



IoT OPPORTUNITIES

EMBRACING TECHNOLOGY IN THE ENERGY SECTOR



Executive Summary

After years of booming industry, a dip in the price of oil and the devalued Canadian dollar are demanding that oil patch producers take a closer look at the way they do business.

Producers seeking to protect their bottom line are looking for innovative ways to improve efficiency while still cutting costs. Industry executives attending a CanadianCIO Roundtable, sponsored by Bell, were united in the view that dealing with the downturn requires more than simply making financial adjustments. They see turbulent markets as an opportunity to gain a competitive advantage by harnessing technology powered by the Internet of Things (IoT). They are investing in technological innovation to be more agile, efficient and productive. They see it as spending that generates real return on investment.

“IoT empowers companies to streamline processes that help boost productivity and increase overall profitability in a challenging market.

— Gary Semplonius,
Bell

Gartner Inc. forecasts there will be 25 billion connected things by 2020, making IoT a transformational force with a disruptive impact that offers oil and gas companies the potential to unlock the benefits of devices, systems and services that connect with each other. With sensors, connectivity and the application of data analytics, industry players can access a rich flow of data that allows them to optimize business processes, improve decision making, allocate resources more effectively and better predict situational outcomes.

“IoT empower companies to streamline processes that help boost productivity and increase overall profitability in a challenging market,” Gary Semplonius, Bell’s Vice President of Business Wireless, Radio and Paging, told the group.

IoT is not just about helping companies manage their existing assets or supply chain. It enables the creation of a new asset: information about their businesses that will help them achieve new levels of safety, efficiency and visibility. It delivers the right information at the right time to the right place.

This white paper explores:

- The digital maturity of the oil and gas industry
- Leveraging IoT through upstream, midstream and downstream operations
- The roundtable's view of the role of IoT in:
 - Remote location monitoring
 - Fleet and asset management
 - Safety
 - Security
 - Preventative maintenance

Shifting gears

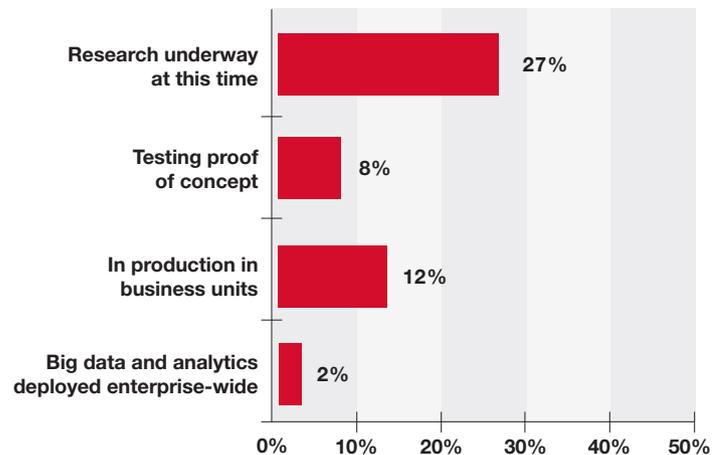
The move toward IoT in the oil and gas sector has been spurred on in part by the falling costs and increasing functionality of sensors, a growing availability of wireless networks and an explosion in computing power. A 2015 Deloitte study indicates sensor prices have tumbled to about 40 cents from \$2 in 2006, and bandwidth costs are a fraction of what they were five years ago. With lower costs, multiple sensors can be deployed affordably, even to lower value locations such as wells and compressor stations. With more sensors and greater connectivity, more data is generated, as are the opportunities to use the data to create value.

Oil and gas companies have always embraced technology, but the efforts have historically focused on operational assets: bigger trucks, faster drills, more powerful geophones. Until recently, there was a lack of technology integration across disciplines or the incorporation of business information into the technology picture.

The study indicated that the oil and gas industry's digital maturity was among the lowest of any sector, scoring just 4.68 on a scale of 1 to 10. The study also estimated less than one per cent of the information gathered by oil and gas companies was being made available to decision makers.

The use of big data and analytics in upstream oil and gas

Oil and gas companies have historically been slow to embrace technology. Only two percent of Roundtable participants said they used big data and analytics across their organization.



Most of the participants in the CanadianCIO roundtable indicated their firms were already using first generation IoT with existing SCADA (supervisory control and data acquisition) systems for remote monitoring and control of machines. The executives agreed the challenge in integrating IoT into the industry is not about the technology, but defining the ways it can solve business problems.

The responsibility for choosing the problems to be addressed with IoT deployment still rests with the CIO and IT management, but it was clear from the discussion that with the flattening of many organizations, business units and line of business players are heavy influencers in the process.

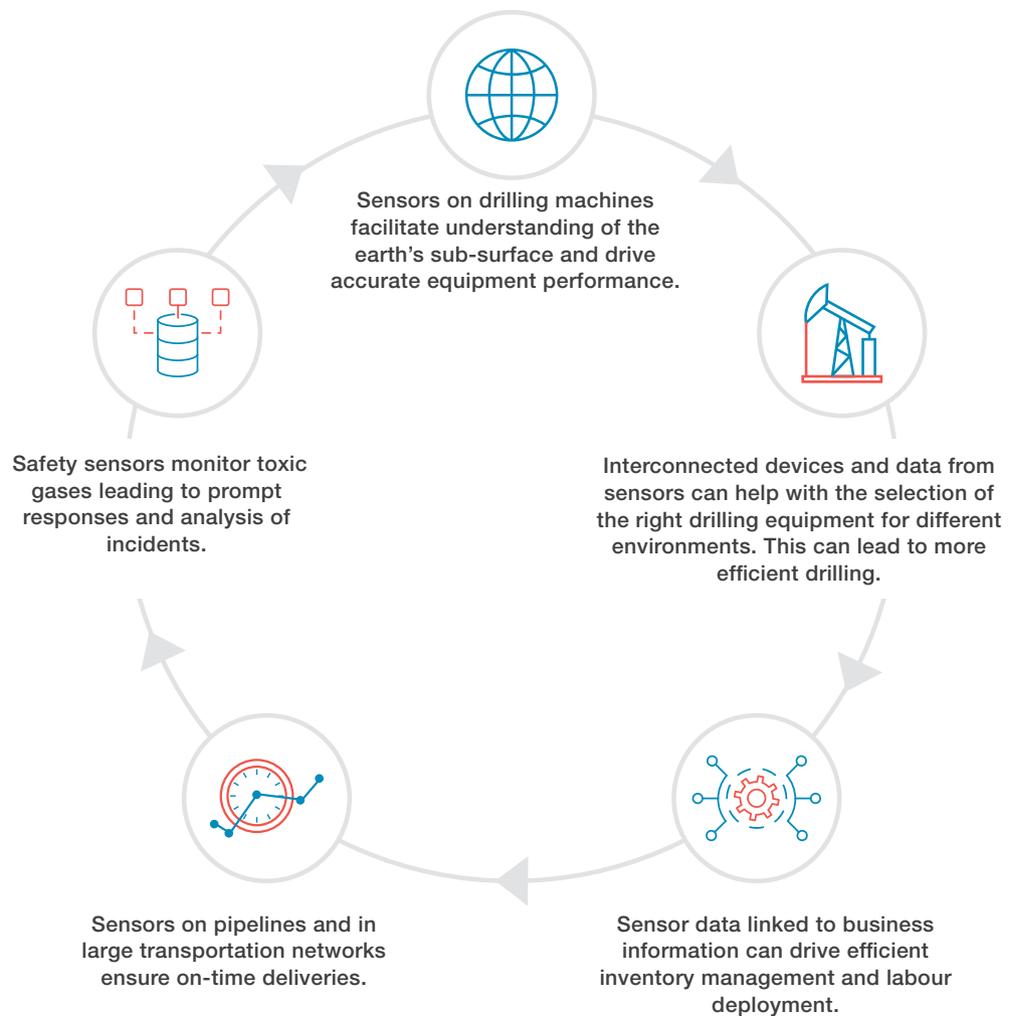
Leveraging IoT

There are three overarching business objectives relevant to IoT deployments in the oil and gas industry: improving reliability, optimizing operations and creating value through connectivity, analytical capability and a wealth of data. Lower prices are driving companies to place a higher priority on using IoT where it can make the greatest difference.

Some of the practical opportunities are most evident when broken down by the industry streams.

| UPSTREAM Exploration and production | MIDSTREAM Transportation pipelines and storage | DOWNSTREAM Refiners and retailers |
|--|--|--|
| <p>Increased data capture and analysis can save millions of dollars by eliminating as many as half of a company's unplanned well outages, boosting crude production by 10 per cent.</p> | <p>Transportation plays an important role in the midstream, facilitating the transfer of oil from wells to refinery and finished products from refineries to end users and customer sites. Pipeline data combined with data from export facilities markets and marine terminals can ensure that product arrives on-time.</p> | <p>Avoiding downtime is a critical part of increasing refinery output. Using sensors to monitor infrastructure and identify potential problems can prevent expensive business losses.</p> |
| <p>Uncertainty and geological risks are significant in resource exploration. To maximize productivity, cognitive computing can be used to optimize strategy for drilling wells and to make more informed bids for exploration blocks.</p> | <p>A built-in data-based infrastructure can help maintain and optimize performance across a vast network of ships, barges, pipelines, trains and trucks.</p> | <p>With an IoT solution, flow rate, pressure and temperature data collection can be reviewed on a real-time basis, enabling optimized operation of gas plants and pipelines.</p> |
| <p>IoT can help companies improve their exploration programs through the analysis of physics and non-physics data. It can be used to speed up the analysis of seismic data. New advanced data visualization software enables the next generation of visual analytics for energy subsurface modeling.</p> | <p>Sensors installed inside and outside pipelines create data about potential breaches, improving pipeline safety and reliability.</p> | <p>Crude refinement results in the production of toxic gases and any leakages can be hazardous. Safety sensors connected to communication networks can ensure workers are quickly alerted in the event of an incident. They also ensure quick responses to incidents.</p> |
| <p>Smart sensors, M2M connections and big data analytics can increase rig time.</p> | <p>Pipeline companies operate long-lived assets under heavy compliance regulations. New ways to monitor and document performance using connected sensors help ease the manpower and financial costs associated with regulation.</p> | <p>Connected sensors can help identify cracked or corroded pipelines that need to be repaired or replaced.</p> |
| <p>IoT can automate thousands of wells and monitor multiple pieces of equipment, with savings on labour costs, operational efficiencies and the reduction of human error.</p> | | <p>Gas retailers are moving toward the elimination of credit card swiping, PIN verification and the issuing of receipts. A new system would connect with vehicles, aggregate information about route and fuel levels and direct the driver to a station where he or she could fill up and make a pre-authorized automatic payment.</p> |
| <p>With an IoT solution, flow rate, pressure and temperature data collection can be reviewed on a minute-by-minute basis that enables optimized operation of gas plants and pipelines.</p> | | |

Even with consultants Wood Mackenzie Ltd. predicting a 22 per cent drop in spending over the next five years because of the slump in prices, the global industry will still invest \$3 trillion in development between now and 2020.



From sensors on drilling machines to deployment of workers, IoT provides the opportunity for companies in the oil and gas sector to drive efficiencies, improve safety and control costs.

Monitoring Remote Locations

Oil and gas companies frequently operate in remote locations. Leveraging remote intelligence to track, monitor, manage, report and resolve asset issues is critical work. IoT devices at remote locations can collect data about well and pipeline performance and send the information to a central data centre for remote monitoring. The ability to receive the information in a timely fashion leads to higher production volumes, better operating costs and reduced impact from equipment failures.

“ All parties can have an immediate electronic record of the transactions, real accountability in remote locations and immediate awareness for maintenance diagnostics.

— Gary Semplonius,
Bell

Rapid advances in robotics, autonomous vehicles and drones are already reducing the need for on-site staffing as well as the risks of investigating hazardous incidents. Remote monitoring solutions from Bell provide companies real-time visibility of their operations and production systems – no matter how remote. By collecting and analyzing this data, companies will be able to streamline operations, reduce costs and improve productivity.

Remote monitoring from Bell also provides timely notifications of low inventory or consumables. Customers are able to accelerate decisions and improve customer service by proactively managing their business.

Easing the skilled labour shortage

A shortage of skilled labour has driven industry experts to discover smart alternatives that can drive processes with automation and reduce workforce dependency. One recent study by Real-Time Innovations (RTI) indicated 60 per cent of current field experts are expected to retire over the next six years. IoT automation can help reduce the business impact of this.

An increased emphasis on mobile technology is also allowing the oil and gas industry to leverage smartphones for employees and executives on the road. The mobile devices allow employees to learn and collaborate. They also serve as a platform for checking system status and receiving network outage alerts.

CASE STUDY

When one of Canada's leading providers of business information automation technology firms needed a solution that would help it remotely monitor oil wells and relay the data back to customers, they chose Bell for modems and wireless coverage. Alberta's CriticalControl monitors oil wells for production companies across Alberta and it worked with Bell to create an online platform that allows customers to read meters at the wells remotely. The innovation eliminated the expensive and time consuming process of sending employees to manually check meters and it reduced the potential for human error. Bell was able to provide a wireless solution that could transmit data from the oil wells securely to keep their customers' information private. With a secure network, CriticalControl avoids unnecessary shutdowns of compressors or plants. Leveraging its partnership with Bell, CriticalControl has grown its wireless solution from approximately 100 modems to nearly 5,000 modems in six years. As its business evolves, the company continues to work with Bell to take advantage of ongoing technological advancements.

Fleet and Asset Management

Asset performance data analyzed in real time can enhance daily productivity by providing insights on performance. Fleet management solutions, like those offered by Bell, can help companies optimize performance, manage fuel consumption and plan routes effectively by transforming data into actionable information.

The data collected and analyzed helps companies control costs and enhance safety. GPS-based software can provide alerts, allowing companies to limit unauthorized vehicle use, streamline the vehicle maintenance process and improve delivery times. With real-time GPS location tracking, companies will always know where their vehicles are.

“Anything that moves is an opportunity for IoT and for cost saving.

— *Calgary oil executive at the roundtable*

Onboard electronic recorders eliminate the need for paper logs and better meet government regulations. Companies are able to improve compliance by providing drivers with access to two-way communication, electronic forms transmission and real-time hours of service reporting.

An IoT-driven preventative maintenance plan decreases costly downtime. “Anything that moves is an opportunity for IoT and for cost savings,” affirmed a Calgary oil executive at the roundtable.

Finding ways to monitor expensive capital assets and to use the data to drive performance enables innovation and keeps fuel flowing.

Security

Key considerations for the adoption of IoT solutions in this sector focus on operational efficiencies, but security and risk management need to be considered as well. There are three layers of security that need to be reviewed when deploying an IoT system. You must secure endpoints (devices and sensor), your network, and applications and data. Each layer requires a different solution.

Connectivity is the foundation for IoT and cellular solutions can provide an attractive option for mitigating security concerns.

A 2015 report from the US Department for Homeland Security found the energy sector topped the list of US industries facing cyber attacks. In 2014 there were 79 reported incidents. Manufacturing followed with 65 and healthcare with 15 reported incidents.

Safety

The oil and gas industry operates under extreme environmental conditions, in remote areas across multiple jurisdictions. Pipeline safety is in the best interest of all players as a spill by any single operator can lead to higher costs and tighter regulation for the whole industry. A remote IoT sensor system can allow for the monitoring of critical infrastructure across thousands of kilometres and with alert systems that allow for rapid response in the event of an incident.

As a highly regulated industry that operates in sometimes rugged conditions, oil and gas companies have obligations to keep their employees safe. As one participant pointed out, remote monitoring in some cases can eliminate the need for visits to potentially dangerous sites.

“If you have a user that doesn’t return to their vehicle, you know it. It can mean trouble and you can act accordingly.

— *Calgary roundtable participant*

A variety of warning sensors can improve the comfort and security of personnel in the field. “If you have a user that doesn’t return to their vehicle, you know it. It can mean trouble and you can act accordingly,” noted a roundtable participant.

Preventive maintenance

A single pump failure can cost \$100,000 to \$300,000 a day in lost production. Refiners routinely pull equipment for inspection and overhaul without much information about the devices’ condition.

Using non-invasive sensors to track parts performance, companies can move away from time-based maintenance to predictive maintenance, which reports on the functioning of the equipment, the available inventory of fuel, fuel consumption rates and even issue alerts when it’s time to replenish supplies. Preventative maintenance can help companies avoid costly failures while driving significant productivity and cost savings.

Bell’s fleet management systems offer diagnostic reporting that analyzes vehicle operation and performance, proactively diagnoses issues and schedules repairs, while at the same time monitoring speed, time spent idling and fuel consumption.

Conclusion

Facing the new normal of lower oil prices, the oil and gas industry is beginning to see the importance of IoT to its future success. Widespread adoption of a viable IoT strategy by oil and gas firms seems likely as core enabling technologies continue to improve.

IoT can help streamline operations, and enable companies to improve workflow and provide meaningful data to make good decisions. Despite business challenges, investment in innovation continues as energy companies strive to be more nimble, efficient and productive while reducing costs.

The executives attending the roundtable recognized that IoT implementation is about more than adding sensors and increasing connectivity. There is a need to identify the business goals IoT can address most effectively. There is also a related need to monitor the success of IoT deployment so when an executive in the C-Suite asks about digitally-driven momentum, the answers will be apparent.

IoT can give oil and gas companies global reach. Embedded sensors, automation and connectivity with data communications can gather and transmit operational data from any location, allowing producers to obtain a more detailed and accurate understanding of current operations. IoT also removes physical barriers so companies can reach broader audiences.

“The more data we have, the more we can learn and put together algorithms to predict problems,” concluded ITWC CIO Jim Love as the Calgary session wrapped up. “It’s about taking information from control systems and using it to make those systems even more efficient.”

About Bell

BCE Inc. is Canada's largest communications company, providing a comprehensive and innovative suite of broadband communications and content services to consumer, residential, business and government customers in Canada. Bell Mobility offers the best selection of global IoT platforms in Canada.

Bell offers a selection of global IoT management tools to meet your business needs. The Bell Management Centre, powered by Ericsson, and Bell Control Centre, powered by Jasper are two of the world's leading-edge management tools that allow you to manage, monitor and fully control an entire IoT infrastructure in real-time on the Bell network. As an organization, you are in complete control of how you:

- Manage devices, SIM cards and subscriptions
- Monitor traffic and set trigger notifications
- Analyze usage and all subscription data

About CanadianCIO

CanadianCIO is Canada's premier digital publication exploring relevant and emerging technologies and the related business and operational issues facing senior executives. It is the IT professional's source for understanding the technology landscape and the strategies and solutions needed to deliver on business outcomes.