Dowhole permanent monitoring systems and intelligent completions deliver large volumes of well and reservoir data in real time. Manually processing the data increases response times, making it difficult to maximize well or field performance.

Schlumberger WellWatcher Advisor real-time intelligent completion software transforms acquired data into actionable intelligence at frequencies as high as 1 s, providing real-time answer products for more valuable, faster business decisions. The result: data analysis workflows that used to take weeks and months of manual study can now be completed automatically in hours and days. These benefits earned the software the 2018 E&P Special Meritorious Award for Engineering Innovation for intelligent system and components. Two recent case studies demonstrate the value of this digital transformation.

Tripling production by managing gas and water

When LUKOIL-Nizhnevолжskneft began developing the complex Korchagin field in the northern Caspian Sea, engineers rapidly discovered that the project faced steep economic and technical challenges. Early gas breakthrough led to a high gas/oil ratio (GOR), resulting in a sharp decline in oil production even with inflow-control devices (ICDs) and periodic manual drawdown adjustments. A more comprehensive, automated solution was required.

Two new wells and two sidetracks were designed with intelligent multizone completion technology, including pressure and temperature gauges and multiposition FCVs, which (unlike ICDs) can be remotely and rapidly adjusted to suit variable dowhole conditions. The operator used FCV settings recommended by the software to incur much lower GOR and water cut as compared with offset wells. In one well, the recommended settings reduced GOR by 75% and tripled oil production compared with previous wells. In another well, the recommended settings enabled the operator to capture some value from a watered-out zone while maximizing a second, highly productive zone. Overall, in two years the intelligent completion with guidance from WellWatcher Advisor software boosted recovery for the Tithonian reservoir by 41% and increased oil production by 3.5 MMbbl (0.56 million m³).

Improving mature well production by 15%

In a mature field of Ecuador, another operator wanted to maximize oil production by optimizing dowhole valve settings in three wells with intelligent completions. WellWatcher Advisor software analyzed data from the dowhole gauges to calculate flow allocation by zone—a result found to have ±10% accuracy compared with the actual well test and ±1% accuracy compared to a multiphase test meter.

Engineers also used the software to optimize valve positions for the wells, and the operator accepted the recommendations for two of the wells, resulting in increased oil production by an average of 15%. In one of the wells, the nonintuitive recommendation was to choke the production from one zone. The result was lower water production but increased oil production.

Simplifying analysis with workflows

WellWatcher Advisor software gives users up-to-the-second insights into well data from any location, on any computer. The system is tailored to work with most existing real-time data streams to bring deeper understanding by incorporating computations such as flow rate estimation, pressure gradient, and productivity index estimation. These computations and an alerting system point users toward problem areas.

The software comprises multiple automated workflow modules that leverage the scalable Avocet production operations software platform:

- Monitoring module to view real-time dowhole pressure and temperature surveillance, historic trends, and equipment health and alarms;
- Flow allocation module that estimates flow rates across each FCV;
- Completion module that uses changing flow rates to compute stable productivity index and reservoir pressure;
- Production module that monitors production trends, analyzes performance problems, and optimizes FCV settings; and
- Reservoir module with a pressure transient analysis tool for quick mobility and skin assessment by zone without logging and testing interventions.

The software can be connected to an operator’s real-time data sources, such as PI servers, or to remote production operations centers. The on-premise software is installed locally on the operator’s computers, and all data remains within the operator’s network, enhancing security.