Apache

Apache Corporation is an oil and gas exploration and production company with operations in the United States, Canada, Egypt, the United Kingdom North Sea and Argentina.

FactoryStudio allows for better data-driven decisions leading to improved drilling performance

CHALLENGE

• The goal is to use real-time data to increase efficiency, drive and improve performance, driving down well costs and make better, data-informed strategic decisions in real-time.

SOLUTION: FactoryStudio

• FactoryStudio from Tatsoft uses high-end analytic tools to aggregate, analyze and present real-time information that accelerates performance and learning.

• FactoryStudio allows Apache to combine high speed data with low latency data sources in real-time.

RESULTS

• The project is in full production, including loading historical data from approximately 800 wells to enable "lessons learned" analyses.

• Direct cost per average well is 20-25% of current land-based EDR systems and, when compared to other high-end solutions and systems with real-time models and logging visualization at the rig, the project rigs are only 5-7% of the current vendor costs.

Apache was founded in 1954, by Raymond Plank, Truman Anderson and Charles Arnao. Originally, Apache was a conglomerate of several industries (automotive, produce, etc.), but later focused its' energies on oil and gas exploration and production. From an initial seed capital of just $250,000, Apache had, at the end of 2015, $62 billion in total assets.

To continue growing, especially with the drop in oil prices, Apache needed large efficiency drive and improvements on performance to drive down well costs and make more acreage economic - the proper use of data is crucial to accelerate these efforts, so Apache made the strategic decision to be data-driven in their decision-making.

After evaluating more than thirty potential process control and other industry applications, FactoryStudio was selected, prototyped, configured, tested and deployed to seven North American land rigs within a ten-month period. The effort used the agile development methodology which is an incremental, iterative work cadence using empirical feedback for rapid deployment of updated versions.

FactoryStudio was designed to take in all forms of data, file types, and communication protocols for seamless integration. The system includes rig state determination, data quality verification, a real-time Bayesian model, smart alarms, integration to the daily drilling report database, real-time visualizations, and an open application layer with a Human Machine Interface (HMI) - all at the rig site. The platform can also be used as a building block to assist automated drilling due to it being a Supervisory Control Advisory and Data Acquisition (SCADA) system although that was not the goal for the project developed for Apache.

The data acquisition model allows for actual data aggregation. All of the different data collected, in all file types and protocols, are stored in one database. Once it is centrally stored, all the data can be viewed on customizable charts in a multitude of ways. The centralized data also creates an environment where a drilling engineer can easily compare historical data for pre-well planning, while drilling the well, and in retrospect.

Another of the key design concepts developed by Tatsoft is to allow data analytics to be distributed. The rig application runs algorithms in real- time to determine rig state, data quality and trustworthiness, hydraulic models, MSE calculations, vibration analysis, and performs time to depth transformations. The results of the subsystems are published to both the rig and the office for real-time review and analysis.

The development of the visual displays was also carefully constructed. The user visual interface was considered a top priority for the team during the system design since the user interacts with the displays and outputs of the system. The use of vector graphics gave the needed flexibility and rapid prototyping for display development and, unlike the traditional pixel- based graphics, the vector graphics engine supports mobile applications on both HTML5 and native iOS and faster creation of displays for time/depth data, drilling mnemonics, and geology information.

Finally, the result of the ten-month project for Apache was to sanction the next two phases of development. These phases include the development of smart alarms, advisory services, and high-end data analytics. Overall, the rig-centric approach has proven to work successfully while still supporting virtual, use as needed, real- time control centers.

Other collective results include: deployed to seven North American land rig operations; received data rates up to 100 Hz, with common rate at 10 Hz; proved to receive data from many data sources and formats (not WITS dependent); mapped inputs and produced outputs from multiple sources including real-time and other transaction systems using an API layer; direct cost per average well is 20-25% of current land-based EDR systems and, when compared to high-end systems with real-time models and logging visualization at the rig, the project rigs are only 5-7% of the current vendor costs.

Finally, Apache now has the advantage of controlling the data quality; and capturing and retaining access to real-time, high frequency data to leverage with other data sources and capabilities.