

Case study: RT-ADS



This case study is based on the article that was featured in Forbes' September 2015 issue. The link to the article can be found here:

<https://www.forbes.com/sites/christopherhelman/2015/08/19/the-robot-roughnecks-out-of-the-oil-bust-comes-a-golden-age-of-drilling-technology/#1ab1e18945b7>

The Problem

Our client was a multi-billion dollar rig technology manufacturer and service provider. Over the course of several years, the client had developed specialized sensors that are installed near the drill bit, passing on valuable information on drilling conditions from downhole. They were now ready for the next logical step:

using this wealth of information collected in realtime to drive drilling decisions. The instant feedback would be used to optimize drilling parameters, and improve the efficiency of the drilling operation.

The Challenge and Opportunity

Faster drilling times can greatly reduce the cost of drilling. For example, reducing the drilling time by a day results in cost savings of \$100,000 per rig. Therefore, the introduction of downhole sensors was a major breakthrough that promised to drive down costs and improve safety and efficiency in oilwell drilling.

Our client initially intended to implement drilling automation using downhole data as a completely in-house project. However, solving this problem requires expertise from many different fields such as physics, mechanical engineering, geology, machine learning, sensor technologies, simulation experts, fluid dynamics experts, and so on. It was not easy to pull all these experts together at the same time. The client tried smaller projects to implement a drilling automation system, but the problem quickly became overwhelming for the in-house teams.

The leadership also tried bringing in outside vendors to solve the problem. However, most of the vendors could not provide technologies beyond web based monitoring and basic statistical data analysis.

As a result, the downhole sensors were not being used to their full potential. The client was on the lookout for a method by which the downhole information could be used in real time to make drilling decisions dynamically, thus improving drilling efficiency.

The Solution

When the client approached Quarkonics with the problem of oilwell drilling automation, we immediately brought together multiple experts from the various relevant field from our 300 + scientific network. We adopted a multi-pronged approach to tackle the problem. Our geological experts were on hand to provide information on different rock structures and their composition, as our physicists developed the mathematical model of the system. Our sensor technologists reviewed the features of the downhole sensor and identified the parameters that

would be relevant as inputs to the automated system. Our data analysts identified patterns in the legacy drilling data and used them to map the drill string behavior under various conditions. They also looked for correlations among various sensor parameters. Finally, our machine learning experts combined all these analyses and created an algorithm that could tackle uncertainties in the drilling environment. The system we developed was RT-ADS, the world's first real time automated drilling system using downhole sensor data. RT-ADS is a machine learning technology that can continuously update the input drilling parameters to maximize the drilling efficiency, reducing the risk of damage to the drill bit while simultaneously making the drilling operation faster, safer, and more efficient.

The RT-ADS system was tested successfully on 6 test rigs. Today, the system is in operation at our client's drilling sites across the world, and has been found to reduce drilling time by 3 days, and improve drilling efficiency by 46%, saving millions of dollars per rig for our client's customers.

Conclusion

The Quarkonics team that made this possible came from diverse scientific and technological backgrounds. The synergy between the team was instrumental in developing the solution – ideas were exchanged, challenged, prototyped, and tested before adoption. Bringing together this combination of skills is not an easy task, and that is where Quarkonics can help our clients. We deliver faster, better, safer and more economical solutions that satisfy our customers' needs and help them to accelerate innovation.

Key aspects of RT-ADS:

- World's first real time automated drilling system
- The system, when integrated with drilling controls, can improve efficiency of drilling operations
- RT ADS can accept data in real-time to help make decisions faster
- System can operate with minimal input data parameters, and can be adjusted to utilize additional parameters when available.