
The motherlode

An oilfield services company piped previously untapped data into an analytics platform to drive efficiencies in downhole steering and evaluation

At a glance

A global oilfield services company used advanced analytics to extract insight from its data and improve efficiencies by predicting and preventing downhole failures.

Outcomes

- Transparency of root causes of failure
- Survival analysis for preventive replacement
- Implemented with no disruption to operations
- 100 percent increase in MTBF

Data boom

The parallels between oil and data are well established. Like oil, data must be refined before it can be used to fuel a program or business. The analogy goes dry shortly after that point. While data may not be the new oil, data has uncapped a new era of possibilities in the oil and gas industry.

The new era is replete with new heroes: the science, technology and analytics that make techniques like fracking and horizontal drilling more efficient. For example, logging-while-drilling (LWD) sensors just behind the drill bit collect data on everything from shock and vibration to gamma rays and neutron porosity. In that same vein, neutron well logging requires high-voltage neutron generators. And so on.

Nonproductive nightmare

Those and other electronic or mechanical components of the drilling rig really go at it, powering through millennia of earth. Temperatures can exceed 500°F – with 35,000 PSI of pressure. Such extreme conditions accelerate aging of tools and increase the risk of downhole failure.

When one component fails in a well or borehole stretching two or three miles, hours quickly fade into days as the drill string is removed for repair or replacement. Meanwhile, the nonproductive nightmare continues and the hole deteriorates.

That's the scenario a global oilfield services company intended to end when it partnered with IT services company Atos. The two organizations set about solving the problem by using existing downhole data to predict and prevent future failures.

They gathered an agile capability team of data scientists and industry experts to develop a cloud-based analytics platform that would accomplish three goals:

- Improve asset utilization and crew performance
- Increase meantime between failures (MTBF) by 100%
- Reduce nonproductive time (NPT)

Scratching the surface of untapped data

The team's initial task was to prove the diagnostic and predictive value of the oilfield company's untapped data. In the first of three advanced analytics studies, they investigated several failure scenarios to find key mechanisms accelerating age and wear of drilling equipment. They analyzed:

- Effects of high temperatures on electronics
- Speed of temperature cycles, fast vs. slow
- Shock and vibration data
- Associations between different types of failures
- Failure of components, e.g., electronic boards, sensors, neutron generators
- Complications of extra mechanical components such as for rotary steering

After a couple of weeks, they confirmed the predictability potential of the datasets.

2 trillion points of data

A run can last 3 days or **259,200 seconds**, with **2 samples collected per second**, totaling **518,400 samples per run**. Each sample consists of **2,000 channels/values**, or **more than a billion data points per run**.

With that they could conduct a deeper exploratory analysis of historic data and descriptive models to understand the major environmental conditions and operational parameters that precede or cause failure.

Drilling down

The exploratory analysis looked into data from 2,000 runs – more than 2 trillion data points.

At the same time, the team developed analytical and predictive models. Their goal was to unite data from directional drilling and LWD tools with the data they had collected on asset performance, maintenance histories, failures and environmental conditions. Then, the juice: the data could be analyzed and used for predictions.

They worked for six months to deliver a methodology and model that search proactively for indicators and tell the driller when to replace a specific part before it fails.

The methodology automates field data processing (including file selection, data cleaning, outlier detection, quality checking and modelling) to track cumulative wear from shock and vibration that ages rig equipment.

The model operates downhole to improve real-time notifications to the driller about operating windows and increased risk for damage or failure.

Since the model was implemented – seamlessly, in a firmware update of the tool that didn't affect operational procedures – MTBF has improved by more than 100 percent! And the oilfield company now has a transparent view into root causes of failure.

Digging deeper

The two companies then built a data lake repository for much larger datasets. Atos used an industrial analytics program, which it had created in partnership with Siemens, as an open-source foundation for the data lake on a SAS grid. Open-source was a key contributor to the data lake's flexibility for future use.

Altogether, the methodology, models and data lake formed a predictive platform that enabled the oilfield company to run analyses on its own. Its data scientists are using the platform to dig deeper into surface-drilling data and integral analysis of downhole as well as surface data. The goal is to transform all their drilling and exploration practices to be driven by data, setting ever higher standards for the rest of the industry to follow.

Why Atos for data analytics in oil and gas

The agile consulting methodologies, proof-of-value sprints and data modeling described in this story are part of Atos Codex, one of the world's leading analytics portfolios enabling IoT and artificial intelligence.

When minutes of downtime represent millions in lost revenue, Atos Codex extends asset life and availability, reduces downtime and prevents equipment failure.

To learn more, visit atos.net/en-na/lp/energy or send an email to info.na@atos.net.

Types of downhole data

- Temperature
- Pressure
- Inclination
- Azimuth
- RPM
- Weight on bit
- Torque
- Bending moment
- Vibration
- Density
- Porosity
- Resistivity
- Gamma

About Atos

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European number one in Cloud, Cybersecurity and High-Performance Computing, the Group provides end-to-end Orchestrated Hybrid Cloud, Big Data, Business Applications and Digital Workplace solutions. The group is the Worldwide Information Technology Partner for the Olympic & Paralympic Games and operates under the brands Atos, Atos Syntel, and Unify. Atos is a SE (Societas Europaea), listed on the CAC40 Paris stock index.

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