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WHITEPAPER

From insights to actions: Transforming artificial lift lifecycle management (ESP & Cable) using intelligent automation

Read how digitalization of Artificial Lift Lifecycle Management in the oil and gas sector using intelligent automation elevates operational efficiencies faster.

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Summary

The global oil and gas (O&G) sector has been undergoing a major overhaul recently, where the whole world is moving towards relentless digital innovation. In response, most O&G companies are realigning their decade-old traditional practices across upstream, midstream, and downstream segments through digitalization and automation of processes accompanying this shift.

Intelligent automation, the true vanguard of digital transformation, is playing a critical role in helping these businesses to notch up with an extraordinary paradigm shift in the industry spurred by technological innovation. This whitepaper provides a detailed look at the changing dynamics of the oil and gas automation market, particularly for Artificial Lift Lifecycle Management (ESP and Cable), unraveling the transformative potential of intelligent automation in the oil and gas sector.

From Electric Submersible pumps (ESP) to field operations and beyond, you will explore how intelligent automation and cutting-edge digital oilfield platforms reshape the O&G industry in this whitepaper. Also, this whitepaper will share valuable insights on how digitalization using automation will streamline tracking ESP cable in particular and helps unlock the next levels of real-time data processing, workflow management, digital oilfield connectivity, remote communication, frictionless tracking, and sustainability.

Read this whitepaper to discover more about

- The essentiality of digitalization and intelligent automation in oil and gas
- Artificial lift lifecycle management with ESP and cables: A comprehensive
- approach to operational efficiency
- Revolutionizing operations: The transformative role of intelligent automation
- and IoT in artificial lifting optimization
- Common application of intelligent automation in ESP and cable systems for
- seamless artificial lifting operations

The essentiality of digitalization and intelligent automation in oil and gas

Digitalization under the umbrella of new disruptive innovations like intelligent automation, big data analytics, artificial intelligence, and industrial internet of things (IIoT) is playing a bigger role in the global oil and gas landscape. As the key catalysts, they are revolutionizing everything in the O&G supply chain by infusing better data connectivity, greater process intelligence, and real-time workflow visibility.

According to this Gartner's report, it is evident that embracing digitalization is in full swing helping many O&G CEOs unlock improved agility, better competitiveness, and greater resilience in an increasingly complex future. Also, many of them recognize the advanced Fourth Industrial Revolution technologies to optimize complex processes, track down inefficiency in oil fields, asset tracking, and data management in the Oil and Gas industry, specifically for field operations and artificial lift lifecycle management.

As a result of accelerated digitalization, these organizations gain numerous transformative benefits such as:

Streamlined workflows and operational agility:

Digitalization using intelligent automation empowers these forward-thinking oil and gas companies to streamline their field operations and artificial lift lifecycle management workflows at the right intersection of advanced technologies such as Internet of Things (IoT) devices, sensors, artificial intelligence, and real-time data analytics. As a result, organizations are able to monitor equipment performance, detect anomalies in oil fields and proactively address issues related to oil wells.

Enhanced asset management and predictive maintenance:

By harnessing the true power of data analytics, these companies are monitoring the overall health and performance of critical assets, including pumps, oil wells, cables, and compressors in real-time. Additionally, they are leveraging predictive maintenance algorithms and machine learning models to quickly identify potential failures in field operations, which leads to reduced downtime, extended equipment lifespan, and substantial cost savings.

Real-time monitoring and remote operations:

Through the seamless adoption of IoT connected devices in sync with remote sensing technologies, and automation systems, the oil and gas companies are able to facilitate real-time monitoring and control of field operations, even in remote and challenging environments. Interestingly, the big chunks of comprehensive data collected on production rates, well performance, and environmental factors during the process unlocks real-time visibility. The O&G companies further leverage this data for proactive decision-making, early detection of issues, and timely intervention to minimize risks, which results in enhanced regulatory compliance, and higher operational performance.

Data-driven insights and advanced analytics:

The power of advanced data analytics for actionable insights, is another transformative benefit O&G CEOs reap with the early adoption of digitalization and intelligent automation in the field operations. By leveraging advanced analytics, including artificial intelligence and machine learning algorithms, oil and gas companies can unlock hidden patterns, trends, and correlations within vast datasets. These insights enable informed decision-making, optimized production processes, and improved resource allocation, resulting in increased operational efficiency, cost reductions, and enhanced profitability.

Embracing digitalization and intelligent automation into field operations and artificial lift lifecycle management is no longer an option, but a linchpin to real-time actionable operational data, reduced downtime, and seamless oil field tracking in a parallel way, making field operations like artificial lift lifecycle management more agile, intelligent and connected. Let's embark on an in-depth exploration and understand what is artificial lift lifecycle management for ESP and Cable systems followed by the profound significance of artificial lift in the oil and gas sector.

Artificial lift lifecycle management with ESP and Power Cables: A comprehensive approach to operational efficiency

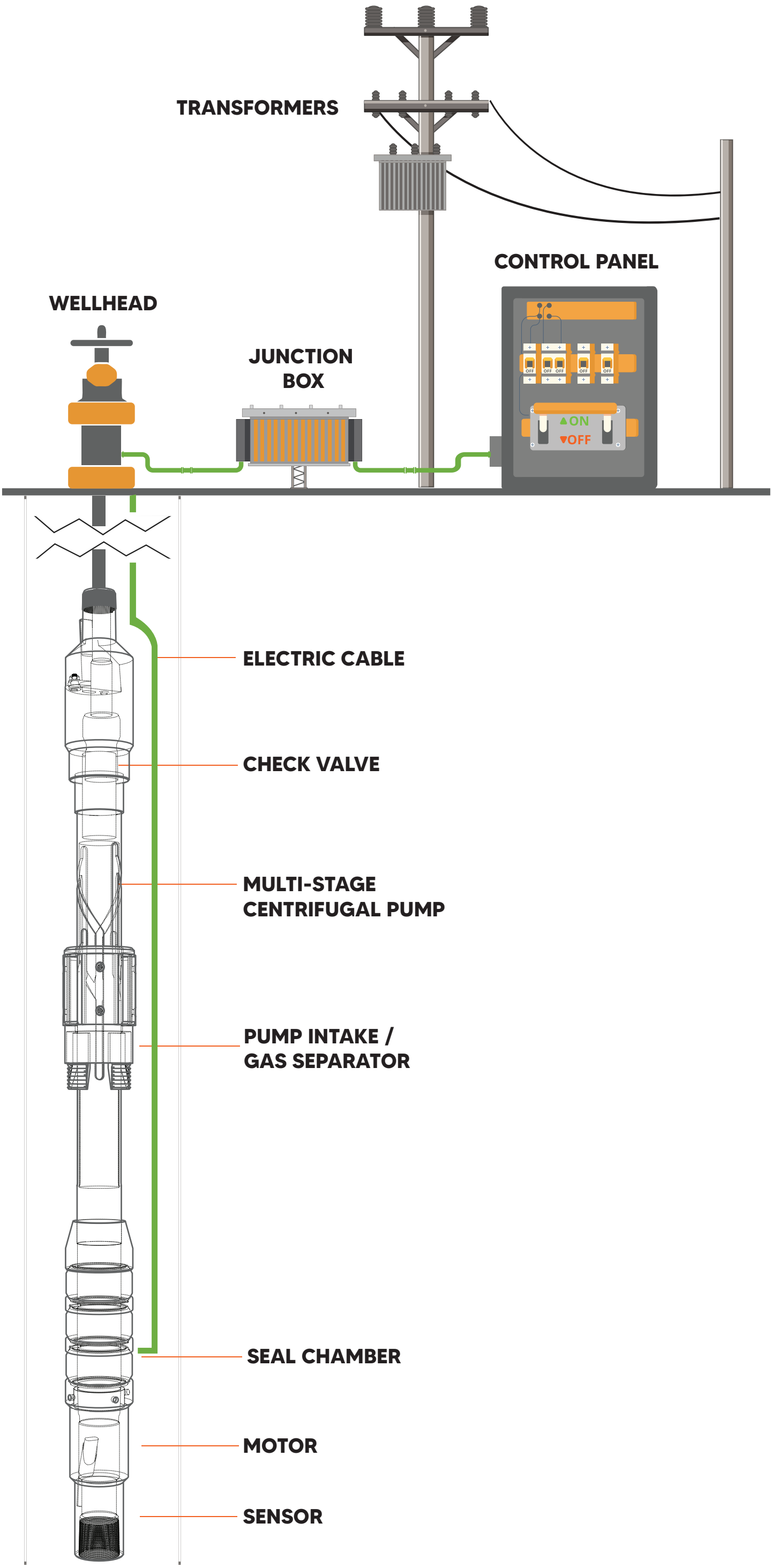
In the operationally challenging oil and gas industry landscape, artificial lift lifecycle management is a fundamental driver of game-changing operational excellence for energy reservoirs with low pressure levels. The purpose of the artificial lift process is straightforward: to optimize production site in oil and gas wells where there is need to lift the renewable energy sources to the surface because of low pressure.

Currently, in the O&G sector, the concept of artificial lift lifecycle management is gaining huge momentum for a wide range of applications, including well monitor and control, reservoir management, production optimization, predictive maintenance, flow assurance, multiphase pumping, etc. Field operations using enhanced artificial lift systems in the oil and gas sector enable companies to respond to serious issues such as unplanned shutdown time, failure of equipment, limited gas availability and compression, changing well production compositions, and other operational constraints hampering the offshore and onshore oil fields performance - on-time and on-budget.

A diverse array of artificial lift systems are gracing the realm of oil and gas industry to fuel transformative operational excellence. However, Electric submersible pumps (ESPs) are one of the most efficient and reliable artificial lift methods used by O&G companies to lift moderate to high volumes of fluids from wellbores. It is a multistage centrifugal pump type capable to lifting range from a low of 150 B/D to as much as 150,000 B/D (24 to 24,600 m3/d) with full efficiency.

ESPs are equipped with multiple stages of centrifugal pumps, which are further connected to the submersible electrical motors to create pressure and lift the production up to the surface. The pumps, which are powered electrically, serve the purpose of moving the fluids in the well from the downhole to the surface.

The electric submersible motors are powered by heavy duty cables and configured to run in an inverted discharge design to pump fluids from the well formation to the surface. The figure below explains the normal ESP system configuration showcasing the main ESP components such as multistage centrifugal pump, three-phase induction motor, seal-chamber section, power cable, and surface controls.


TRANSFORMERS
CONTROL PANEL
WELLHEAD
JUNCTION BOX
ON
OFF
ELECTRIC CABLE
CHECK VALVE
MULTI-STAGE CENTRIFUGAL PUMP
PUMP INTAKE / GAS SEPARATOR
SEAL CHAMBER
MOTOR
SENSOR

In the dynamic realm of the oil and gas industry, artificial lift systems utilizing electrical submersible pumps and cable systems, play a pivotal role in optimizing production and maximizing reservoir potential. There are several crucial phases to be followed in artificial lift lifecycle to navigate the complexities of reservoir characteristics, fluid dynamics, and production requirements. Let's explore the strategic steps and pivotal phases that drive the success of ESP and Power Cable systems in the oil and gas industry:

Planning and design phase:

- Conduct a comprehensive analysis of well characteristics, reservoir conditions, and production requirements.
- Determine the suitability of ESP and Cable systems based on well depth, fluid properties, and expected production rates.
- Design the optimal configuration of equipment, including pump size, motor power, and cable specifications.

Installation and commissioning phase:

- Execute the installation of ESP and Cable systems with meticulous attention to detail.
- Ensure proper alignment and secure connections of the pump, motor, and cable to ensure optimal performance.
- Conduct rigorous testing and validation procedures to verify system integrity and functionality.

Operation and monitoring phase:

- Implement real-time monitoring systems and IoT technologies to continuously gather data on well performance, fluid levels, and system parameters.
- Monitor pump efficiency, power consumption, and fluid production rates to assess system performance.
- Regularly analyze collected data to identify deviations, diagnose potential issues, and optimize production parameters.

Maintenance and optimization phase:

- Develop a proactive maintenance plan, including regular inspections, preventive maintenance tasks, and scheduled repairs or replacements.
- Leverage intelligent automation, IoT, and predictive analytics to anticipate equipment failures and plan maintenance activities accordingly.
- Conduct equipment optimization, such as adjusting pump speed or implementing advanced control strategies to enhance system efficiency.

Decommissioning or replacement phase:

- Evaluate the performance and economic viability of the ESP and Cable systems over time.
- Determine if the equipment has reached the end of its useful life or if replacement is necessary to sustain production levels.
- Safely decommission and remove the equipment, following industry standards and regulations.

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Revolutionizing operations: The transformative role of intelligent automation and IoT in artificial lifting optimization

Optimization of well production performance, creating new capabilities, and strengthening technology foundations are three crucial business imperatives that every O&G company focus on to facilitate digital innovation faster across their field operations. With approximately over 90% of oilfields and wells in operation relying on artificial lifting approach, the use of intelligent automation along with advanced AI, ML, IIoT and predictive analytics for artificial lift lifecycle optimization helps O&G companies to address the growing security and performance risks efficiently in real-time.

The deployment of Artificial lift optimization (ALO) solutions unlocks many potential benefits including material ROI, increased production, enhanced oil recovery (EOR) and estimated ultimate recovery (EUR) through integration of advanced technology, information, people, and processes in the oil and gas production life cycle. Also, Artificial lift optimization helps organizations identify

This dynamic flexibility allows organizations to seize new opportunities with speed and efficiency, ensuring they stay ahead of the competition and thrive in even the most volatile market conditions.

- fast-loop processes for equipment monitoring and leak detection
- medium-loop processes for lift optimization
- slow-loop processes for reservoir optimization.

ALO simply works on vast amount of data, which is thoroughly collected from multiple sources and and analyzed by automation engineers/data scientists using predictive analytics, deep learning models, and numerous data analytics methods. Applying intelligent automation and IoT helps these companies increase both operational and capital efficiencies while improving return on investment.

Intelligent automation in artificial lift lifecycle optimization: The core benefits

The transformative role of intelligent automation and IoT in Artificial Lifting optimization cannot be overstated. By embracing these technologies, production heads and oil and gas companies can revolutionize their digital oilfield operations. Also, intelligent automation in synergy with advanced technologies like machine learning, big data, and artificial intelligence, enables real-time monitoring of well conditions, production parameters, and equipment performance.

This influx of real-time data facilitates continuous optimization, allowing production heads to fine-tune Artificial Lift Systems

What's more? Employing machine learning algorithms and big data in the right way, production heads can identify patterns and anomalies in the data, gain a better understanding of oilfields and oil wells maintenance needs, and can prevent costly unplanned downtime. Furthermore, production heads can leverage advanced analytics to uncover hidden correlations, identify optimization opportunities, and fine-tune production strategies for enhanced performance.

Interestingly, the convergence of advanced machine learning algorithms and big data into the artificial lift management cycle helps O&G companies to unlock benefits of a powerful framework for "learning" using the vast data available in abundance. The utilization of actionable insights based on real-time feedback and data-driven intelligence, enable companies to enhance their decision-making capabilities, optimize equipment designs, extend equipment runlife, streamline maintenance procedures, and ultimately improving the overall performance and longevity of artificial lift systems at various levels.

Also, the implementation of machine learning and big data analytics fosters a culture of continuous improvement, collaboration, learning and innovation by helping cross-functional teams to work together to capitalize on historical data and real-time information, to deliver significant value.

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