

## PROBLEM: THE NEED FOR A BETTER MAINTENANCE PARADIGM

Preventing asset failures and accidents is critical for offshore oil and gas operations. Asset failures are expensive events that can cost millions of dollars in lost 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 lost 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 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 the historical sensor data, as well as added knowledge from subject matter experts (SMEs), this model can pinpoint exactly when and how a failure will take place, 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, that is 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. This device could then inform the patient that they need to see

*“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 SparkCognition, we have delivered this project in an agile way.”*

—Fereidoun Abbassian,  
VP of Transformation, Upstream Technology at bp

a doctor for medical treatment to avert a heart attack they will otherwise have on a specific date. In the same way, the proactive diagnostics of offshore assets would allow upstream operators to anticipate and mitigate 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 SparkCognition™ O&G Maintenance Advisor. 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 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	O&G Maintenance Advisor <b>proactively identifies anomalous behaviors</b> and adapts to asset changes over time	Identified <b>75% of customer's</b> production-impacting events, improving production by <b>\$30M annually</b> per platform
PRESCRIPTIVE MAINTENANCE	Asset repair workflows are not optimized, depending on centralized information and tribal knowledge with added complexity of a retiring workforce	SparkCognition™ Deep NLP product is based on natural language processing that <b>assesses fault codes</b> , delivers the most relevant documentation to streamline repair, and captures user input to improve results	Reduces maintenance costs by <b>5-10% annually</b>
PRODUCTION OPTIMIZATION	Optimizing production is a complicated process with hundreds of variables influencing decisions that must be made rapidly	SparkCognition™ ML Studio automated model building product enables data scientists and non-technical users to <b>build highly accurate predictive models</b> using their production data	Machine learning models <b>can be developed in hours</b> , not weeks, and without data science expertise



### 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. O&G Maintenance Advisor 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 is not going to 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 is only able to analyze structured data, or data containing numbers or categories.

AI-powered NLP platforms, like SparkCognition Deep NLP, 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 sources of data 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

Predictive analytics, while invaluable, is only part of the value that machine learning delivers. Predictive maintenance doesn't absolve operators from having to perform maintenance. By incorporating NLP technology, maintenance solutions are able to 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

### SparkCognition™ Delivers With Proven Technology



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%**

In past deployments for offshore oil and gas, SparkCognition has increased the ability to identify unexpected subsystem failures by 75%, and more than doubled previous lead times to an average of nine days advance warning, where previous lead times were typically a matter of hours, if there was any advance notice at all. The projected economic impact of SparkCognition's predictive maintenance work with one oil and gas supermajor on their offshore platforms is \$800M annually. Machine learning technologies are already allowing leaders in offshore oil and gas to truly leverage the potential of their data, enabling safer and more predictable operations.

### ABOUT SPARKCOGNITION

SparkCognition's award-winning AI solutions allow organizations to predict future outcomes, optimize processes, and prevent cyberattacks. We partner with the world's industry leaders to analyze, optimize, and learn from data, augment human intelligence, drive profitable growth, and achieve operational excellence. Our patented AI, machine learning, and natural language technologies lead the industry in innovation and accelerate digital transformation. Our solutions allow organizations to solve critical challenges—prevent unexpected downtime, maximize asset performance, optimize prices, and ensure worker safety while avoiding zero-day cyberattacks on essential IT and OT infrastructure. To learn more about how SparkCognition's AI solutions can unlock the power in your data, visit [www.sparkcognition.com](http://www.sparkcognition.com).

## 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, the O&G Maintenance Advisor predictive analytics product 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.