

## A JPT Roundtable: The Funding and Uptake of New Upstream Technology

In March, JPT hosted a panel discussion with key oil and gas senior executives from both operators and service companies. The intent was to discuss the critical issues of the funding, deployment, and acceptance of new upstream technology. In the first of these sessions, the panel heard detailed and open discussion of the relevant issues from both ends of the spectrum: service companies (the developers of technology) and operators (the users of technology). Below is a brief summary of these discussions.

Participants in the discussion were:

- Michael Bahorich, Executive Vice President E&P Technology, Apache Corp.
- Stuart Ferguson, Chief Technology Officer and Senior Vice President, Weatherford.
- Jack Hirsch, Manager, Technology Access GameChanger, Shell Exploration & Production.
- Steve Jacobs, President, RMI.
- Joseph Leone, Vice President, Upstream Technology, ConocoPhillips.
- Vik Rao, Vice President, Halliburton Technology Ventures.
- Wolfgang Schollnberger, former Vice President of Technology, BP.
- Zaki Selim, President, Well Completions and Productivity, Schlumberger.
- Moderator: Ali Daneshy, President, Daneshy Consultants Intl., and Partner in Dapish Oil & Gas Strategy Consultants.

This article summarizes some of the key issues identified by the panel members and the existing practices within the industry for acceleration of technology funding and acceptance.

### Current Industry Status and Drivers

A seismic shift in upstream technology funding and deployment has occurred in the past two decades. The oil price crash of the 1980s and the rash of mergers and acquisitions in both the operator and service sectors have slowed the pace of new technology application. The development of new upstream technology shifted largely from the operators to the service companies over that time. Starting in the early 1980s, as part of a general strategy to reduce costs, most major producers downsized and restructured their technology departments, with the implied expectation that the service sector would fill the created gap in technology budgets. Faced with the same market environment, the service sector has not had the financial returns needed to undertake large increases in technology budgets. Thus, the gap has continued to exist. This situation was later exacerbated by M&A activity in the

late 1990s, which further increased the emphasis on short-term business objectives and holding down costs. The result has been a shift in in-depth understanding of how to use technology. Twenty years ago, operators had considerably greater involvement in the technology and the attendant expertise. Now, the funding and expertise have shifted to the service companies, which sometimes have a disconnect with operators when it comes to what new technology is required and viewed as acceptably priced.

There is broad consensus among executive management of all companies that technology holds a key to future growth and profitability of the industry. At the same time, it is legitimate to ask whether the industry will be able to meet its technology needs and whether the financial drivers will exist to propel the development of new technologies required to meet growing world hydrocarbon demand in the years and decades ahead. Both operators and service companies agree that the industry benefits tremendously from the introduction of new technologies. But current pressures—both financial and structural—could delay or prevent the introduction of the needed technology. On one side, operators are slow to take full advantage of existing technology that would improve the financial and production efficiency of their operations. On the other side, to reduce the risk of technology investments, the service sector has taken the safer route of more emphasis on product improvement and focus on reducing the cost to deliver such products. The danger is that this will lead to “incrementalism” and delay investments in more risky revolutionary technologies that have the best potential for a step change in the way oil and gas fields are explored, developed, and produced.

Introduction of a new technology follows a tedious route. It begins with the creative idea of an individual, is developed into a product or service by a support team, and then is introduced into the field by a service company for use by the industry. The financial success of the technology for the technology provider depends on the speed of its spread in the field and the price it is able to fetch in return for the value it creates for its users. The most critical and expensive part of this cycle is rapid market acceptance, and this is where most of the industry’s concern lies.

The general complaint from service companies is that much of the technology they develop is not adequately valued or reasonably rapidly deployed by operators and that they are under constant pressure from procurement departments to sell their specialty products at low commodity prices. With inadequate return on investment, they see little incentive to continually develop new technologies.

Operators point out that they are under intense pressure from the financial markets to improve short-term profitability, production, and reserves. Under this situation, the preferred technology strategy for many operators is to be “fast follower” rather than “first mover.” Short-term production targets are therefore a barrier to the uptake of new technology.

### Recent History of Technology Acceptance

During the panel discussion, Steve Jacobs, President of RMI, offered example case studies involving the introduction of three new technologies—coiled-tubing drilling, intelligent wells, and rotary steerables—and how they were received by the industry. In spite of early industry enthusiasm, coiled-tubing drilling has not been widely successful, although it has gained acceptance in niche markets such as Alaska and Canada. The level of technology use has not been sufficient to justify additional funding by some service companies to spread its use into broader industry applications. A significant amount of money was invested with little return. The acceptance of coiled-tubing drilling technology also has been affected by reliability issues and higher than anticipated service costs.

Intelligent-well technology also has been a disappointment. By the end of 2003, only around 150 intelligent-well systems were in use, even though operators appeared excited about the technology when it was introduced. On the other hand, rotary steerables, initially developed through collaboration between an operator and a service company, have been successful and now represent a U.S. \$500 million market. The benefits were quickly realized by operators, and funding and acceptance are growing.

The panel cited other technologies that failed or were slow to win acceptance. Downhole separation appears to be widely needed by operators but has had trouble gaining acceptance even though produced water is costing the industry about U.S. \$50 billion/yr. Part of the resistance to technology acceptance appears to be regional. Expandable screens, for instance, have found widespread use in the Eastern Hemisphere but have not been quickly accepted in the North Sea and the Gulf of Mexico.

Horizontal drilling is an example of a technology that was slow to win acceptance but eventually became an industry standard. Use was slow when it was introduced in Europe, but it gained quick favor in the Austin Chalk area of the U.S. because it was necessary for producers' survival. Short-term gratification drove its use, and the technology found wider acceptance as the initial reluctance for its use was overcome by the industry. Other successful technologies over the past 40 years include subsea trees, measurement while drilling, and floating production, storage, and offloading. Recent technologies with good promise include expandable casing and visualization.

Two majors have adopted internal programs to improve the use of technology in their businesses. BP adopted a philosophy in which new technologies are being rapidly disseminated through networks of excellence, and field tests are being encouraged. Its business units could test new technology essentially risk free to see if it would improve operations. The result was that the technology almost always improved operations, and sometimes more than expected. Shell created Global Implementation Teams that oversaw technology spending within the company, a type of peer-review system that encouraged the use of new technology and ensured that the money was available to use it.

### New Technology Benefits Entire Industry

The consensus among the panel is that operators and service providers need each other and must cooperate for mutual benefit. That partnership may take a variety of forms, including one-on-one relationships, consortiums, or through ad hoc agreements that focus on a particular geographic region. But with R&D now passed largely to the service sector and operators facing the chal-

lenge of replacing existing production with new reserves to meet growing demand, better use of current technology and uptake of new technology will be essential. The emphasis on short-term production and profit targets is blurring that need. Current technology funding may be adequate for the short term, but the industry will be challenged to meet growing hydrocarbon demand over the next several decades as it looks for oil and gas in more challenging environments and tries to increase output from brownfields. Because operators and service companies operate under different constraints, they need to learn more about each others' perspectives.

The panel was in general agreement that the ultimate value for the operator and the industry as a whole lies in the reservoir. This value can be substantially larger than incremental benefits that may arise from owning or licensing of the intellectual property rights (IPRs). Currently, service companies own the majority of technology IPRs. The entire industry benefits when priority is given to a technology that increases the value of the reservoir. The dilemma is that quick commoditization of new technology could stifle the development of products that ultimately would enhance the value of the reservoir.

Other industries, such as pharmaceuticals, medical systems, and computer industry offer successful models that the oil and gas industry could learn from. These generally have involved more cooperation among competitors as well as more collaboration between the developers and users of technology. These industries also attract more venture capital than the oil and gas industry. Venture capital has its own inherent benefits, beyond financial, since it brings focus to a project as well as outside ideas. One possible avenue for the oil and gas industry would be for operators to set up a venture fund, which would have its own independent board charged with speeding up the successful implementation of new technologies. The operators would bring site-specific competencies in determining how to use and install new technologies, hence provide test beds. Service companies, although often intensely competitive, could be shareholders in this type of independent corporation.

### Minimizing Risk

One of the benefits of such an approach is that it would minimize risk for the operator, a stumbling block to the introduction and uptake of new upstream technology. The operator could become a part owner of a new technology as an investor in its development. And the collaboration of both operator and service company in a project likely would attract venture capital. The service sector would benefit from the increased funding and the commitment of the operator, and this approach would address one of the main risks for service companies: the slow uptake of new technology. The venture fund board also would address the need for service companies to involve operators more in the development of new technology, which is often a key to successful uptake, such as in the example of the quick acceptance of rotary steerables.

The industry also needs other funding mechanisms that will mitigate risk for the buyer. If technology can be developed in a low-risk way, that will certainly increase acceptance. Service companies should look for other ways that will minimize risk for the operator for trying new technologies. Operators, meanwhile, should move away from being risk-averse and occasionally acting as "hostile gatekeepers" when approached with new ideas. In the end, the decision on value always lies with the buyer.

Operators also need to show more leadership at the top in the acceptance of new technology. With the current focus on short-term



**Participants in the JPT Roundtable discussion were, clockwise from left, Ali Daneshy, Michael Bahorich, Vik Rao, Wolfgang Schollnberger, Jack Hirsch, Joseph Leone, Steve Jacobs, Zaki Selim, and Stuart Ferguson.**

profitability, employees will need to find broad management support for trying new technologies that could prove successful but also might fail. And operators must find ways to ensure that those who make the decisions about purchasing technology are informed buyers. Operators should develop technology standardization so that technologies do not have to be tailor-made for specific companies or projects. The emphasis should be on high-impact technologies, not incrementalism. And service companies should not be afraid to develop

on how to accelerate the development and use of new upstream technology would be beneficial. A second panel session was set for this summer.

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***If you have any comments or ideas for the panel, please send them to Ali Daneshy at [alidaneshy@daneshy.com](mailto:alidaneshy@daneshy.com) or John Donnelly at [jdonnelly@spe.org](mailto:jdonnelly@spe.org).***

technologies that might make some of their older products obsolete.

It is clear that the current framework for the development and uptake of new upstream technology has structural flaws. Operators need ways to mitigate the risk of trying new technologies that could improve the value of the reservoir. Service companies need better financial returns if they are to shoulder the burden as the main R&D vehicle for upstream technology, and they need to create products that are affordable and useful to operators. Both operators and service companies need to seek ways to jointly share in the risks and benefits of developing new technology to ensure the viability of the industry in the future.

The panel agreed that this roundtable was just the beginning of a very essential dialogue within the oil and gas industry. Further discussion of these topics and recommendations