The Intelligence Behind Intelligent Completions

Egbert Imomoh, 2013 SPE President

There are many definitions of intelligent completions, but the one I find most apt is a well completion that enables remote monitoring and control of the well inflow without physical intervention to optimize production and reservoir management.

Before the late 1980s, when intelligent completions were introduced into our industry, data collection or well intervention had to be carried out by introducing tools from the surface using wireline or coiled tubing. However, a number of factors drove us to seek more cost-effective ways of obtaining well data and downhole intervention without shutting down production.

As we developed the capacity to drill in increasingly deep water, opening up new reserves, we had to find more innovative, cost-effective means of well intervention. The high upfront costs and the loss of revenue resulting from shutting these wells in just to obtain well data had a huge impact on the revenue stream of companies.

Another factor that encouraged application of intelligent completions is that, during penetration of many stacked reservoirs, operators saw that it was cost-effective to complete as many of the horizons as possible in one go but to retain the flexibility to manage which zones could be brought into production without incurring the expense of a rig or rigless intervention. In addition, many authorities were becoming more flexible in allowing commingling of production from different reservoirs.

The opportunities encouraged many service companies to develop new types of completions, either alone or in collaboration with other companies. The equipment already existed, but needed to be repackaged for the new application that was required (Docherty 2001). In designing intelligent completions, oilfield operators specified a number of requirements relating to reliability, ability to segregate inflow, minimal impact on existing well equipment, and the ability to integrate with current technology.

Over the years, new technologies have enabled real-time surveillance of wells and real-time control of inflow of reservoir fluids or the injection into reservoirs for pressure maintenance. Surveillance is achieved using modern electronic devices, while control is managed by the installation of innovative downhole equipment (a valve or sleeve) that is controlled using electric, hydraulic, or electrohydraulic signals.

Operators all over the world have applied the technology to provide services ranging from the control of gas breakthrough to selecting which part of long horizontal completions can be brought into production, to managing water injection for pressure maintenance. The use of intelligent completions has even been extended to shallow-well operations, where economics is the driver. Similar to deep-well operations, the cost of well intervention and the attendant loss of production have encouraged operators to install intelligent completions when such wells are initially completed. The use of intelligent completions also obviates the need for direct human intervention with possible attendant safety risks.

As with most new technologies, the first intelligent completions were basic, and wells required only low-density transmission for flow, temperature, and pressure data. However, over time, data requirements increased, and this has led to greater

(Continued on page 141)

To contact the SPE President, email president@spe.org.

use of communication packages that can handle more data and do so over increasing distances (Furlow 2000).

The seemingly independent technologies of control devices, power transmission, and communications have been brought together to provide integrated systems that can lead to more economic extraction of hydrocarbons in a safe manner. We will continue to seek to achieve more with less. **JPT**

References

Docherty, M. 2001. Intelligent Completions: Potential, but Some Hurdles. *Drilling Contractor* March/April 2001: 40–41. http://www.drillingcontractor.org/dcpi/2001/dc-marapr01/m-expro.pdf

Furlow, W. 2000. Intelligent Well Systems Expand in US Gulf, but Who Controls System Communications? *Offshore Magazine* May 2000. http://www.offshore-mag.com/articles/print/volume-60/issue-5/news/general-interest/intelligent-well-systems-expand-in-us-gulf-but-who-controls-system-communications.html.