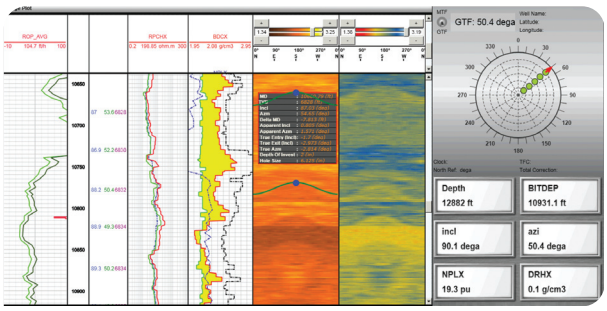
REAL-TIME DRILLING DATA

DOES STANDARDISATION LEAD TO SEAMLESS INTEGRATION AND RIGHT TIME DATA FOR RIGHT DECISIONS?

Nick Baker, Marketing Director of Petrolink, reflects on the challenges of real-time drilling and geological data integration, workflows and analyses in order to drill wells safely and successfully

THE CURRENT APPROACH AND CHALLENGES

The USA National Commission stated in a report that: "In the future, the instrumentation and displays used for well monitoring must be improved. There is no apparent reason why more sophisticated, automated alarms and algorithms cannot be built into the display system to alert the driller and mudlogger when anomalies arise. These individuals sit for 12 hours at a time in front of these displays. In light of the potential consequences, it is no longer acceptable to rely on a system that requires the right person to be looking at the right data at the right time, and then to understand its significance in spite of simultaneous activities and other monitoring responsibilities."



The above paragraph from this very detailed and exhaustive report says it all. Just monitoring display screens of data does not suffice. The data must be analysed in real-time to provide alerts, alarms and real-time well engineering.

Petrolink's integrated real-time drilling and geological data monitoring system, PetroVault, collects, aggregates, stores and displays data at the rig that is acquired by:

- Rig Drilling Sensors (Surface)
- Mudlogging Acquisition Unit (Surface)
- Measurement While Drilling and Measurement While Logging Unit (Downhole)

This aggregated data is instantly transmitted to the Real-Time Operations Centre at the operating company's office, where it is stored in a mirrored data store and instantly displayed. This means that the data displayed at the rig is identical to the data displayed at the RTOC.

It sounds easy to do, but it is not. This is because the data acquisition systems of the three main sources above are in different data formats. These data formats vary considerably depending on the rig instrumentation type, and which service companies are providing the Mudlogging and MWD/LWD services. Some service companies are now beginning to provide real-time feeds in WITSML, but they are still in the minority.

PetroVault importantly converts these differing and proprietary data formats instantly into the industry standard WITSML (Wellsite Information Transfer Standard Markup Language) format.

The WITSML standard is supported and managed by Energistics (www.energistics.com) on behalf of its members, who are oil and gas operating companies and service companies. The WITSML standard has evolved over the last 10 years to the point that it now provides a seamless exchange of data between data acquisition service companies and the operating company, who are the consumers of well data.

With its WITSML capability, PetroVault provides true data input output inter-operability. This has allowed Petrolink to become the only true neutral and independent integrator of real-time well drilling and geological data.

As soon as the data is standardised to WITSML, data is visualised in displays and plots suited to the needs of the various customers for the data, who are:

- Drilling Engineers
- Geologists
- Geosteering Specialists
- Petrophysicists
- Pore Pressure and Geomechanical Specialists
- Completion Engineers

Typically drilling engineers view data indexed against time, whereas geologists and petrophysicists view data indexed against depth. These displays and plots are visualised through a web browser on laptops, desktops or large screen projectors. Additionally data is displayed on mobile devices such as Blackberries, iPad, iPhones and Android tablets to allow engineers and geologists to monitor and analyse the drilling operations 24 by 7.

BEYOND MONITORING TO REAL-TIME ENGINEERING

In the last ten years, the use of real-time data delivery and monitoring systems in the E&P industry has increased several fold. This is due to the following:

- The amount and complexity of the data acquired in each well has increased considerably
- The costs of drilling a well have risen steeply in the last 10 years. In particular the costs of deep water drilling and geo-steering wells are considerable

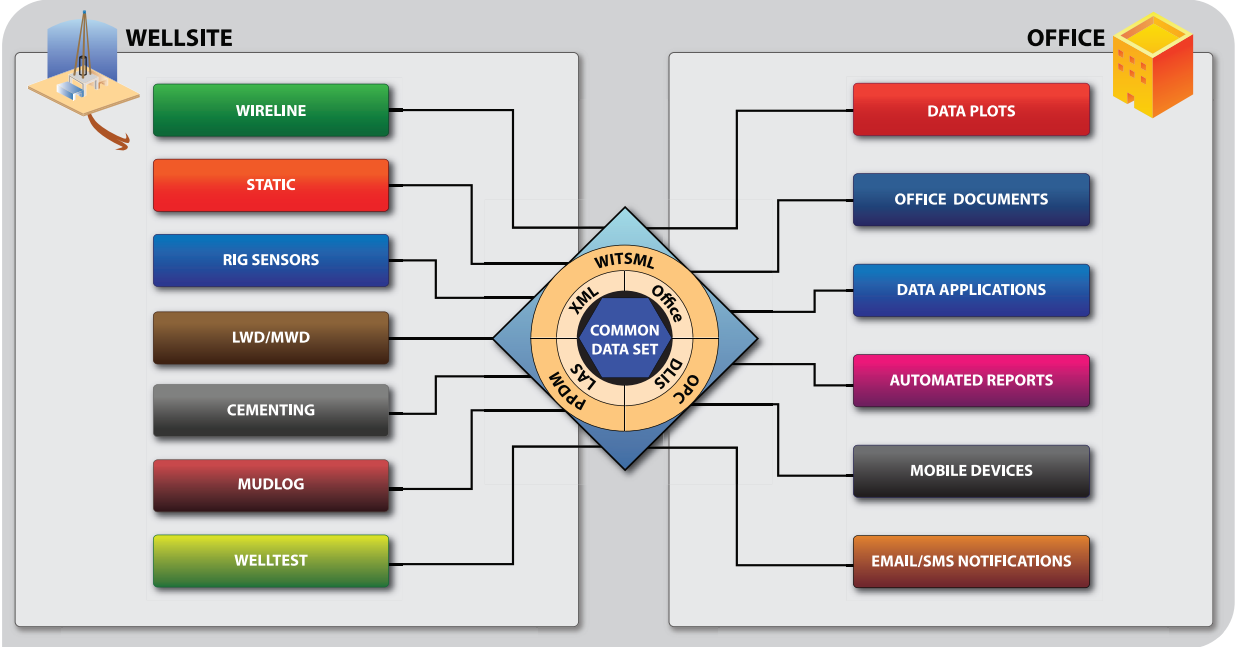
MONITORING AND BEYOND!

- There is a worldwide shortage of drilling engineers, geologists and other geotechnical personnel to manage and analyse well data. With real-time data delivery, the data is brought to the operational and technical professionals in the office, thereby reducing the number of personnel who need to travel to the rig
- Bringing the data to the operational and technical professionals is considerably cheaper than sending personnel to each drilling rig. This also provides improved operational safety
- Real-time data is required in the RTOC to update pore pressure and fracture gradient models in order to predict and communicate foreseeable events and risks
- Geomechanics experts analyse in real-time all available drilling, petrophysical, mud, seismic, and geological data to visualise current downhole conditions
- Real-time identification of wellbore instability, along with the mode of failure, is critical in correcting and reducing the cost associated with wellbore instability
- Geosteering operations require real-time data to identify changes in the geological structure compared to the original models and then to incorporate into the 3D reference model an update of the well path while drilling

The data is available in real-time for export from the Petrolink PetroVault hub to third party applications and databases which are WITSML compatible such as:

- Openworks
- Seabed
- Drillworks
- Petrel
- Techlog
- Interactive Petrophysics
- DSP-One
- EDM
- MS Excel spreadsheets

As well as being able to output data to third party applications and databases for analyses, PetroVault has a built in calculation engine which allows algorithms and equations to be entered. These calculations, which include mechanical specific energy (MSE), vibration severity, drilling activity codes (states) and equivalent circulating density (ECD) are written into the WITSML store either at the rig, or in the RTOC. Instantly these calculated values are displayed and instantly synchronised with the other WITSML store.



At the beginning of 2011 Petrolink was asked by its clients to collect and display data from cementing units when a cementing job was being run. This gives the operator a valuable quality control aid.

Both surface and downhole well testing data are now aggregated and displayed by the Petrolink real-time system. This allows well testing engineers to monitor operations from the office and make timely decisions concerning the well testing.

PetroVault has proven itself to be a very scalable aggregator of all types of well data. With its inbuilt calculation engine and ability to easily export and import data from third party engineering applications and databases, it has shown that it is in the forefront when it comes to Real-Time Engineering and easily provides alerts, alarms and the calculation of key drilling parameters.

STATIC DATA IN PETROLINK'S PETROVAULT – THE BUILDING OF A DIGITAL WELL FILE IN REAL-TIME AS THE WELL PROGRESSES

An important addition to the PetroVault solution is the capability to store unstructured data files and assign metadata to these files for fast and easy retrieval. All types of data generated on the rig such as daily drilling reports, mud logs, memory MWD/LWD, wireline logs, geological reports, well test reports, simple spread sheets and documents are uploaded into this constantly updating digital well file. This valuable data is easily retrieved and displayed, so that it can be used to supplement the real-time data. Nobody should forget that memory MWD/LWD data is always of a higher quality than the equivalent real-time data. By having both digital and graphical data made available through the same PetroVault interface, the retrieval of well data is simple and fast.

BUSINESS BENEFITS

Petrolink provides:

- A collaboration environment that improves multi-disciplinary communication between rig personnel, service company personnel, office based operational and technical professionals
- More efficient integrated decision making since the speed and accuracy of responses to operational drilling events are optimised
- WITSML connectivity to third party applications and databases
- Total well information capture, aggregation, delivery and visualisation by integrating with all service company data acquisition units
- Additional well information capture is provided by capturing unstructured static data sent in batch mode
- Independence from service companies allows the operator to access and control the workflow of well data instantly
- Highly scalable platform that supports one rig, or multiple rigs around the world
- Safer operations through collaborative decision making
- Lower costs by improving the speed and quality of solving engineering problems and decision making