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Case Study

MACHINE-LEARNING: THE FUTURE OF MAINTENANCE FOR OFFSHORE OIL AND GAS

PROBLEM: THE NEED FOR A BETTER MAINTENANCE PARADIGM

Preventing asset failures and accidents is critical for offshore oil and gas operators. Asset failures are expensive events that can cost millions of dollars in deferred production and repairs, as well as grind operations to a halt for extensive periods of time. Just 12 hours of downtime for a 200K bpd offshore production platform can result in $6-8M of deferred production opportunity. That doesn't include the cost of labor, the need for new parts, or the cost of damage to the company's public image. Today, most offshore platforms have already invested in sensors across their operations that generate massive volumes of data. By making better use of the data they already have, offshore operators can switch to a predictive maintenance approach, allowing them to predict and prevent asset failures before they occur.

Predictive maintenance uses machine learning algorithms to ingest historical sensor data from a facility's operations. This data is then used to build a model that acts as a profile of what normal operations look like. The normal behavior model can then analyze asset sensor data in real time, and identify and flag any values that deviate from this established norm. Using historical sensor data and added knowledge from subject matter experts (SMEs), this model can pinpoint when and how a failure will occur rather than simply warning that a component is at risk. Operators are then able to plan timely maintenance and avoid excess downtime or catastrophic failures.

To offer an analogy, predictive maintenance is akin to having a wearable medical device, like a wristband, constantly scanning a patient's body, examining every aspect of their health as they go about their day, and continually assessing the results in real time.

> ***"Cutting-edge technologies, like AI-based predictive analytics, are key enablers to improving the efficiency of our operations and meeting our ambition to become a net-zero company by 2050 or sooner. Working collaboratively with Avathon, we have delivered this project in an agile way."***
>
> **FEREIDOUN ABBASSIAN,**
> Former VP of Transformation,
> Upstream Technology at bp

This device could then inform the patient that they need to see a doctor for medical treatment to avert a heart attack that will otherwise take place on a specific date. In the same way, the proactive diagnosis of offshore asset health would allow upstream operators to anticipate and address failures before they occur.

SOLUTION: AI-POWERED PREDICTIVE MAINTENANCE

The best way to truly derive value from predictive maintenance is by using an AI-powered solution such as Avathon's Industrial AI platform. Predictive maintenance can be (and has been) done without the use of artificial intelligence (AI) and machine learning (ML), but machine learning alleviates—or even eliminates—many of the difficulties associated with traditional predictive maintenance.

FIGURE 1:

Customer Success Stories in Offshore Production Platforms and Oil Wells

	PROBLEM	SOLUTION	VALUE
PREDICTIVE MAINTENANCE	Reactive maintenance programs for industrial assets are risky, disruptive, and expensive, relying on legacy methodologies and continuity of subject matter expertise.	Industrial AI platform proactively identifies anomalous behaviors and adapts to asset changes over time.	Identified 75% of a customer's production-impacting events, improving production by $30M annually per platform.
PRESCRIPTIVE MAINTENANCE	Asset repair workflows are not optimized, depending on centralized information and tribal knowledge with the added complexity of a retiring workforce.	Avathon Industrial AI platform uses natural language processing that assesses fault codes, delivers the most relevant documentation to streamline repair, and captures user input to improve results.	Reduces maintenance costs by 5-10% annually.
PRODUCTION OPTIMIZATION	Optimizing production is a complicated process with hundreds of variables influencing decisions that must be made rapidly.	Avathon Industrial AI platform provides automated model building that allows data scientists and non-technical users to create highly accurate predictive models using their production data.	Machine learning models can be developed in hours, not weeks, and without data science expertise.

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Addressing speed and scale

Predictive maintenance requires large amounts of data at a scale that is cumbersome and prohibitively time-consuming for human analysts.

Machine learning can unlock the insights in this data quickly, efficiently, and accurately. Industrial AI platform analyzes large volumes of data, identifies anomalous behavior, and understands causal relationships using advanced unsupervised learning techniques. This system provides operators with faster insights into asset failure prevention for any size of operation.

Alleviating the cost and burden of model upkeep

Another problem machine learning addresses is maintaining models over time. With traditional predictive models that don't employ AI, a change in even a single variable, such as a replaced part, necessitates reworking the entire model. This also applies to the normal changes an asset goes through over time as it is used; a pump that has been in service a long time will not perform the same as when it was brand new.

Machine learning models avert these problems because they dynamically learn and maintain themselves by adjusting to any component or asset and adapting to changes over time.

Overcoming the lack of sufficient, structured data

Not all systems or subsystems have the sensors to provide the amounts of data predictive maintenance requires. Machine learning alone can't solve this dilemma, but ML-powered natural language processing (NLP) can. Most software can only analyze structured data or data containing numbers or categories.

AI-powered NLP technology can decipher and use unstructured data as well—be it PDFs, books, journals, audio, video, images, notes, analog data, or any other source imaginable. This capability is valuable for offshore operators because, with NLP, predictive maintenance models can use data sources beyond sensors. This includes all manner of associated data about an asset, such as maintenance records. By extracting facts, figures, entities, and contextual data from an asset's maintenance history, predictive maintenance solutions outfitted with NLP find causal patterns that indicate potential failures, even in so-called dark subsystems that lack sensors.

Realizing the potential of predictive + prescriptive maintenance

While invaluable, predictive analytics are only part of the value machine learning delivers. Predictive maintenance doesn't absolve operators from the need to perform maintenance. By incorporating NLP technology, industrial asset maintenance solutions can ingest historical records and service manuals, as well as past courses of action taken by subject matter experts. Using this bank of information, the solution can speed up maintenance processes by listing possible next steps and suggesting corrective measures.

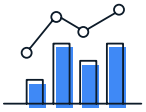
RESULTS: COST-EFFICIENT MAINTENANCE

Increased Identification of Unexpected Subsystem Failures by

75%

Increased Failure Identification Lead Time from Hours to

9 Days



Increased Production Efficiency on Offshore Platforms to Nearly

99%

CASE STUDY: PREDICTIVE MAINTENANCE FOR A LARGE FLEET OF OFFSHORE PLATFORMS

PROBLEM

A supermajor with high-volume offshore platforms needed to maximize production potential and improve overall platform safety.

SOLUTION

In just two months, Industrial AI platform was deployed across 20 critical subsystems to predict impending failures and optimize maintenance activities.

RESULTS

The customer improved annual production by 4%, or up to $30M annually per platform.

ABOUT AVATHON

Avathon, a leader in Industrial AI, extends the life of critical infrastructure while advancing the journey toward full autonomy. Avathon's Industrial AI platform empowers commercial and government customers with scalable, secure, and value-driven solutions that enhance efficiency and resilience across heavy industry.

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