Digital asset work flows: changing the way we work

Work proceeds on mapping defined processes for geosteering, drilling, and stimulation.

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The digital oil field is a hot topic among industry leaders. Virtually everyone recognizes it is the best route to the improved efficiencies and increased production our industry will need to meet future energy demands.

The allure of the subject and the romance of the vision must eventually make way for some practical questions: What are the real challenges? What are the goals? How are we going to make this vision a reality? What groundwork do we need to lay for the digital oil field?

Understanding the goals of the digital oil field is paramount to success. Simply, our industry needs to provide energy to support the growing worldwide demands. Sounds easy, until you consider the many challenges our industry is facing: smaller and harder to reach accumulations, shrinking supply of expertise, and increasing costs — just to name a few. In terms of how operations are structured, our industry still operates in many silos, where too often departments or disciplines do not effectively communicate or collaborate. Moreover, many of our processes are not automated — we are behind many industries that have already decreased the inefficiencies associated with processes that are too human dependent.

The digital oil field must address not only the issues described above, but it must close the connectivity gaps we have; it must foster collaboration and integration, and all of this must be done in real time, or near-real time. Only then can we attack the inefficiencies that act as a barrier to meeting the worldwide demand for energy.

When the digital oil field was first conceived many years ago, much of the focus was on the new technology to help solve these challenges; less emphasis was placed on people. What we have discovered over time is our initial approach was backwards. We will achieve the vision of the digital oil field by placing more of our focus on people and the way they work, with technology being an enabler.

Individual approaches

Many companies have their own digital oilfield initiative; Halliburton's digital oilfield initiative is called
The Digital Asset environment, and it is defined as a collaborative open environment to model, measure, and optimize asset-related productivity. The objective of the Digital Asset environment is to reduce operational inefficiencies — not only for customers but for ourselves — as well as reduce finding and lifting costs for our customers. In Halliburton's approach to the digital oil field, we are targeting work flows, as part of this environment, as the vehicle to realize our objectives. Many digital oilfield initiatives have broadly targeted the entire exploration to production lifecycle; this is simply too much to swallow all at once. A focused approach on work flows allows Halliburton to address our customers' most pressing problems in a timelier, more cost-effective manner.

With all the Digital Asset work flows, we are helping eliminate the gaps that prevent information sharing and hinder current work processes. These issues exist because many disciplines don't talk to each other, because databases and applications can't automatically or easily share data, or because our industry operates in many separate and remote physical locations. We can reduce inefficiencies caused by these challenges through improved collaboration and integration.

We are also improving the ability to access information in real time and use it to update our plans to affect what is happening during operations. We are automating processes by providing a virtual working environment through a common architecture so work flows can be completed faster and easier. Additionally, all Digital Asset work flows leverage a model, measure, and optimize approach. In this way, we can create a dynamic model that can be updated as we gain new real-time information to optimize our results. With better access to information and the ability to incorporate it into our models, plans, and operations, we can mitigate risks and improve accuracy for not only the current project, but the entire field.

Three good examples

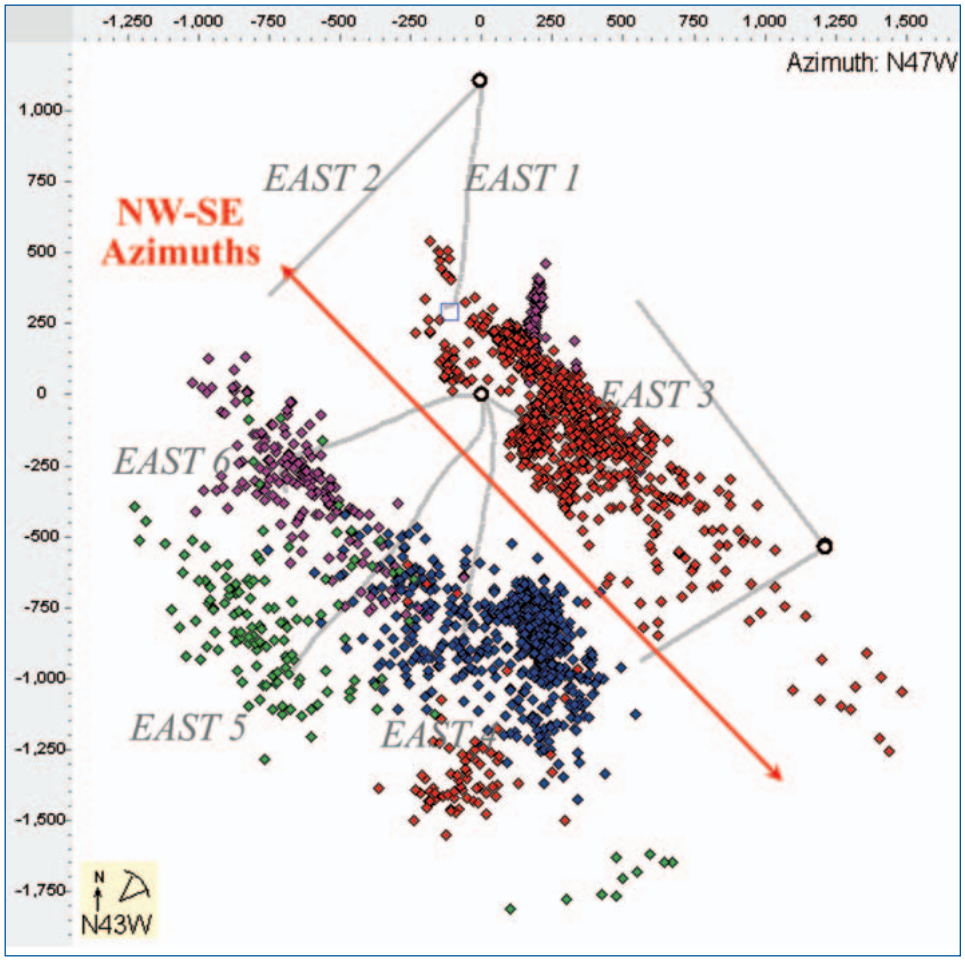
Examples of three work flows we are focused on today are geosteering, drilling, and stimulation.

The Geosteering for the Digital Asset work flow aims to improve understanding of the reservoir geology so we can maximize wellbore contact to the most productive reservoir zones. With this work flow, information from multiple offset wells and true 3-D petrophysics can be used to generate a single integrated geosteering model to aid in decision-making.

In drilling, despite comprehensive models, unexpected events such as faults are frequently encountered. This could lead to landing the wellbore in either an unproductive or under-produc-

tive zone, resulting in a significant loss of production — and revenue. With the Geosteering for the Digital Asset work flow, as new information becomes available during drilling, models can be updated to help us stay in the target zone. This new information is rarely, if ever, currently used to update the earth model in real time or used to improve the field development plan. This is not due to lack of desire to do so; it is because updating models is today hindered by challenges related to connectivity, manual process, time, and resources issues. With the Geosteering for the Digital Asset work flow, these problems have been resolved so that we can actually change the way we geosteer.

The objective of the Stimulation for the Digital Asset work flow is to maximize stimulated reservoir volume and effectiveness, and therefore production, while at the same time reducing stimulation uncertainty. Stimulation treatments can be optimized by better understanding where the treatment is going and how the fractures are growing in real time. With this work flow, a customized stimulation solution is first modeled in the context of the geological model using all the available data that are appropriate. Second, as the stimulation treatment progresses, we measure how the reservoir responds to the treatment and how the fractures propagate. Then, in real time, the treatment can be optimized — by varying parameters such as volume, rate, fluid type, time, etc. — to achieve the desired results. This processing loop is repeated as often as new data become available. Lessons learned can help improve the drilling and completion process in the next well and across the field.



Fracture mapping, as part of a customized Stimulation for the Digital Asset work flow, can help in determining fracture azimuth and half-length to help optimize well location, so that fracture stage volume and ultimate recovery can be optimized. (Image courtesy of Halliburton)

Underpinning all the work flows is digital connectivity (this includes data management, networking, and infrastructure) and enabling technologies (such as domain specific tools, applications, and technologies). These two components are essential for the digital oil field and represent where the majority of the industry's focus has been historically. The Digital Asset environment builds on our existing digital connectivity and enabling technologies to take us to a higher level of integration, connecting silos and creating open, cross-disciplinary work flows that automatically share data. This allows any qualified person to access any data for any asset. And they can do this anywhere at any time.

It's about getting the right information to the right person at the right time so that decisions can be made efficiently and effectively. The way in which we meet our goals of improving operational inefficiencies and lowering finding and lifting costs, and ultimately meeting demand for energy, lies with these integrated work flows and fundamentally changing the way we work. ■