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## The Digital Wellhead

O&G operators are poised to reap the benefits of advances in field devices and back-end analytics



The Internet of Things (IoT) and related technologies are making inroads in just about every sector of the economy and the oil and gas industry is no exception. Larger players in particular are exploring the technology's potential and some are already finding new ways to extract value from the data flowing from digitized wellheads.

One O&G firm ABB works with has increased its in-house analytics group by a factor of six over just the last few years as more and more operational data has become available. Another, Australia's QGC, has implemented a cutting-edge system that allows the company to manage thousands of wells spread across 1,100 square miles with just four staff members.

Most firms are still in the early stages of evaluating technologies and developing a business case for investments in digitalization, but the potential is significant. Aside from the industry's ever-present focus on safety, cost reduction tops the list. There are more than 1 million wellheads in North America, and the companies that operate them are keen to reduce the amount of time field crews spend traveling between them to perform maintenance checks. Digitalization offers the possibility of remote monitoring coupled with analytics to do just that, and more.

### Why the cloud?

Typically, controllers at the wellhead perform a certain level of optimization locally, taking actions, for example with chemical injection, based on measurements taken locally. Now, the advent of reliable, high-bandwidth data communications has made it possible to do more in the cloud. Wellheads don't have particularly complex processing needs, and latency is not as much of an issue thanks to more advanced field networks. So, what does this new level of data availability do for O&G operators?

First, they can potentially get faster, more conclusive decisions about their operations by gathering data from the field and applying advanced analytics to it via cloud computing. Analytic programs in the cloud can provide a much more detailed picture of what's going on across a large number of wells, allowing op-

erators to spot trends and take action. For example, an improvement action at one location might be offset by a detrimental reaction at another location. Such a conflict might not be immediately apparent, but if the operator has the benefit of cloud-based analytics to provide a field-wide view, it's much more likely to be addressed before developing into a serious problem.

This capability is beginning to change the type of equipment in the field. Edge devices are being tested and deployed now to evaluate augmenting proprietary controllers, enabling users writing their own programs and minimizing concerns of obsolescence. It's also easy to equip wellheads with technology and simply turn on additional features or even rewrite programs later to adapt to changing production conditions.

With data flows established, the real value in digitalization happens when data is fed into analytic tools, for example predictive maintenance programs that eliminate unnecessary travel by field technicians.

Realizing value from digitalization is predicated first on having the domain knowledge to turn raw data into actionable intelligence. This may seem obvious, but it's often not immediately clear what to do with data being collected or even where it will be used within the organization. What is the data worth? What is the commercial value of analytics? These are still open questions for the industry, but O&G operators needn't face them alone. Suppliers already offer the means to leverage data flows via cloud-based AI without fear of compromising IP or data ownership.

There is more software-based control, too, which when combined with increased availability of operational data allows actions to be taken based on historical trends rather than simply on real-time readings. It's likely that O&G firms will find new applications as they move forward on their digital journey.

#### **Going digital – first steps**

As noted above, the first step in digitalization is the ability to handle large data flows. That implies secure, high-bandwidth communications. Scalability is also essential. Can a given technology support a 60-well pad? Will it work across thousands of pads? Wellhead control can be done at this level using local controllers of varying aptitudes—the key is ensuring the ability to scale up.

Suppliers are beginning to offer packages for field automation that will provide onshore operators a more economical option than the larger, more sophisticated (and more expensive) systems used in offshore applications. For example, ABB has developed an inte-

grated offering that combines controllers, motors, drives, wireless communications and electrical balance-of-plant along with digital applications to optimize operations. It can support operations of any size from a few wells to thousands.

Of course, not everything is a candidate for cloud computing. Analytical, data-driven applications such as plunger lift and gas lift applications are well-suited to it, but real-time applications are better off residing in the RTU. It's also important to understand that the O&G industry—and others—may never converge on a single cloud computing environment. Industrial customers have very specific needs vis-à-vis safety, regulatory compliance and operational requirements, among others. Banking and travel firms, for example, have chosen to keep their own transactional systems despite being highly digitalized otherwise.

#### **The four phases of digitalization.**

O&G companies are on an evolutionary path to optimize their operations. The digital wellhead is only the first step.

- Phase 1: the digital wellhead
- Phase 2: digital pipelines
- Phase 3: digital terminal solutions (including LNG)
- Phase 4: the integration of all of the above

Eventually, it will be more important to “connect the clouds,” similarly to how consumer systems bring myriad products and services under one interface (e.g., Amazon Alexa). Integration is much easier to do at a cloud-to-cloud level where computing, storage and connectivity resources are plentiful and cheap compared to traditional approaches.

#### **Other important considerations**

Security will remain a top concern as the O&G industry becomes more and more digitalized, but securing industrial systems is more challenging than laptops and mobile phones. Many devices have no screens or keyboards, and they run mission-critical systems that cannot be taken offline. Vendors and users together must make sure programs can't be tampered with. Protecting devices at start-up, ensuring software updates come from reputable sources and detecting (and acting on) threats as they happen are all vital.

Recently another issue, data ownership, has arisen not just in O&G but in other sectors too. Operational data is valuable, and the owners of it don't want it to be shared with anyone without permission. Some cloud providers currently ask their users to nullify

patents as part of their terms of service, but we believe that companies should not have to forfeit their intellectual property simply because they choose to use cloud-based services.

### **Looking ahead**

The onshore oil & gas industry is evolving rapidly. The real challenge will be making sure every development dollar spent generates real ROI. Companies that embrace digitalization will position themselves to uncover real value, but they need not embark on large capex projects to do so. No matter which stage of connectivity a company may be at, modular technologies can deliver on unique application needs today, regardless of region, and scale up as conditions change and new opportunities arise.

Onshore O&G is well situated to benefit from experience from the offshore side of the business, as well as new technologies onshore. Given the rapid pace of innovation in the areas of analytics and cloud services, not to mention field devices, we are likely to see even more options for wellhead digitalization over the coming years. The key to realizing returns and gaining competitive advantage is to start the digitalization journey now.