

## Advancing well flow

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Given the current climate in the oil and gas industry, and with more complicated methods of oil recovery on the horizon, operators require fast, safe and cost efficient equipment.

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discusses how developments in technology have enabled the industry to drill previously unreachable wells and optimise drilling - particularly the management of borehole pressure through Managed Pressure Drilling (MPD), via advances in choke valve technology.

The MPD method, which uses hydraulic choke valves, is currently the industry standard for deep well drilling and has been used by operators for several decades. As a result, previously inaccessible reservoirs may no longer pose such a technical challenge. MPD can allow operators to drill more accurately, deeper and reach out farther in to lateral wells, while creating a better flowing reservoir wellbore.

Before chokes were used to manage well bore pressure, the well was drilled in a more benign way with heavier mud and more wellhead pressure control equipment. This created a whole set of challenges, and meant some wells were not drilled due to pressure control concerns and higher costs.

### Managing flow

Choke valves enable operators to better manage and control the flow of well fluids. Where necessary, they also allow operators to kill the pressure from the reservoir and regulate the downstream pressure in flowlines.

The purpose of choke valves is to allow fluid to flow through a very small opening, created to kill the reservoir pressure while regulating the well production (as fluids can contain unwanted sand particles and other debris). Typically, wells have two choke valves; one designed to serve as a non-regulating choke valve, while the other regulates downstream to the non-regulating choke valve.

The main function of the non-regulating choke valve is to act as an on/off valve and reduce reservoir pressure to a desired operating value in the flowline. This type of valve is not used for flow regulation and is not sized for controlling the flow. On the other hand, the regulating choke valve is sized for flow control and designed to maintain a steady production level in the flowlines and production header.

In the drilling environment, a hydraulic choke valve is most commonly used and has become the industry standard across the world. It is equipped with a reservoir accumulator, designed to navigate a choke into a safe position in case of pressure loss.

However, even with the introduction of a hydraulic choke valve, the deployment of traditional methods such as MPD systems can cost operators more than \$10,000 per day. This solution comprises of large packages, which require a significant footprint and several personnel to operate, making it an expensive option. In addition, in extreme conditions, if there is any kind of moisture in the atmosphere, the air pushing

the hydraulics through the diaphragm will freeze, bringing the operation to a halt. This can cost operators significant losses in potential downtime.

### **Innovative solution**

Driven by a genuine industry need, Expro has advanced MPD systems by designing and developing its own innovative solution – the Automated Back Pressure (ABP) choke, part of its PowerChokes® product line.

The company's ABP technology was created as an improvement over the conventional MPD method and uses field-proven technology and software to effectively manage pressure allowing more efficient drilling. More importantly, no air is used in pushing the hydraulics through the diaphragm pump, thus eliminating the possibility of freezing. As a result, the ABP system is more accurate, reactive and faster than conventional MPD systems, which use a standard hydraulic choke valve.

The system control function eliminates the cyclic pressure on the wellbore, allowing for faster connection times. Pressure is directly maintained and the data simultaneously logged, allowing operators to be alerted to any issues.

The ABP will maintain set pressure within an accurate window while the operator monitors the operation. As connections are made during drilling and mud pumps cycle, the ABP controls the choke to maintain steady pressure preventing damage to the reservoir and managing any influxes to or from the well.

The system is also capable of being operated by crew on a rig, rather than a more complex and invasive MPD system. The ABP system requires a small amount of space and can be operated by one person part-time, resulting in a day rate that is a fraction of other MPD systems. It can also be applied in flowback and clean-up well testing and production operations.

Developed in-house and configured to the operator's required specifications, the equipment is designed to provide wear resistance and reliability for most extreme of conditions. For example, with +/- 20 psi tolerance, the system can withstand extreme environments.

### **Choke control**

The technology was developed to provide superior toughness, operability, ease of maintenance and cost-effectiveness for operators globally. In situations such as underbalanced drilling and MPD, continuous choke use is required to control the drilling operation.

A key feature of Expro's technology is the precise automatic choke control, which is required for managed pressure drilling and well control operations, such as kick control. The ABP system is specifically designed to provide this in well operations, especially in challenging oilfield operations. In addition, the system features both electronic and pneumatic control consoles - previously unavailable to operators.

In extreme use and highly-abrasive applications, PowerChokes® improve operations by helping to minimise downtime and reduce costly equipment damages. The ability to install large orifice trim for high flow rate requirements minimises plugging requirements and allows drillers to continue under a wider range of conditions.

## **Real-time solutions**

Expro has a successful record of meeting the demands of operators, whether in severe or emergency conditions. For example during one North America land operation, an operator experienced loss of circulation when entering a critical formation. Since the pore pressure and fracture pressure gradient window was very narrow, it was imperative to have close control of bottomhole pressure. This was especially important since this formation can produce violent gas kicks and influxes, which have to be managed quickly and effectively.

The company used the ABP system to maintain setpoint pressure more accurately and with much less deviation than alternative solutions. The ABP helped to maintain bottomhole pressure, while stimulating mud weight to reduce significant gas influxes. As a result, the operator was able to continue drilling, rather than closing in the well, saving significant time and money.

Now more than ever, time is an important commodity due to pressures on cost. As the systems are developed in-house, with teams dedicated to manufacture and testing, the system can be ready quickly. In one recent project, Expro was able to assemble a PRV system in-house, complete factory acceptance testing and ship the package direct to a rig within a 14-hour timeframe avoiding more significant down time.

While an exception, on average a PowerChoke® system can be delivered to meet client specifications, within 6-8 weeks. This is all while meeting the highest international accreditation standards, including API specifications, DNV, ABS and ATEX Zone 2.

## **Conclusion**

For more than 25 years, Expro PowerChokes® has worked to provide solutions for severe service drilling, flowback, well test and production applications. In addition, other providers of bottom hole pressure management technology use Expro's PowerChokes® systems in their technology globally.

The company is working on developing a further advancement of its ABP system; a non-hydraulic actuator, which will be completely electronic. This will significantly advance management of borehole pressure resulting in improved accuracy and convenience.

In drilling operations, the need for technology that can open up flow from the well is growing. Effectively managing pressure via an economically viable solution is integral in allowing more efficient drilling; and doing this safely, reliably and continuously is the key to operators' success.