

Guest Editorial

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EVOLUTION OF TECHNOLOGY IN THE UPSTREAM OIL AND GAS INDUSTRY

The oil price crash of the early 1980s had a major and sustained impact on the funding and organization of technology within the upstream oil and gas industry. As part of their drive to reduce the cost of operations, many oil and gas producing companies undertook major downsizing and restructuring of their technology departments. The rationale was that operators were engaged in the types of technology development that were within the domain of service companies and should be undertaken and funded by them. The other observation was redundancy in projects and that some technology projects were reinventions of the same wheel. While, by themselves, both points were correct, they did not account for several other factors. Among them:

- Since the main drive was to reduce cost, the other part of the same initiative was renegotiation of service contracts and prices with service companies such that their margins, and subsequently the ability to fund technology, were reduced at the same time. Thus, contrary to expectation, the reduction in technology in one segment of the industry was not offset by increases in the other.

- Service companies did not, and still do not, have the financial size and resources to even partially substitute for the capacity and funding that was cut by the operators. Their profit margins are also generally lower than the operators.

- Reduction of leading-edge competencies within producers' organizations. The "well-informed" buyer needs competencies in the same technical areas as the developer and provider of new technology.

- Because of the enormous value of the reservoir and the operators' higher margins, the absence of technology has a bigger impact on the operators than the service companies.¹ The operator has retained the role of technology integrator. This does not create an obstacle to the introduction of technology as long as it is a simple extension or modification of existing practices. But when the new technology requires integration of diverse elements from several suppliers, or competencies not readily available to the operator, the result is slow acceptance and use of new technology. An example of this situation is technologies introduced under the general umbrella of "intelligent wells." In spite of high expectations by the industry and large financial and human commitments by service companies, the growth of this technology has been very slow and a financial burden for its developers.

Mergers and acquisitions (M&A) among operators and among service companies also have resulted in reduction of technology funding and resources. These usually involve closure and consolidation of technology facilities and staff and a higher workload, thus leaving less time available for activities that are not directly connected with the daily operations of the organization. M&A among operators have created "mega" buyers that have the purchasing power to lead market pricing and intellectual terms of service delivery. Indeed, the financial strength, size, and profit margins of major operators are considerably superior to those of even the largest service companies.

The other evolution in upstream oil and gas organizations has been the concept of "assets" and local accountability of operations. While this has increased local efficiency, it also has reduced the size of the business unit and its ability to undertake long-term projects or consider even moderate risk to short-term production. This situation is exacerbated by the natural competition within the assets, the performance of which is measured by their direct immediate financial contribution, thus making it difficult for them to accept any risk of possible disruption to the flow of reservoir fluid. In this situation, the focus of management is primarily on continuation of known practices, emphasis on improving efficiency, and reducing unit cost of operations through different contracting mechanisms and philosophies.

The operators' reluctance to accept risk creates a dilemma for developers of technology: how to prove the "value" of a new technology if no one is willing to accept the "risk" of being the first user and assist with the teething process! The strategy of being a "fast follower" requires a "leader." An example is downhole water separation and reinjection. The concept was viewed as highly attractive by offshore operators (who produce and have to dispose large volumes of water). But when the commercial tools became available, to everyone's surprise, there was no offshore market for it, and the developers got no return on their investment.

Several features differentiate technology development in the oil and gas industry from others. These are:

- The main source of wealth, the reservoir, has an enormous inherent value. Any action that enhances the performance of the reservoir creates large value for its owner. This added value is a function of both the efficiency and suitability of the technology, as well as

the properties of the reservoir itself. Thus, higher rewards come with higher risks.

- In spite of its size, the upstream oil and gas industry is still mostly a specialty market. Differences in reservoirs, wellbores, and operational environments and preferences make each situation unique.

- The financial reward for technology usually comes from differentiated products at differentiated (but still competitive) prices. For understandably selfish reasons, the operator prefers to compensate the technology provider on the basis of the resources directly used for the provision of the service, independent of the created value. The service company, on the other hand, prefers to set prices on the basis of, and in proportion to (albeit a very small percentage of), the created value.

- The large discrepancy between the size and financial strength of the large and medium size operators and even the largest service companies gives operators great leverage in leading the market in establishing the acceptable price levels and philosophies.

Intellectual Property Rights (IPR). The industry's attitude and approach to IPR also has changed during the last 2 decades. Initially, the operators reasoned that the value of technology came from its application, not its ownership. But soon they found it desirable to exercise some control over the development and ownership of technology. Furthermore, they recognized that the owner of technology has certain unique legal rights that enable it to set prices and have certain powers over the market, while the operator desire is to "commoditize" the technology and create competition among the service providers as soon as possible. As a result, several major operators incorporated clauses in their service contracts that gave them varying rights to patents and intellectual property developed in the course of provision of their services.

The thinking process also underwent a gradual evolution within the service industry. Initially, service companies also believed that the value of technology was in its application and provision of the associated services to the market. The emphasis was on ownership of IPR to allow unobstructed continuation of service and the capture of new markets through superior performance. They believed that lengthy patent litigations would interfere with the primary mission of the enterprise, which was to receive direct revenue from the provision of services. Furthermore, patent litigations could legally involve the client, whose goodwill is necessary for retaining the market. However, examples from other industries are gradually convincing the service companies that patents have intrinsic value not necessarily associated with their use by their owner, and that prevention of patent infringement, and licensing, can be a profitable source of revenue. Recent large patent infringement judgments in favor of service companies will undoubtedly enhance this position.

In general, it is difficult to maintain IPR information confidential within the oil and gas industry because of requirements that directly or indirectly necessitate disclosure of proprietary information. Among them are material composition disclosures for safe handling and transporta-

tion, testing for performance and quality control, detailed technical information to match products from one supplier with those of others, etc. While most service companies are careful not to copy an exact product of the competitor, they are quick to introduce competing products with the same functionality. Thus, the culture of the industry generates competition in and by itself.

Conclusion. Everyone agrees that the growth of the industry mandates the development and introduction of new technology. This requires better margins as well as faster product acceptance for the developers of useful new technologies. The following are a few recommendations that should help this process.

- Operators should establish and diligently monitor corporate measures for funding, adoption, and acceptance of new technology, especially those that enhance the long-term performance of the reservoir.

- Operators and service companies should explore means of jointly developing and sharing the risks and benefits of new technology development. Among the methods available are licensing, preferential pricing, limited alliances and partnerships, and joint ventures.² The operator always has the option of divesting itself of its interest when the technology has reached a reasonable or targeted growth and profit margin. This also gives it the ability to create competition!

- Operators should actively participate in the development of technology beyond the concept stage. After all, it is only when a new product or process is introduced into the market and accepted for use that the operator appreciates its main benefits.

- Value pricing is a reasonable basis for rewarding new technology. The sharing of value does not have to be on an equal basis, but the change of culture will benefit everyone. Better reservoir performance has enormous benefits for the operators, and better prices will give service companies the margins required for future investment in technology. JPT

References

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