FourPhase

New Innovation Secures Oil Supplies

How Data is Helping Oil Production Get Back Its Mojo

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Fluctuating Crude Oil Prices Affect the Global Economy

Oil prices affect the global economy tremendously. Based on the estimates of the US Federal (Fed) Reserve System, every USD 10 rise per barrel in oil prices shaves 0.1% off GDP growth. A series of impacts stemming from the COVID pandemic and disruptions to the global supply chain have propelled the global supply of energy into severe turbulence and a potential energy crisis. During this tumultuous three-year period, the lowest Brent crude oil price plunged to less than USD 10 a barrel, but then again, the highest Brent crude oil price soared to over USD 100 a barrel, causing a global economic impact. Therefore, it has become more critical than ever for oil producers to improve oil production efficiency in terms of long-term crude price stabilization.

FourPhase

Founded in | 2012
Headquarters | Bergen, Norway
Industry | Oil and Gas
Website | http://www.fourphase.com

Solids Are Problematic for Oil-and-gas Production

Crude oil recovery covers four major elements: oil, gas, water, and solids. Traditionally, the focus is on oil, gas, and water, while solids, which can negatively affect production, are often overlooked. However, according to Arkwright Consulting, which interviewed well operators across eight regions, around 70% of reservoirs globally run into production difficulties because of issues with solids. These unwanted by-products congest filters and bypass the production separator, causing wellbore blockage and ultimately production shutdowns.

FourPhase focuses on removing solids. As a solid removal expert, the company has designed and delivered effective solids management solutions and services at over 80 project sites, including the North Sea, Gulf of Mexico, South China Sea, etc., to stabilize oil-and-gas production. Its clients include several global oil giants.

Business Challenge

Manual Operation, Passive Maintenance, and Emission-intensive

Traditionally, operators require dedicated employees to walk around the plant, open valves manually, write the data generated by every sensor cautiously on paper, and operate the equipment manually. Besides, without simultaneous monitoring and operation support, the operators must apply re-completion or coiled tubing (CT) cleanout to resume production when solids have caused well blockages and complete shutdowns. These approaches are costly and emission-intensive, with high levels of CO2. The ideal is to extract oil out of the ground in the quickest, safest, most affordable, and sustainable way possible. However, drilling new wells does not always achieve this. Enhanced oil recovery techniques from old wells will inevitably be developed and leveraging them is paramount to reducing the carbon footprint.

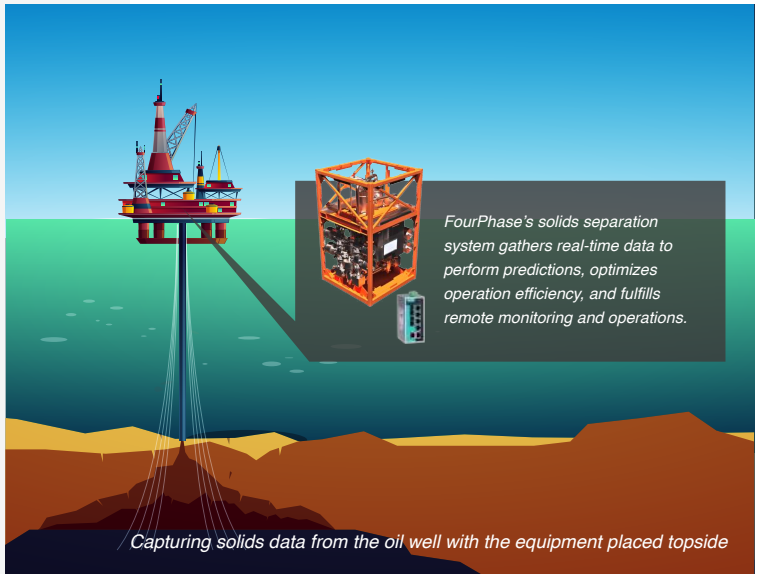
FourPhase COO&CTO, Jørgen Bruntveit

"We make the system intelligent. We believe data is the key to achieving the perfect result. FourPhase's separation systems give customers more than solids removal; they gather data to make informed decisions, enabling optimal oil-and-gas production."

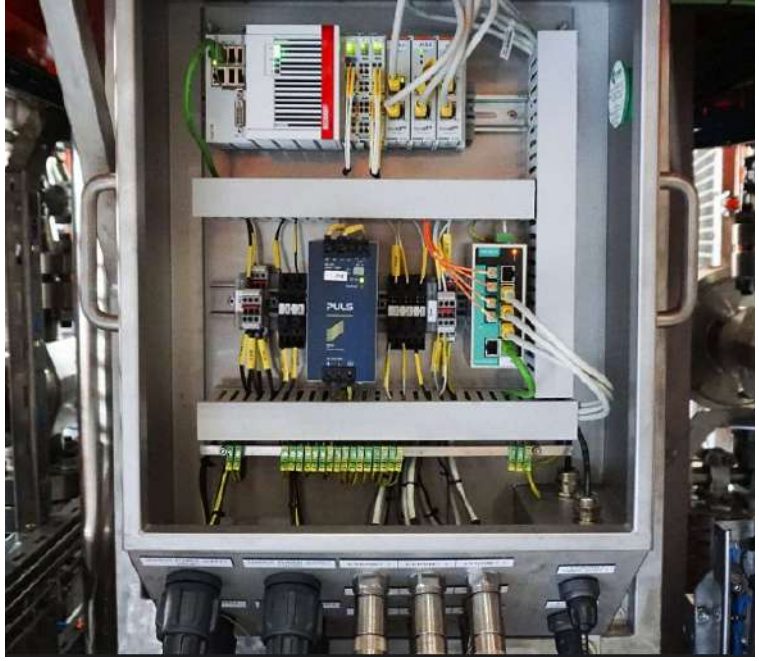
FourPhase COO & CTO, Jørgen Bruntveit, an innovator and influencer recognized by Hart Energy's '40 under 40' program

Data is a Game Changer

FourPhase incorporates real-time data to automate solids removal, as data is the key to achieving the perfect result. Thanks to digitalization, FourPhase can collect a variety of data sets with its compact equipment from an oil-and-gas well. For instance, one of its core solids separation systems, the Dual Flow, comprises over 60 hard sensors and 500 soft sensors to gather real-time data, thus continuously recording the status of solids. The on-site sensors collect data every 10 to 100 milliseconds, gathering a significant amount of data. The data is transmitted back to the offshore database, ranging from once every minute to once every hour, based on the application's requirements. Therefore, unlike traditional solutions that only react when a blockage occurs, FourPhase accumulates rich insights with continuous data gathering to perform predictions for better decisions, optimizes operation efficiency, and fulfills remote and automated monitoring and operations.



Capturing solids data from the oil well with the equipment placed topside



The "Brain Box" with Moxa products to enable reliable communication

Reliable Communication for Data Transmissions

To drive data-driven operations, FourPhase developed a "Brain Box." It acts as a central nervous system to manage communications between equipment and connect all equipment units, such as desanders, surface safety valves, and HMI screens, to transmit data through Ethernet to a cloud-based control room. FourPhase's equipment, including the Brain Box, is placed directly downstream from the wellhead, onshore or offshore. The equipment must deal with saltwater, heavy rains, storms, or extreme heat of up to 50°C, for example, in deserts. These harsh environments require reliable communications solutions to meet the system's demands.

Solution

Astonishing Reliability

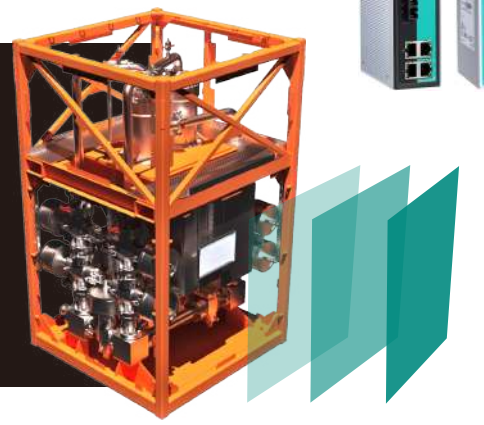
The FourPhase's Brain Box includes a PLC, a EtherCat module, Moxa's EDS 200/300 Series Ethernet switches with fiber connectors, and AWK Wi-Fi access points. All of the equipment units, such as desanders, surface safety valves, and HMI panels, connect and communicate with each other through Ethernet. The transmitted data is accessed from an OPC UA server running Modbus, TCP/IP, and HMI protocols. To ensure the critical data gets transmitted, FourPhase also uses Wi-Fi access points to create redundant on-site data transmissions via wire and wireless mechanisms. "So far, FourPhase has run over 100,000 operational hours. We've been going with Moxa since day one. There has been no downtime or any incidents related to Moxa products," said Jørgen Bruntveit, CTO of FourPhase.

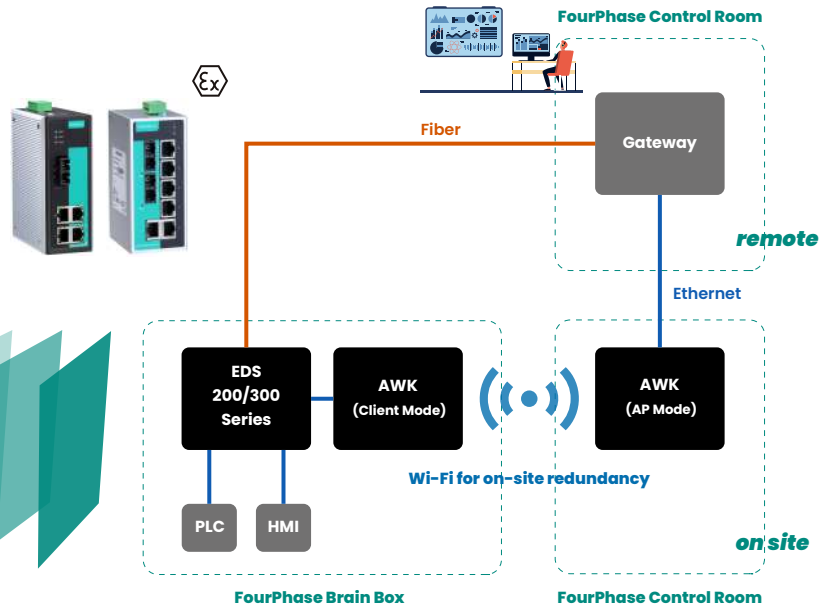
"We have used Moxa products in all our connected equipment since we founded FourPhase. I honestly don't recall we ever had an issue with Moxa's products, and we haven't had a single minute or second of downtime with the products, which is compelling."

FourPhase COO & CTO, Jørgen Bruntveit, an innovator and influencer recognized by Hart Energy's '40 under 40' program

Certified Solutions for Harsh Environments

FourPhase usually installs their equipment for the removal of solids in a Zone 2 area. Therefore, because of potential oil and gas leaks in the field, ensuring all electronic devices in the systems are explosion-proof is top priority. Moxa provides a complete series of connecting products with ATEX Zone 2 certificates. It gives FourPhase the flexibility to choose from a large portfolio of suitable devices with different requirements, including the number of ports, mounting design, and fiber-optic extensions.





Results

Transforming Oil-and-gas Production With Data-driven Analysis

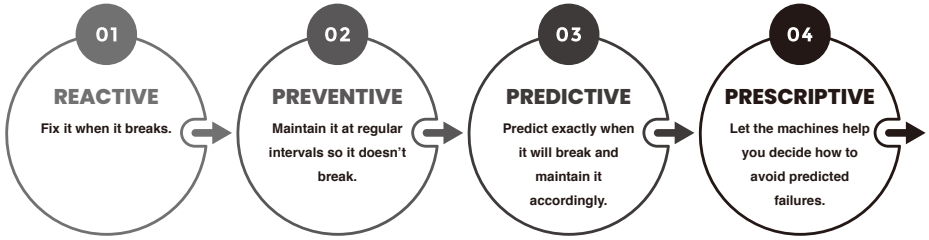
Technology's role in the oil-and-gas industry is becoming more and more critical, with digitalization continuing to drive changes in the world's leading petroleum groups and operators. In contrast with the traditional reactive solution involving simple equipment and manual operations, FourPhase, by accumulating data and insights, is forging the advancement of prescriptive maintenance strategies in the management of solids. This approach reduces the chances of downtime and assists oil-and-gas producers in increasing their production capacity, thanks to more optimized operations.

So far, FourPhase has run over 100,000 operational hours and separated over 600,000kg of solids. Each system has around three Moxa devices to power up to 2,000,000 hours of operations together. The cooperation of robust hardware and innovative solutions and services is transforming oil-and-gas recovery.

Nowadays, FourPhase increasingly gets requests from clients to integrate data streams into their operations to improve performance. Besides converting a part of the business model of companies, data-driven analysis transforms the oil-and-gas industry with enhanced efficiency, reduced downtime, increased production, and less manual handling.

Committing to a Future of Lower Carbon Emissions

Embracing sustainability is infused in FourPhase's core business strategy. This is best demonstrated by the company's continued endeavor to sustain old oil wells with the approach: 'repair the ones you have'. FourPhase's clients value their efforts to help them meet an incredibly high demand, while adhering to environmental, social, and governance (ESG) criteria.



THE EVOLUTION OF MAINTENANCE STRATEGIES