Wellhead surveillance for optimised production

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Expro are currently collecting real-time data to support production optimisation from brownfield wells using their non-intrusive wellhead surveillance technology.

With more than 70% of current world oil production coming from mature fields, the challenge in a low oil price environment is to extend the production life of these fields cost effectively.

Non-intrusive wellhead surveillance gives operators the ability to collect real-time data from individual wells without production interruption, at lower cost than traditional production testing methods whilst minimising safety risks associated with traditional well testing technologies.

Clamp-on flow meters use sonar array processing to determine the rate at which naturally occurring flow turbulence, known as coherent vortical structures, travel past an array of sensors. The meters, both PassiveSONAR™ and ActiveSONAR™ (analogous to passive and active underwater sonar methods) are seeing increasing industry acceptance for applications throughout the well lifecycle.

The technology has been applied in the North Sea to lead proactive decision making in the implementation of production optimisation campaigns and is also widely adopted in the Middle East for production surveillance, ESP optimisation, and gas lift and water injection optimisation.

The first successful field-wide surveillance for the technology was Centrica Energy's operated North and South Morecambe Fields, which are among the largest in the UK Continental Shelf in terms of original reserves.

Monitoring real-time production surveillance rates from each well provides critical information for reservoir management and workover planning. Centrica explored the range of potential replacement technologies for the existing venturi meters, including installing new in-line differential pressure meters and traditional ultrasonic type meters. Turndown ratio, or the instrument's measurement range, was an important consideration as this instrument was expected to measure well production throughout the declining life of the field.

After a trial to assess the meters' applicability to well conditions, the meters were permanently installed on all 44 producing wells across six platforms. Sonar meters clamped onto the existing pipework allowing installation without shutting in the well (and incurring associated lost production) reducing management of change and HSE exposure.

Production teams were able to benefit from the availability of real-time flow information for each well. Following the start-up of a new, high pressure field, wells on one of the platforms had reduced in performance. Sonar flow meters were used to establish the worst affected wells, along with those that would respond well to a cycling procedure.

The decision was made to have a particular well shut-in for an hour each day, in order to help unload liquid in the tubing and achieve slightly higher flow rates from the well. The benefit was observed almost immediately with peak flow rate almost doubling. Further shut-in lengths and/or frequencies were implemented on the well until an optimum operating routine was established.

Sonar testing can also aid production allocation from individual wells, thus enabling engineers to identify underperforming areas and implement short and long-term strategies such as well cycling. The surveillance data can then be used to evaluate the effectiveness of this work and select suitable candidates for further intervention work, helping to prolong the field life of a mature asset.

Looking to the future, sonar metering technology will continue to deliver non-intrusive surveillance solutions that deliver critical data and enable operators to make important decisions for the well lifecycle.