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IoT Based Predictive Maintenance Solutions for the Oil and Gas Industry

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The oil and gas industry, which is one of the most challenging and demanding industries, is one of the industries that should give the most importance to predictive maintenance. Factors such as global climate change, pressures in the oil industry, increased costs, and intensive use of traditional technologies create serious pressures on the industry. This White Paper focuses on how manufacturers in the oil and gas industry can increase their competitiveness through predictive maintenance.

Why Is Predictive Maintenance Critical to the Oil and Gas Industry?

An unplanned machine failure can have serious consequences for companies operating in the natural gas and oil field. According to The International Maintenance Association (IMA), less than 4 days of unplanned downtime in this industry can result in an average loss of more than \$5 million. This means that a complex failure in a vital asset can have a tremendous impact on the profitability of the organization and even lead to financial collapse.

Fact

42% of offshore equipment is over 15 years old and has 13% downtime, the vast majority of which is unplanned. Source: Impact on Digital Unplanned Downtime Report

Another important point to remember is that machinery in the oil and gas industry is installed in remote and difficult-to-access areas. Being able to monitor all asset performance in real time from a single dashboard, regardless of whether machines are in one location or 100 different locations, makes it easier for the maintenance department to deal with issues much more efficiently and quickly.

Increasing Employee Safety

According to the U.S. Centers for Disease Control (CDC), oil and gas exploration companies have been involved in 602 incidents, 481 hospitalizations and 166 amputations at work in recent years.

In addition to remote monitoring of equipment, IIoT-based predictive maintenance solutions help reduce these numbers, allowing workers to know exactly where the problem is occurring and whether the environment is safe to step in and fix.

The industrial IoT takes risk management to the next level by reducing the need for maintenance workers to perform unnecessary hazardous investigations. Maintenance workers know exactly where and what the problem is, using large datasets to perform predictive analysis.

Remote monitoring also helps teams verify that the environment is safe. After maintenance is performed, it is possible to use the sensor data of the assets to verify the effectiveness of the operation before restarting the machines, which prevents accidents and additional unplanned downtime.



Predictive Maintenance with **Artesis is easier than ever!**

Artesis' patented unique technology allows to detect both electrical and mechanical faults months in advance by obtaining only current and voltage information from the monitored equipment. Since sensors do not need to be installed on equipment in this unique technology, they can be easily used in open seas, in hard-to-reach areas, in areas such as wells, drainage, pumps. All assembly and wiring operations are performed on the panel of the equipment to be monitored. This gives maintenance personnel more flexibility and convenience than ever before.

Fact

Artesis can detect malfunctions that may occur in equipment up to 6 months in advance. Remember that catching faults sooner means cheaper repairs, longer equipment life, and no unexpected loss of production.

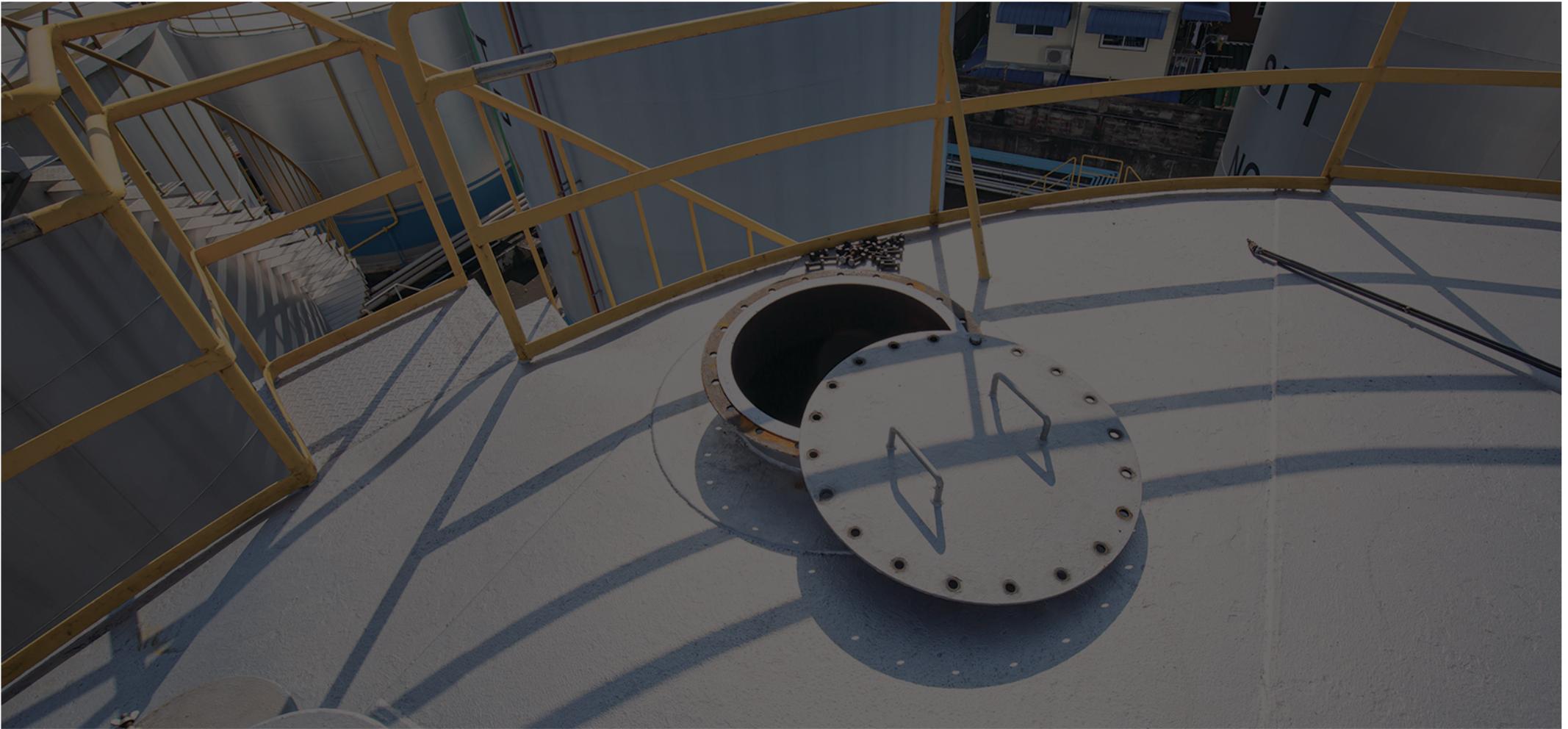
In Which Fields Can You Use Artesis in **Oil and Gas Facilities?**

1- Oil and Gas Pumps

Artesis predictive maintenance solutions monitor a gas pump's flow, power, vibration and other key variables in real time to look for problems such as leaks. These solutions automatically generate reports on pump conditions and alert the maintenance team when performance falls below benchmark.

In addition, because it collects historical data on pump performance, oil and gas companies can use it to run simulations of potential failure scenarios along with real-time data. This helps companies prepare for future maintenance activities and implement process improvements that increase pump performance and efficiency.





2- Tank Pressure Monitoring

Monitoring tank pressure is crucial to protecting workers, maintaining the integrity of the tank contents and reducing emissions to comply with increasingly stringent environmental regulations. In addition, fluid and temperature changes require continuous monitoring of the tank pressure.

Predictive maintenance solutions for void, pressure, temperature or discharge rate and real-time monitoring using IoT tank sensors can overcome these challenges and effectively manage tank pressure changes.

3- Pipeline Monitoring

Oil and gas pipelines travel long distances and are subject to scrutiny of numerous regulations to ensure operational efficiency and personnel safety. Defects in these pipelines can cause accidents such as explosions or leaks and cause significant environmental damage.

This is where real-time pipeline monitoring can help. With continuous monitoring and tracking of key KPIs, oil and gas companies can respond immediately to potential problems and fix them as they occur, reducing the likelihood of unplanned downtime and lost revenue.



4- Drilling Operations

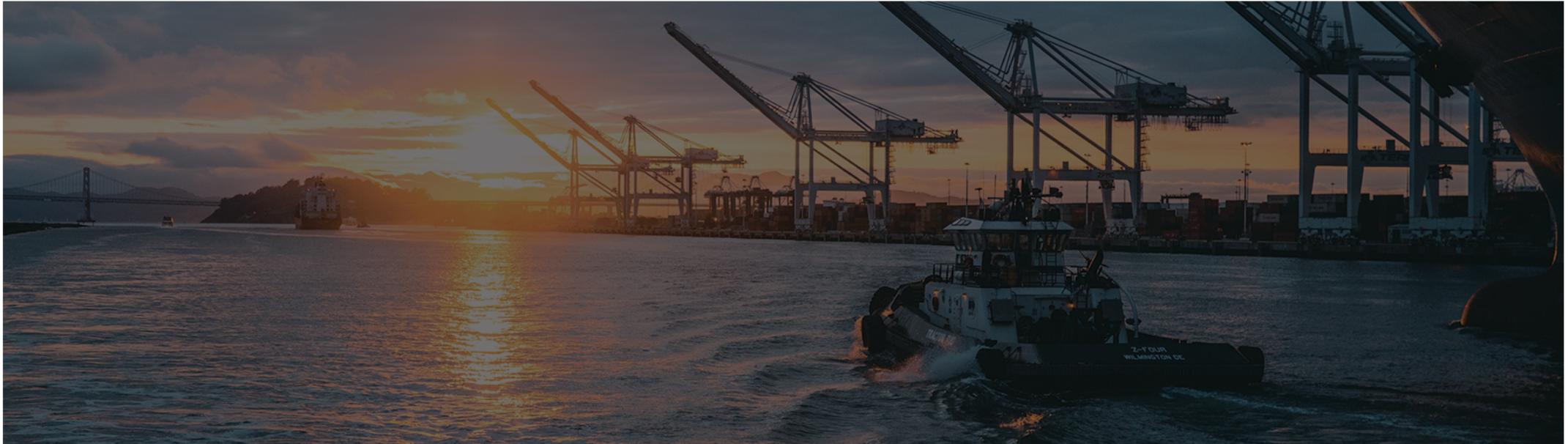
Drilling operations are among the most challenging environments on earth. Moreover, each drilling operation is a serious cost for businesses. High pressure, temperature changes, corrosion, vibration are incredible and early detection of equipment operating at this level is critical. Artesis provides real-time data without installing sensors in hazardous areas, allowing you to identify equipment failures before they become a major problem. Drilling machines, drawing works, mud pumps, and pulleys can be continuously monitored without sensors. (Drilling machines, draw works, mud pumps, sheaves, and thrusters can be monitored continuously without installing sensors in hazardous areas.)

Fact

In the US alone, oil and gas refineries lose over \$6.6 billion a year due to unplanned outages. Therefore, operators should utilize predictive maintenance to ensure equipment is working well and correct problems before a malfunction occurs to prevent losses. Source: Impact on Digital Unplanned Downtime Report

If You're an Oil or Gas Company, What Predictive Maintenance Solution Should You Have?

- ▶ It should be an effective solution in hard to reach and dangerous areas.
- ▶ It should provide faults in advance with maximum accuracy.
- ▶ It should be easily integrated into automation systems.
- ▶ Remote monitoring and reporting processes should be user-friendly.
- ▶ It should be able to detect not only mechanical faults but also electrical faults.
- ▶ It should contribute to energy efficiency.



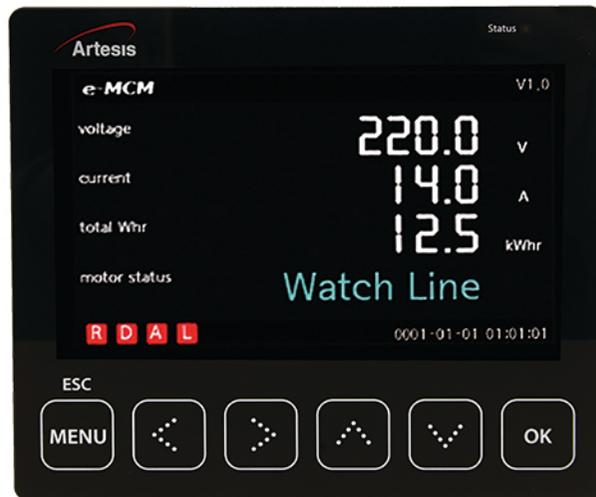
Fact

With the help of advances in IIoT, predictive maintenance can focus on data received, particularly through periodic or continuous monitoring of the health and performance of equipment currently operating under normal operating conditions. . And it can do this without disrupting daily work. Source: Connected World

With e-MCM Sensorless Condition Monitoring Solutions, Predictive Maintenance is Possible in the Most Difficult Areas!



An IoT-based predictive maintenance solution is essential for the oil and gas industry. Being able to monitor equipment regardless of location enables a facility to manage emerging issues much faster, reducing downtime and expensive equipment failures. As smarter devices evolve and oil and gas transportation and refinery become more complex, the data that needs to be processed increases. All of this makes a sensorless and IoT-based predictive maintenance solution mandatory.



How e-MCM Works?

The e-MCM constantly monitors your rotating equipment, takes measurements and compares them with the digital twin it created during the self-learning process, giving you information about the latest status of the equipment. The unique machine learning algorithm allows it to recognize normal operation in a wide variety of conditions such as different speeds or loads, providing control without false alarms.

With Artesis, the problem of installing in hard-to-reach areas, which can often be encountered in almost every facility, ends. The e-MCM only needs three-phase voltage and current connection via conventional current transformers (CT) and voltage transformers (VT). Usually the e-MCM is installed in the engine control cabinet. This makes it very easy to access especially hard-to-reach equipment.

Which Faults Can Be Detected In Advance?

Artesis e-MCM offers comprehensive solutions in the detection of both electrical and mechanical faults.



Electrical and Mechanical Failures

- Loose foundation / components
- Mechanical imbalance / misalignment
- Transmission faults
- Driven equipment malfunctions
- Gear box, belt, coupling and bearing failures
- Stator and rotor faults
- Internal electrical faults
- External electrical faults



Process Faults

- High energy consumption
- Low efficiency
- Cavitation in pumps
- Flow turbulence in fans, blowers
- Contamination in the filter and heat exchanger
- Lubrication
- Overload



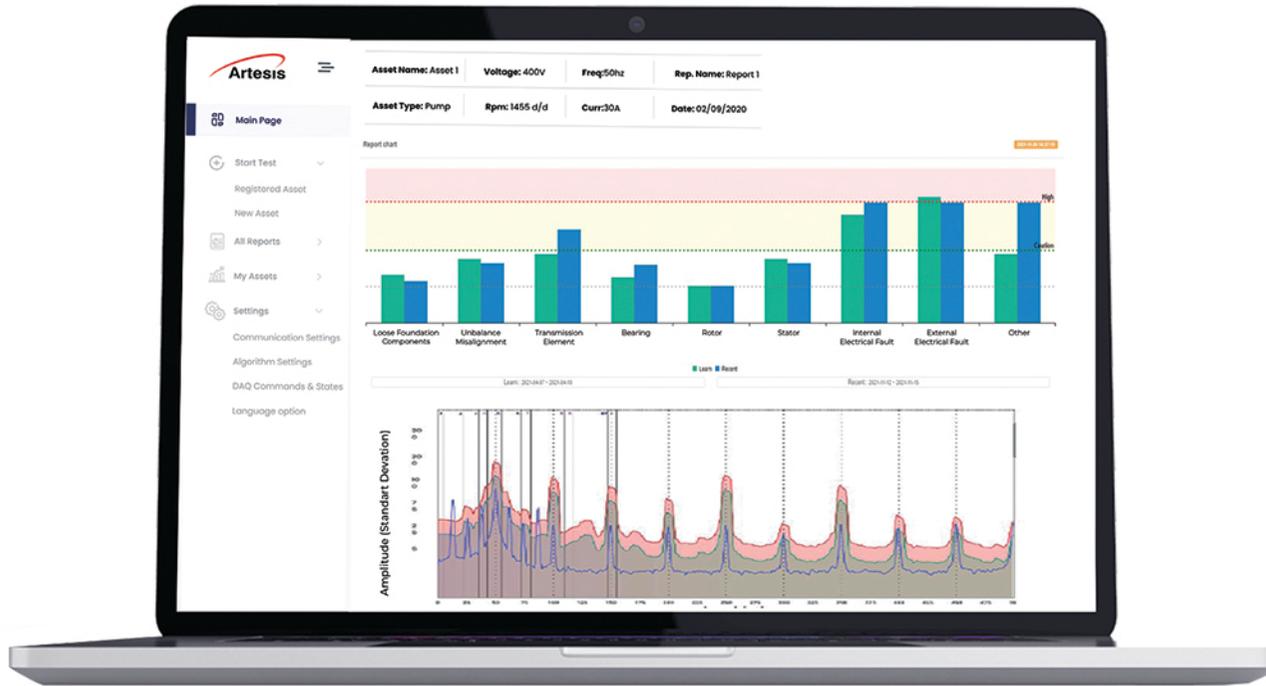
Power Monitoring

- V_r , V_s and V_t
- I_r , I_s and I_t
- Frequency
- Voltage Unbalance
- Current Unbalance
- Motor Load
- Power Factor
- Active Power
- Reactive Power
- Total and odd harmonics

Easy and Digital Use

Many predictive maintenance methods are difficult to operate even after they are installed. Artesis e-MCM provides a fast and easy use with its automatic fault diagnosis feature. Instead of dealing with dense and complex data, maintenance personnel take quick action only with actionable data.

After installing e-MCM systems in your treatment plant, Artesis IoT platform communicates easily with e-MCMs. You can establish a wireless connection by integrating a 4G / LTE router into your system that allows communication between e-MCMs Artesis IoT cloud platform. Integration packages are available for a wide variety of third-party systems, including integrated condition monitoring, SCADA/HMI, and reporting/business intelligence.



Real-Time and Error-Free Monitoring

The e-MCM continuously takes measurements and compares them with the baseline condition to assess the severity and type of any developing faults. It can recognize anomalies in a wide variety of work situations and even expand the self-learning process further when it recognizes that it has gone beyond the original learning boundaries. This allows the e-MCM to detect faults very precisely without false alarms. This real-time data provided by Artesis is an effective method for solving problems that are progressing quietly, especially in the oil and gas industry.

Result



Oil and gas companies are under serious pressure in many areas from costs to carbon emissions. To overcome these pressures, prevent disruptive shutdowns and increase competitiveness, an IoT-based predictive maintenance solution is essential. Thanks to the smart solutions, we help facility managers and engineers to reduce the increasing complexity and operating costs of their systems, improve reliability (uptime) and increase process efficiency.

Artesis

Contact us

If you have any queries related to condition monitoring for Oil and Gas Industry please kindly contact us.



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