

Digital Oilfield Developments Addressed in Joint Workshop

Ted Moon, *JPT Online* Technology Editor

More than 70 petroleum engineers and information technology (IT) professionals converged on Salvador, Brazil last October for the SPE/IBP Joint Workshop on the Digital Oilfield. The workshop's mission: to review the current status of the digital oilfield concept and to understand what remains to be done to allow the industry to meet the demands of the 21st century.



Hite

"The E&P industry has led the way in applying leading-edge computing and communications technology," said workshop Cochair Roger Hite of the Business Fundamental Group. "Seismic processing and imaging, reservoir simulation, and many other areas have provided notable advances to our business. In the 21st century, the fast pace of technology development continues, this time with the goal of automating and optimizing operations in the oil field itself. There is a renaissance under way that promises to yield enormous gains."

The workshop was organized into sessions that surveyed key questions on how well the industry is doing in developing the digital oil field. A mixture of presentations and group working sessions were employed to cover each topic. The first session set the stage by asking "Where are we today?"

"We set out to cover the landscape and to gain a broad view of progress, rather than focus on one aspect," said Hite. "In my opening remarks I said that the concept of the digital oil field is rapidly developing into an important reality in our industry." He also stated that the conclusions drawn about the digital oil field should be framed by business issues, namely, the value gained from the decisions that can be made and implemented and by the efficiencies that can be gained by automation.

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Infrastructure

"Discussions of infrastructure have moved beyond ways to establish connectivity to concerns about how that connectivity should be designed to facilitate collaboration and to enable improved work processes," said Hite. This session addressed how effectively infrastructure plans fit business needs.

Particular emphasis was placed on centralized drilling and production operations centers which aid activities from

remote locations. Several case studies demonstrated how the collaborative environment afforded by operations centers provided benefits such as improved recovery from downtime incidents, faster handling of abnormal situations, and faster access to experts. However, to achieve these benefits infrastructure designers must focus on understanding how teams work, how decisions get made, and how to best involve all stakeholders.

The following are the criteria for deciding if an infrastructure truly meets business needs: 1) all data and information must be easily delivered, visualized, and analyzed by decision makers; 2) all analyzed data and decisions must be easily delivered back to the field; and 3) there must be seamless interfacing between applications, visualization tools, vendors, and service providers. "Infrastructures need to address people and processes, as well as technology," Hite said. "The main point I took away from this session was how much progress has been made," he added. "The whole industry has seemed to have moved beyond wires and gadgets to instead discussing the use of drilling and operations centers to improve how work gets done."

Software

The topic of software was addressed next in a group working session environment in which six teams explored what is working satisfactorily with existing software and what gaps must be filled. Each team addressed a different field-development scenario. "The consensus pointed to the need for better software integration that would allow for collaboration across disciplines," said Hite. "Management by exceptions—with alarms, alerts, or automated problem identification—will allow engineers to cope with terabytes of data. Better tools for knowledge capture and sharing are also needed."

Reliability/Maintenance

Reliance on real-time data for making decisions and for managing oil fields is growing. "With more customers and more work processes founded on access to real-time data, reliability becomes vital," said Hite. "Those of us who lived through hurricane Ike know very well how reliant we are on electricity.

"In the digital oil field, all stakeholders have become terribly reliant on access to real-time data to do their job," he continued. "Demands on the IT community are now very high: provide reliable, quality data all the time to all customers. Wow! What a challenge."

A real-world example of how to cope with maintenance issues in the field came from a case study on the engineering upgrade of the dynamic-positioning (DP) thruster control system on the SEDCO 710 semisubmersible drilling rig. An



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upgrade of the system was justified by the frequent problems with older analog control components of the DP system. Maintenance challenges grew from complex analog circuitry, customized nonstandard boards, poor documentation with inconsistent information, and an intense demand for highly qualified technical labor onboard. A new maintenance solution was developed using standard hardware that is available in the international marketplace with comprehensive failure and alarm detection. The result was a more robust system with fault-tolerant electronic circuits, easier hardware maintenance, broader fault and alarm diagnostics, and functionality that is easy to change or expand through software changes in the programmable logic controller.

Value Proposition

The supervisory-control and data-acquisition system—commonly known as SCADA—no longer serves only operations and facilities engineers. This session was designed to identify the new customers being served by the digital oil field, how efficiently the subsurface and surface are being integrated, and how workflows are being automated.

A case study was presented on the implementation of GeDig for Petrobras' E&P Business Unit for the Campos Basin (UN-BC). GeDig is a Petrobras corporate initiative to implement digital oilfield technologies to achieve integrated management for both mature and new producing fields. The implementation strategy is ongoing and has taken place over the past four years. Starting with conception in 2005, the strategy then shifted to pilot tests in 2006–2007 to prove the feasibility and economic returns possible, an extension phase designed to guarantee and validate the value predicted in the business case, and a rationalization stage that guarantees the right tool for each process and minimizes unnecessary differences between similar processes in different locations. Some of the key findings from this ongoing exercise include that 1) early involvement of all key players is crucial to success, 2) the implementation team should be able to quickly adapt workflows as needed, 3) a clearly defined business case is essential, and 4) preset guided workflows are important.

Business Case

This session analyzed where one can find value in the digital oil field and attempted to quantify that value. Several perspectives, from operators and service providers alike, were presented outlining effective strategies for building a business case that will be approved. One perspective from Accenture grouped the typical quantitative benefits of a digital integrated management implementation process into four categories:

- Operational efficiency increase
- Operational cost reduction
- Invested capital reduction
- Increase in reserves

At the end of the business-case development process, the following benefits should be achieved:

- A clear picture of the solution's expected benefits, in a quantitative and qualitative way
- Solid support material for obtaining project approval with company executives

- A baseline for measuring project success
- Support for project planning by prioritizing the most valuable solution's components
- Easy to use tool for updating the business-case scenarios

The Digital Engineer

In an effort to highlight the skills and knowledge necessary to develop technical professionals who are well founded in both IT and E&P fundamentals, six teams were asked to structure an IT-enabled database and decision support system which also addressed implementation of steps to train, orient, and motivate the workforce. Each team addressed a different development scenario, including offshore shallow-water fields with unconsolidated formations, onshore sour-gas condensate fields, and a deepwater operation with subsea completion targeted for pressure maintenance by cycling produced gas.

The teams competed to develop the best IT-enabled database and decision support system, prepare recommendations for an asset manager, and create a 30-year forecast of reservoir and well deliverability. They were also to suggest ways to develop closer interaction and collaboration between all disciplines and suggest solutions for any manpower shortages.

"This is the kind of challenge facing a digital engineer—one skilled in IT as well as in petroleum engineering," Hite said. "Our feeling was that the teams did an impressive job—clearly the workshop attendees were digital engineers!"

The Future: Where Do We Go From Here?

This closing panel session reviewed the messages that attendees will take back with them, as well as their plans to implement what they've learned. "We took a survey of workshop attendees to get their consensus views," said Hite. "There was good agreement that the digital oil field is having a significant impact on their work [more than 80% of respondents agreed] and that their company's infrastructure was effective in enabling the digital oil field [67% agreed]."

And while there was general agreement that the business case for the digital oil field was accepted throughout their companies and work was underway to fill whatever gaps existed in the infrastructure, nearly two-thirds of respondents felt that the full potential of the digital oil field was not yet being realized. "Progress is needed to assure that the needs of all customers are being met," Hite added. "A training program to develop the needed skills and effective maintenance programs must be put in place to assure the appropriateness and reliability of our IT systems."

Hite said he is impressed by the level of progress that has been made in the digital oil field over the last five years. "Five years ago we were defining broad strategic directions and concerned about building convincing business justifications. Today I see less discussion of that," he said. "There are many more believers in the concept of the digital oil field now than there used to be. We have crossed the threshold of gaining connectivity and providing communication and are now very much into capturing value, which gets into the major discussion points of the workshop: integration, communication, and collaboration." **JPT**

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