helps to push Singapore towards being a more sustainable construction space.

How do you intend to expand your company's customer base internationally?

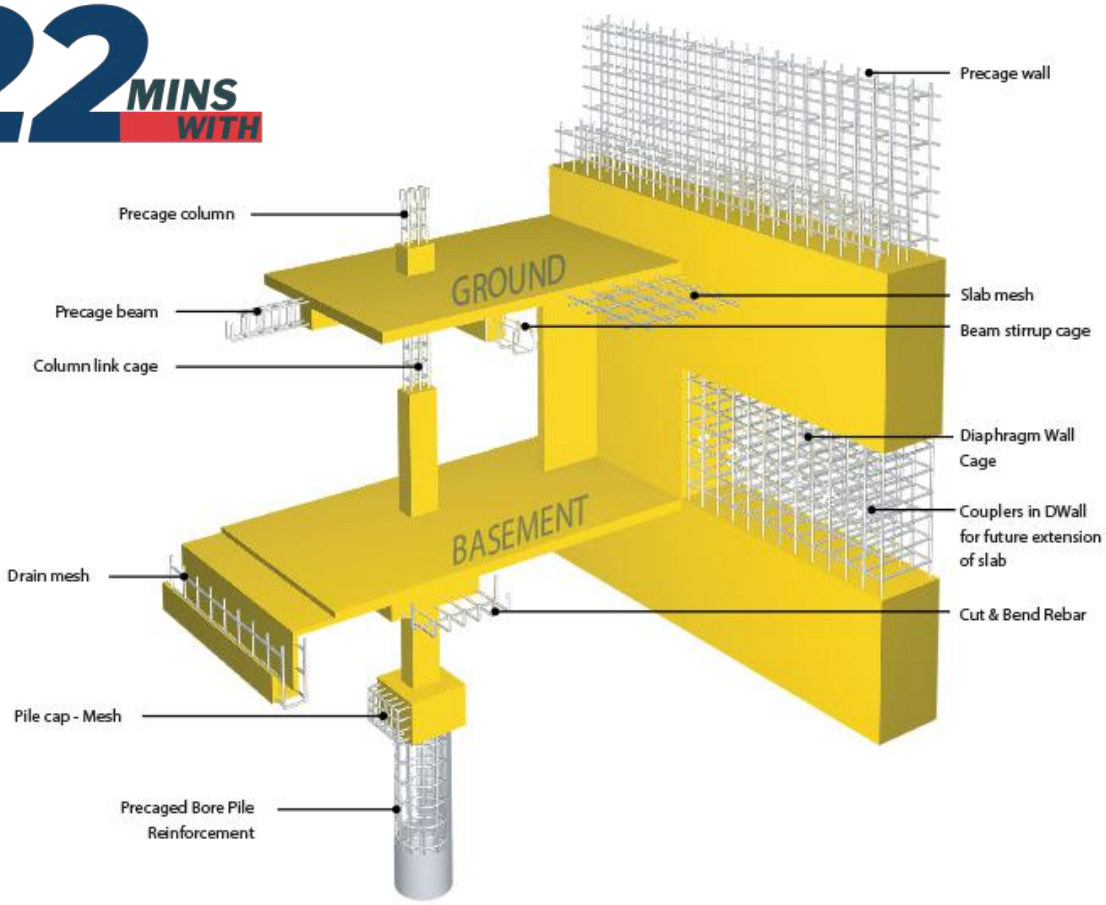
At the moment, NatSteel has an established presence across Southeast Asia, with facilities in Singapore, Malaysia and Thailand. We are looking to strengthen our presence in each of these countries first, before expanding into other countries. This will be done by improving and upgrading our facility production capacities and further streamlining our processes to make our steel production process cheaper and more efficient. We are also hoping to lead the industry in making the switch towards more environmentally-friendly processes, first within the region and then worldwide.

What do you hope will be different about the heavy machinery industry then compared to now?

Many believe that it is difficult for the steel industry to achieve sustainability, due to the nature of the industry (steel production greatly contributes to carbon dioxide greenhouse gas emissions). In Singapore, the steel industry has a carbon footprint of about 52 million tonnes a year. However, despite being a leading South-east Asian steel company, NatSteel only contributes to 0.3% of this carbon footprint.

NatSteel is leading the industry in terms of sustainability, as we operate one of the most energy efficient electric arc furnaces in the world. NatSteel utilises 30% less energy to produce a tonne of steel, compared to other electric arc furnace operations. This is achieved by adopting various technologies such as electric arc furnaces to reduce overall energy consumption, and the use of virtual lance burners, among many other technologies.

We hope that other players in the heavy machinery industry will similarly make the switch towards more energy-friendly and sustainable practices, in order to minimise the carbon footprint this industry has as a whole. At the current moment, about 70% steel made comes from the blast furnace route, and the remaining 30% comes from the more environmentally-friendly electric arc furnace route. Thankfully, with the way the industry is developing, we expect electric arc furnace



technology to pick up and replace the blast furnace route, and we can also expect the development and utilisation of newer, cleaner technologies within the next five to ten years.

What are some of the challenges facing the manufacturing and construction industry in Singapore? How do you think Natsteel can close this gap?

The construction sector has been badly hit by the COVID-19 pandemic, and one of the current main challenges is the shortage of manpower. What NatSteel is doing at the moment to close this gap is increasing automation and digitalisation of our products and services, so that there is reduced reliance on manpower and foreign labour. By making the shift towards automation, this also improves workplace safety by minimising any potential for workplace accidents.

Mr. Jiansen Liu

Vice President of XCMG and GM of XCMG Import and Export Ltd

Pandemic had affected badly most of the industries, how did you leverage that to make an impact at this company?

The spread of COVID-19 worldwide has had a huge impact on global economy and trade, as well as on international industry and supply chains. China is increasingly "needed" in global import and export trade because of its measures to prevent the spread of and control the pandemic, which has led to rapid recovery of the country's industry and supply chains.

In the first half of this year, China's foreign trade achieved faster growth on both the import and export sides. Official data show that in the first half, China's foreign trade reached 18.07 trillion yuan (approx. US$2.8 trillion), an increase of 27.1% year-on-year. On a month-on-month basis, both imports and exports have increased for 13 consecutive months. The country's domestic economy has experienced a stable and robust rebound.

Recently, a German organization released data showing that the world's total machinery exports in 2020 were valued at 1.05 trillion euros, of which 165 billion euros (roughly equal to 262.72 SGD or 193.71 USD) were contributed by China alone, accounting for 15.8% of the total, compared with only 15.5% coming from Germany. This is the first time that China has overtaken Germany to become the world's largest exporter of machinery equipment.

According to official data from the Chinese government, in the first half this year, China's exports of electromechanical equipment and components rose by nearly 30% year on year. Of particular note, XCMG's exports of such goods

increased by more than 70%, demonstrating the remarkable results of XCMG's international presence and positive reputation of the brand globally.

How do you see the heavy machinery industry in the next 2 or 3 years if Covid-19 still around? What is your approach to making big-picture decisions?

2021 marks the first year of China's 14th Five-Year Plan. Throughout the country, infrastructure investment has continued trending upward, with some regions even expecting to see a significant increase. Recently, new starts have increased at a slowerpace due to the impact brought about by the Delta variant. However, the construction industry is expected to witness an explosive increase in starts after the current series of minor outbreaks in the country have been effectively controlled.

The process of China's management of COVID-19 also demonstrated that China's public infrastructure, especially medical infrastructure, needs to be further strengthened. After the pandemic, China will certainly further build out its medical infrastructure, creating a growth opportunity for the construction machinery industry.

Countries benefiting from the Belt and Road Initiative have maintained rapid growth, transforming overseas markets into a key growth point for China's construction machinery makers.

Demand for product upgrades will also drive another wave of business growth: the equipment purchased during 2009 and 2010, a period of rapid growthin China's construction machinery industry, now needs to be refurbished or replaced. Several restrictive measures, especially those having to do with environmental protection, have made it necessary to replace much of the technologically outdated equipment, creating hugeopportunities for sales of new machinery.

Demand for equipment upgrades to meet China IV emission standard is expected to bring more business opportunities. Although the releasing date of the new policy on emission of non-road mobile equipment might be postponed without exact rescheduled date, the irresistable trend of environment-friendly equipemnt adoption will bring more overall business revenue.

All of above show that there are several favorable factors pointing to the maintenance of sustainable growth across the industry. COVID-19 will affect the industry in the short term, but the outlook remains promising in the long term.

Walk me through the major changes and improvement that being made so far during Covid-19 pandemic in the company.

COVID-19 has presented our company with both challenges and new opportunities in terms of reshaping the global industry chain. When a company expands into the international market, it cannot rely solely on itself, but on deep integration and collaborative efforts with other players in terms of industry, supply and value chains.

For this reason, XCMG, on the one hand, has been steadfastly implementing its localization strategy for key overseas regions, to consolidate its presence and leverage the opportunities in the international arena. The company has been aggressively expanding its footprint in major markets including Africa, Southeast Asia, West Asia and Central Asia, while taking advantage of its European R&Dand Brazilian manufacturing facilities from which it plans to enter surrounding high-end markets. XCMG has built an efficient global synergy system for innovation in technology, recruitment of talented individuals and market development, with the explicit goal of providing high-quality products and services, and comprehensive solutions, to global customers.

On the other hand, we have always been strong advocates of allying oneself and collaborating with likeminded partners and "advancing and retreating together", by taking steps to mitigate the difficulties faced by upstream and downstream producers in the industry chain, to ensure the supply of production resources and meet production and operation targets. At the same time, we have also strengthened our partnerships with more than 80 Chinese-funded firms, such as, for the export component, COSCO Shipping, Lianyungang Port Holdings Group and other sea transportation firms. By building a platform that brings together global transportation, access to foreign construction projects and collaborative efforts with key overseas customers, we aim to achieve the goal of seeing China's transportation, construction and equipment industries working together to serve customers worldwide and make our contribution to the recovery of the global economy amid the pandemic.

What are the biggest challenges in expanding the heavy machinery industry market all over the globe?

The biggest challenge: the 14th Five-Year Plan for the Development of the Construction Machinery Industry says that China's construction machinery industry will face external challenges during the period, such as the downward trend in the global economy and trade pressure, alongsideinternal challenges, such asthe industry's obvious weaknesses in core technologies in key areas including core components, advanced basic processes, key basic materials, high-end universal chips, basic software offerings and high-end manufacturing equipment. As a result, the industry needs to unshackle itself from its technical dependence on foreign countries, and make breakthroughs in core and key technologies.

In addition, when an industry player expands overseas, it may not only face many uncertainties such as industry periodicity and rising material costs, but also need to deal with challenges in the procurement of core parts and key basic materials as well as in the implementation of advanced basic processes.

--Challenges brought about by industry periodicity.Analysis shows that the construction machinery industry is expected to be affected by a new round of periodic factors. We believe that the industry has recovered since the second half of 2016. Based on the industry's cyclical pattern of growth lasting about 5 years as seen previously, we would expect the industry to enter an adjustment period in 2021 or 2022. However, due to macro support policies put in place due to the impact of COVID-19, we can look forward to the adjustment period being delayed by about 1.5 years, with the next such period starting in 2023 or 2024.

--Challenges brought about by rising material costs.In the first half of this year, the price for steel continued to run at a high level, resulting in many construction machinery makers raising the prices for equipment several times over the course of the year.

Between January and May of this year, steel prices increased in a range between 44% and 52%. This round of price rises was led by small and medium-sized manufacturers and agents who found themselves under inordinate cost pressure. This was gradually adopted by major manufacturers.

Steel is one of the industry's key raw materials, accounting for roughly 15% to 20% of total manufacturing cost. Cranes, mixing plants and tower cranes use the most steel, hence, they were more directly and obviously affected by the price rise,

and became the main items driving the price rise.

--The need for continuous innovation in the industry is urgent. Challenges faced in some areas of the industry include gaps between R&D capabilities and product performance and demand, organizational structures that no longer makes sense, and a lack of competition in the market that needs to be addressed. The biggest challenges are structural overcapacity and lack of aftermarket management.

Heavy industry accounts for some 50 per cent of global energy consumption, what would you do to preserve energy in a long-run and have greener invention?

"Green" and low-carbon are becoming trends worldwide, and all countries are actively pursuing environmentally responsible, low-carbon, sustainable development. Global standards and requirements for green and low-carbon development are becoming increasingly stringent, while the utilization efficiency of resources and energy has become an important criterion in measuring the competitiveness of a country's manufacturing sector. This forces construction machinery makers to consider energy saving and environmental protection as a key part of their growth strategies, ultimately obliging all-terrain cranes to become energy-efficient and environmentally friendly.

As an example, as the emission standards for heavy-duty diesel engines become more stringent, diesel engine makers worldwide are developing light-weight products that reduce energy consumption, while constantly researching energy recovery solutions as well as hydraulic and pump control systems, to achieve energy savings across every functionality within a unit of construction equipment.

The current development trend across the industry is pushing all-terrain cranes to become energy-efficient, environmentally friendly and intelligent. XCMG took the lead in exploring energy-efficient and intelligent products.

1. XCMG has made repeated breakthroughs in technologies such as parametric multi-body dynamics-based machine optimization and matching, as well as in structural optimization to achieve overall weight reduced 5%-15% per unit. In addition, XCMG also adopted new materials and processes to improve

product quality, extend product life, reduce material and resource waste, and lower energy consumption.

2. XCMG has launched natural gas-powered and hybrid energy-efficient cranes, advocating a "green manufacturing" approach. The company also developed crane energy recovery technologies, new energy-efficient hydraulic systems, and low-speed high-torque power transmission systems, all of which reduce the crane's comprehensive fuel consumption per 100 kilometers by 10%-12%, and lower operational fuel consumption by 14%-18%. The energy saving capability of our complete cranes has met the world's leading standards.

3. XCMG adopted technologies including multi-mode drive, independent suspension, intelligent boom, automatically-folding boom, self-dismantling, remote operation and maintenance, wind-power boom self-turning and intelligent simulation of lifting, to enable intelligent driving, transferring, handling and auxiliary operations. These technologies improve the driving traffic ability and transferring ability of the cranes, reduce labor costs and the risks associated with manual operations, and enhance user safety and operational efficiency.

For example, the XCA1600 all-terrain crane, with our proprietary independent suspension technology, overcame the roadblock that limits a crane in terms of simultaneously featuring both excellent off-road traffic ability and load-bearing capacity. The crane is capable to lift up to 30t with single-shaft design, marking the highest single-shaft load-bearing capacity in the industry, along with better driving traffic ability. The wind-power boom that can turn by itself and does not need dismantling when transferred heavy loads reduces the time to set up the crane for a job to two hours, doubling transferring efficiency.

Safety is an important consideration when operating any of the things we use. How do you ensure the stringent safety a measure is up the highest standards for your users?

As the global economy continues to grow, modern science and technologies constantly advance, industrial production scales up and the level of automation improves, construction equipment is widely used and plays an increasingly important role in modern production. The requirements for product safety are also becoming stricter.

In order to ensure both user safety and higher efficiency, XCMG has accelerated the development of intelligent products as a result of having achieved innovative breakthroughs in information technologies and improvements in 5G communication technology.

To take cranes as an example,

intelligent and information technologies as well as big data have been applied to the design of XCMG's crane motor units, product development, manufacturing processes and corporate management. Remote intelligent monitoring of equipment failures allows for equipment data collection, centralized monitoring of the platform and early warning of equipment failures. Multi-mode drive, intelligent boom, automatically-folding boom, self-dismantling, and intelligent simulation of the lifting operation enable intelligent driving, transferring, handling and auxiliary operations. These technologies improve the driving traffic ability and transferring ability of the cranes, reduce labor costs and the risks associated with manual operations, and improve user safety and operational efficiency.

Have you implemented any components of I 4.0 in your products and services? If yes how well receive has it been? If not, why?

XCMG has entered its Smart Manufacturing 4.0 phase, in which intelligent applications are used in all products covering the entire value chain, with more emphasis on data analysis and application. XCMG has undertaken efforts in many areas to shorten product development cycles, improve equipment overall equipment effectiveness, reduce procurement costs, and enhance digital service capabilities. These efforts facilitate our company's ability to meet China's national standards, improve intelligent manufacturing capacity and drive quality growth. From the economic benefit perspective, the added value of intelligent products is also more than 30% higher than that of traditional products.

Mr. Friedhelm Best

Vice President APAC, HIMA

What are your thoughts on the future of the oil and gas industry, and the role of i4.0?

Despite traversing through economic highs and lows in past years, the oil and gas industry was significantly affected by the COVID-19 pandemic, perhaps due to reduced consumption by global lockdowns that persisted in many nations in Asia Pacific. Forecasts have shown that Asia will only account for 35 percent of year-on-year oil growth in 2022, down from 75 percent before the pandemic occurred. With nations now planning to transition to an endemic with very different economic and sectoral dynamics, the oil and gas industry may evolve differently from previous forecasts.

Organizations that adopted Industry 4.0 faced challenges as a result of work from home (WFH) and "safe distancing" restrictions. As organizations shift towards a hybrid work environment whenever possible, the oil and gas industry too has to adapt to such a new paradigm for some of its workforce while retaining the same crisis-preparedness and safety-centric culture as before. Fortunately, safety vendors such as HIMA has successfully deployed secure remote access solutions to facilitate remote operations and maintenance access for operators who are working from home or offsite.

How has technology affected your industry in general so far since?

In the digital age, technology is leaping forward by the minute. By 2030, more than 50 billion IoT devices will be used globally, creating a massive web of interconnected devices and sensors. New technologies may introduce

new risks, necessitating the adoption of new safety and security measures that can be as automated and as intervention-free as possible. Over the years, HIMA has committed deep research with field successes in new technologies that are customizable, modular, internetworked, remote-access capable, and secure (including the defense against cybersecurity threats).

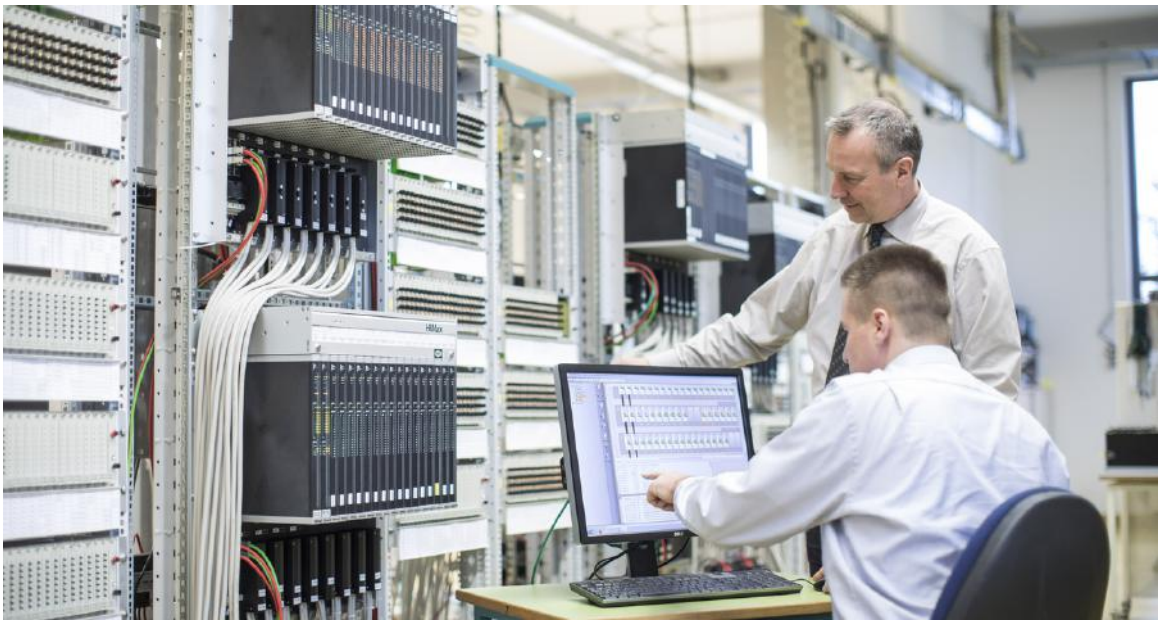
What are your thoughts on new technologies that could help boost safety in the industry, such as blockchain?

Technology is always a double-edged sword. As technologies advance with increasing complexity and pace, risks and threats will escalate correspondingly. Safety and security are now twinned and inseparable for industries, where advancements such as cloud, cybersecurity, secure systems-on-a-chip (SSoC), and perhaps blockchain, all partake in closing the loop. At a plant or critical infrastructure for example, HIMA has the world's first scalable safety platform with built-in automated security with SIL 3 capabilities (the highest safety integrity level of the IEC 61508 standard that is economically viable for industrial operations).

With increasing controller and network capabilities the benefit for the operators will be increased with the valuable use of data. We have now the possibility to gather more data than before and technologies such as AI will allow a better understanding of the plant safety. An operator can build the whole safety lifecycle of a plant in a digital twin. With this digitization and the connectivity to other databases as ERP, new solutions for improved safety and higher productivity are real.

What are the biggest challenges that you foresee in the coming years in the Oil and Gas Industry?

With increasingly complex plants, up-to-date safety knowledge for the proper maintenance of plants is critical. Plant operators may have increased risks over time, since existing installations that have aged over decades in use, may have unknown risks with antiquated or deteriorating safety systems with insufficient feedback or insights, or such systems may lack clear audited logs of modifications, documentation, performance, and standards compliance. With emerging connectivity with industrial and safety systems, cybersecurity threats have emerged as new additional challenges. While technical specialists may be familiar



with specifications and features of the installations as well as industry standards and compliance, the laborious need for proper documentation of safety and security analyses may sporadically become forgotten when workloads overwhelm them. And when one specialist leaves the organization, irreplaceable field knowledge is lost within the organization. Therefore, continuous and relentless documentation for processes, systems, and incident response are critical, while new entrants must be given continuous and adequate training to build up the organizational knowledgebase.

What do you believe is the best approach to solve these challenges?

Training by experts is a proven way to impart essential knowledge to operators. However, since every safety device at a plant may be unique, the knowledge from technical experts may only address specific parts and not the whole. A detailed safety plan must be developed to ensure that the operational and safety equipment, required expertise and processes are all synchronized. By combining consistent lifecycle management with comprehensive functional safety management, plant operators can achieve a long-term solution to address such challenges. The lifecycle management platforms also ensure that all safety-relevant data, impending deadlines, and available expert knowledge within the organization, are all digitally accessible and never overlooked.

What are the new trends that your clients can look forward in the Oil and Gas industry?

Fully digitalized business operations - In 2019, Deloitte reported the Digital Maturity Index in the oil and gas industry marks an average of 1.3, one of the lowest scores compared to other sectors. This is an extremely low rating for an asset-heavy sector of such scale and strategic

importance. However, the onset of Industrial IoT (IIoT) and increased affordability of sensors, data storage, and data processing have triggered an acceleration in digitalization. Additionally, the worsening oil price volatility and downward pressure on revenues impacted by the COVID-19 pandemic have led to oil firms digitalizing the entire business operations for cost containment and survival. Oil and gas firms that are bold enough to combine business process management with digital technologies will foresee improved productivity while minimizing financial and operational risks.

Predictive maintenance - With artificial intelligence (AI) and machine learning (ML) becoming more entrenched in many industries, including oil and gas, the concept of "predictive maintenance" rather than merely scheduled or reactive maintenance, has become highly sought-after. Predictive maintenance focuses on ensuring optimal working conditions of equipment, reduces downtime, correct suboptimal resource allocation, and assuage security concerns. As the stalwart for smart safety solutions to nine of the ten largest oil and gas companies globally, HIMA has witnessed an increase in the demand for digital systems that assures Smart Safety Management while ensuring high levels of production continuity.

What is HIMA's commitment to sustainability and how has it been recognized by the industry and public?

For 50 years, we are providing electrical and electronic safety automation for critical industries. Our aim is to protect people, the environment, and assets from harm. Our customers are handling hazardous material that needs to be captured and separated from the environment. The HIMA safety system ensures a safe shutdown in an emergency case to reduce the risk of an incident.

Another commitment for sustainability is the long lifetime of our products. We are developing and producing electronic components designed for a lifetime of 20 and more years. Consumers are living in a world where changing to new electronic devices is so common, creating a tremendous amount of electronic waste. The best would be to reduce electronic waste by designing products with future-proof and long-term reliable use. HIMA has taken on a leading role in ensuring safe and sustainable operations that bring positive impact to the people and environment.

What are 3 things that the Oil and Gas Industry should prepare now for the endemic?

Onsite and remote support - Many industrial companies are responsible for critical infrastructures and often rely on external partners for support and spare parts. In the event of a failure, financial damages, service lapses, and even public health impact and mortality may arise. Organizations may require the help of service providers to collaboratively resolve a crisis, such as obtaining replacement parts, support measures to mitigate malfunctions or unscheduled downtime within a defined timeframe. Organizations may also demand onsite support during a crisis, especially when quarantine measures are mandated, and high-risk areas are involved. HIMA has developed remote-capable, functional and secure operations, which are used by operators to control for instant their offshore facilities. In an integrated operations centers or remote operations centers the subject matter expertise, maintenance support, and other disciplines are consolidated for safety and efficiency of operations.

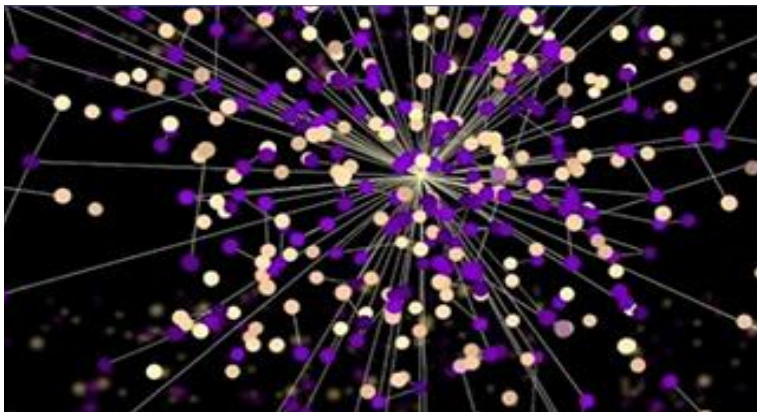
Replanning measures - To prevent situations such as maintenance backlogs, plant operators should continue their planned modernization and maintenance measures. Furthermore, rescheduling such modernization and maintenance may prove impossible with recurrent safety tests. In such instances, organizations may need assistance for installations, troubleshooting, and preventive maintenance.

Modernizing safety equipment - The safety and security of a plant are merely the fundamentals in its successful and sustained operation. Some organizations also have to wrestle with declining sales and the subsequent pay cuts and even layoffs for employees during the ongoing pandemic. Despite these challenges, the progress towards automation and modernization for safety and security cannot be delayed nor put on brakes, as these are the building blocks for ensuring the next lap for such plants as they exit the pandemic in the years ahead.

Please share with us one key project during this pandemic that your team has successfully solved?

The downturn of the economy and production was used by an Oil & Gas operator to run a larger overhaul and maintenance of his offshore and onshore production facilities. The challenge for this is to keep the shutdown time short and manage all resources on site. During the pandemic, the number of engineers was limited due to various restrictions. We supported the operator during the shutdown with engineers on-site and another team working from a remote location. Through secure remote access, our remote engineers were capable of working on the safety controller as they were sitting in the control room on-site. Additionally, we used an augmented reality solution to support the onsite engineer with experts from a remote location. By doing this, we were transferring the knowledge and expertise to the site, with an increase in safety. Our team is happy to complete the shutdown job ahead of the schedule so that the operator could start his production earlier and gain more production output.

STEM Art and Film Festival



FURTHER INFORMATION

The Sigma Xi STEM Art and Film Festival is the final event of the Society's Annual Meeting and Student Research Conference. Join us to explore science, technology, engineering, and math (STEM) through different forms of visual and performing arts, including photography, painting, 3D visualization, videos, films, and documentaries.

Entry Fees : FREE
Prizes : up to $500 in each of three categories (artwork, performing art, and film)
Virtual Event : 7th November 2021

PRODUCT MANAGEMENT ONLIINE SUMMIT'21

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https://geekle.us/pm

Entry Fees : FREE / $49
Virtual Event : 29th - 30th November 2021

FURTHER INFORMATION

DeveloperWeek Global: Enterprise 2021

DeveloperWeek Global: Enterprise Conference invites over 3,000 enterprise dev professionals to converge for a 2-day virtual conference & expo, featuring technology innovations and trends that corporations need to know about. Topics will include: DevSecOps, Organizing Dev Teams, DevTech Trends, Microservices, Containers, Kubernetes, and more.

FURTHER INFORMATION

Entry Fees : PRO Pass $195.00 / PREMIUM Pass $445.00
Virtual Event : 7th - 8th December 2021

World Future Energy Summit 2022

WORLD FUTURE ENERGY SUMMIT

The World Future Energy Summit is the leading international event accelerating sustainability and the global transition to clean energy.

FURTHER INFORMATION

Exhibition, technology showcase, investment incubator and business forum all rolled into one event, the summit convenes leaders, innovators and global thinkers to share ideas that are creating the blueprints for a sustainable future.

Location : ADNEC, Abu Dhabi
Event Date : 17th – 19th January 2022

World Congress on Petrochemistry and Chemical Engineering

Petrochemistry 2022 gathers all the researchers directly linked with the field of Petrochemistry and Chemical Engineering along with its associated fields, which provides an erudite platform for the students, professors, lecturers, speakers, scholars, researchers, consultants, and industry professionals to frame new network and strengthen their knowledge.

FURTHER INFORMATION

Location : Edinburgh, Scotland
Event Date : 11th - 12th March 2022

OIL & GAS ASIA 2021

The team and partners of OGA 2021 would like to reassure you that the health and wellbeing of our exhibitors, visitors, and colleagues remain our highest priority. As we closely monitor the situation, Oil & Gas Asia remains fully operational, continuing ahead with the necessary preparations to bring you your familiar first-rate international trade fair.

FURTHER INFORMATION

Location : Kuala Lumpur Convention Centre, KLCC, Malaysia
Event Date : 7th - 9th December 2021

Wanted: Unique Projects with Energy Supply Systems

The vector award for the best energy chain applications is entering its eighth round.

They rotate by 7,000 degrees, travel at speeds of up to ten metres per second and move three-dimensionally like snakes: energy chains made of high-performance plastics. Every two years, a panel of expert judges presents the vector award and up to 5,000 euros of prize money to the most fascinating projects and their developers.

Classical mechanical engineering is no longer the only place energy chains made of plastic are found. All over the world, they ensure that cables and hoses are guided safely – in space, at sea, and underground. In thousands of projects, energy supply systems and cables perform their tasks, overcoming great challenges – from strict particle-free requirements in cleanrooms, in the semiconductor industry to high chemical resistance in electroplating, to dirt resistance in mining to chips and sparks in woodworking. Then there is compact installation space, high speeds, and even acrobatic torsional movements. The vector award honours precisely these unique applications of energy supply solutions and e-chain systems with cables.

Last year alone, there were 266 entries from 32 countries. The winners will be selected by a panel of expert judges from the fields of science, industry, and specialist media and associations and will receive their awards at the 2022 Hannover Trade Show.

FURTHER INFORMATION

Location : Singapore
Applicant Date End : 11th February 2022
Contact Number : +65-64 87 14 11

OCTOBER

12 - 14 OCT 2021

Trade Fair For Deburring Technologies And Precision Surfaces

DeburringEXPO Karlsruhe, RheinstettenAnd Precision Surfaces

11 - 13 OCT 2021

INMEX SMM India Mumbai

INMEX SMM India, Mumbai, India

20 - 22 OCT 2021

TAITRONICS 2020 (46thTaipei International Electronics Show)

Taipei Nangang Exhibition Center, Hall 1 (TaiNEX 1) Taipei, Taiwan

13 -15 OCT 2021

International Metal Technology Indonesia 2021

Jakarta International Expo, Kemayoran, Indonesia

15 - 19 OCT 2021

Canton Fair International Pavilion - Phase 1

China Import and Export Fair(Canton Fair Complex), Guangzhou, China

15 - 16 OCT 2021

The Property Investor Show

ExCeL London - UK

06 - 10 OCT 2021

VIETNAM INTERNATIONAL INDUSTRIAL FAIR 2021

Hanoi International Center for Exhibition (I.C.E.), Hanoi, Vietnam

27 - 29 OCT 2021

Japan IT Week Autumn

Osaka, Japan

27 - 29 OCT 2021

Automotive World Nagoya

Nagoya International Exhibition Hall, Nagoya, Japan

19 - 21 OCT 2021

KORMARINE 2021

BEXCO, Busan, South Korea

NOVEMBER

04 - 07 NOV 2021

Philconstruct

SMX Convention Center Manila, Manila, Philippines

14 - 27 NOV 2021

India International Trade Fair

Pragati Maidan, New Delhi, India.

28 - 30 NOV 2021

International Apparel & Textile Fair

Jakarta Convention Center (JCC), Jakarta - Indonesia

03 - 06 NOV 2021

VINAMAC EXPO 2021

Saigon Exhibition and Convention Center, Ho Chi Minh City, Vietnam

16 - 19 NOV 2021

The Leading International Trade Fair For The Medical Sector

Düsseldorf, Germany

30 NOV - 01 DEC 2021

Be 4.0 Industries Du Futur 2021

Parc Expo de Mulhouse, Mulhouse, France

17 - 20 Nov 2021

The 33rd International Plastics & Rubber Machinery, Processing & Materials Exhibition

Jakarta International Expo (JIExpo) Kemayoran, Jakarta – Indonesia

10 - 12 Nov 2021

Electric & Power Vietnam 2021

Saigon Exhibition and Convention Center, Ho Chi Minh City, Vietnam

29 - 30 NOV 2021

INTERNATIONAL APPAREL & TEXTILE FAIR

Dubai World Trade Centre (Dubai Exhibition Centre)

DECEMBER

4 - 16 DEC 2021

Automechanika Dubai

Dubai World Trade Centre, Dubai

06 - 08 DEC 202

Middle East Organic And Natural Product Expo - Dubai

Dubai World Trade Centre, Dubai

09 - 11 Dec 2021

China Machinex India 2021

Bombay Exhibition Centre, Nesco Complex, W.E. Highway, Goregaon East, Mumbai

04 - 07 DEC 2021

Vietnam International Electrical Appliances ExpoFair International Pavilion - Phase 1

Saigon Exhibition and Convention Center, Ho Chi Minh City, Vietnam

01 DEC 2021

Progressive Technologies in Automation. PTA- Ekaterinburg 2021

Novotel Ekaterinburg Center Engels street, 7

02 - 04 DEC 2021

AGRI LIVESTOCK MYANMAR 2021

Myanmar Expo Hall, Yangon, Myanmar

01 - 05 DEC 2021

Industrial Automation Show (IAS) 2021

National Exhibition and Convention Center (Shanghai)

01 - 04 DEC 2021

MACHINE TOOL INDONESIA 2021

Jakarta International Expo, Kemayoran, Indonesia

01 - 04 DEC 2021

PLAST EURASIA 2021

Tüyap Fair Convention and Congress Center, Istanbul

05 - 09 DEC 2021

DAC (DESIGN AUTOMATION CONFERENCE) 2021

Moscone West, San Francisco, CA

05 - 09 DEC 2021

WORLD PETROLEUM CONGRESS 2021

Houston, USA

05 - 07 DEC 2021

High Security Printing Asia Colombo

Sri Lanka

JANUARY 2022

10 - 13 JAN 2022

STEELFAB 2022

Expo Centre Sharjah - Sharjah, UAE

17 - 19 JAN 2022

WORLD FUTURE ENERGY SUMMIT 2022

ADNEC, Abu Dhabi

19 - 21 JAN 2022

CAR-ELE JAPAN 2022

Tokyo Big Sight, Japan

26 - 28 JAN 2022

NANO TECH 2022

East Halls & Conference Tower, Tokyo Big Sight, Japan

27 - 30 JAN 2022

AGROTICA 2022

THESSALONIKI INTERNATIONAL EXHIBITION & CONGRESS CENTRE

2021

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上海国际纺织工业展

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