



OIL & GAS: TRANSFORMING THROUGH DIGITAL TECHNOLOGIES

The oil and gas industry has recently experienced one of its worst downturns, driven by multiple factors including a sharp supply-side disruption where heightened production flooded the global market with an oversupply that reached as much as 1.8 million barrels of oil equivalent (BOE) a day in 2015. At one point, commodity prices had fallen by more than 70% compared with June 2014 levels.¹

While prices have rebounded slightly in 2016 and early 2017, the oil price crisis has been a wakeup call that the “business as usual” attitude which pervades much of the industry is no longer a viable option in such economically and politically volatile times. Oil and gas companies need to operate in a much smarter, more efficient and forward-thinking manner, in order to tackle the major issues of the day, including: rapid supply/demand changes, ecological sustainability and combating heightened HSE hazards. This is particularly important for the key hydrocarbon producers in the Middle East, such as Kuwait with its hugely ambitious production target of achieving 3.165 million b/d by 2020.²

Increasingly, the industry is seeing more operators turning towards digital technologies to provide the answers to the tough questions being posed by current circumstances. In a time where other industries have embraced digitalisation with great speed and relish, oil and gas has been somewhat lethargic. However, this is changing as the potential impact of effective digitalisation continues to be demonstrated in terms of billions of dollars saved in efficiency along with a slew of other long-term benefits. With nations like Kuwait leading the digitalisation charge with its \$155 billion national strategy to transform the national economy by 2035, oil and gas companies are an instrumental part of this fundamental shift towards digital.³



¹ World Economic Forum, Digital Transformation Initiative Oil and Gas Industry, 30/01/2017

² S&P Global Platts, Kuwait sticks to capacity targets of 3.165 mil b/d in 2017, 4 mil b/d in 2020: execs, 11/03/2016

³ Oxford Business Group, Kuwait lays out project agenda with state development plan, 2015 report

Now is the time: Why shift to digitalisation?

The traditional barriers to digitalisation in oil and gas include the usual suspects which haunt most industries: high investment costs combined with slow-to-appear returns. Until very recently, an even bigger barrier was organisational inertia: companies felt less incentivised to go to all the trouble of a digital transformation when prices were high and profits were flowing. During periods of peak prices, capital went to drilling more holes and pumping more oil, not to implementing digital technologies.

The necessity for change has been made abundantly clear by the prolonged low price of oil, as well as global attitude changes towards climate change accountability and a number of key sustainability issues. With prices unlikely to return to their former peak, and overproduction becoming politically unpopular, the time for operational optimisation through digitalisation is now. By embracing it, oil and gas companies may leverage a wide range of both long and short-term benefits and opportunities:

- **Increase profitability:** Ultimately, digital technologies allow for greater profit margins as they enable costs reductions through intelligent maintenance, workflow automation, better labour utilisation, and increased standardisation and simplification of designs, processes, and equipment.
- **Aid decision making:** A single drilling rig at an oilfield, for example, can generate terabytes of data every day, but only a small fraction is currently used for decision-making. Through the intelligent use of data collection and analysis, operators can take advantage of the opportunities that derive from using their data in a more meaningful and strategic manner.
- **Enjoy greater operational resilience:** Digitalisation, and more specifically automation, can lead to assets enjoying better health, safety, and environmental performance. Digital sensors, drones and “wearable” technology (sophisticated data entry and display devices for engineers) can enable proactive and preventative maintenance, as they monitor pressures and other stresses on assets. By reducing headcount on more dangerous drilling platforms through automation, companies can keep employees away from danger while at the same time making operational cost reductions. These combined digital approaches can improve the efficiency of asset lifecycle management and markedly reduce the chance of a catastrophic incident occurring.
- **Meet changing customer demands and expectations:** Across industries, the average consumer now expects much higher engagement, personalisation and ethical standards from their providers. For oil and gas companies, this incentivises the implementation of digital technologies which promote greater sustainability and customer interaction by being connected to multiple digital platforms.
- **Increase agility:** Companies become more agile with digital. With increased market volatility, upstream companies need to ramp production up and down much more quickly in order to successfully manage demand flows. Digitisation gives them the tools necessary to achieve this kind of agility.



Digital technologies in oil and gas: The way forward

"The research we'd had said that 65% of the capital projects over \$1 billion failed. And that's either 25% over budget or 50% late." – Jim Nyquist, group president of systems and solutions, Emerson⁴

A recent report from World Oil states that approximately 69% of companies overrun in cost, and about 80% overrun on time, both of which leading to billions in operational losses.⁵ In order to alleviate or entirely avoid such costly overruns, the use of digitalisation is essential, as it can help companies manage over-spending and operations, ultimately elevating overall productivity.

Expert analysis from the World Economic Forum suggests that there is a vast monetary incentive for the oil and gas industry to embrace digital transformation, citing the many ways in which digital technologies can add value to organisations:

- Digital transformation in the Oil and Gas industry could unlock approximately \$1 trillion of value for oil and gas firms, with another \$640 billion for its customers and wider society.
- This figure includes approximately \$170 billion of savings for customers, roughly \$10 billion of productivity improvements, \$30 billion from reducing water usage and \$430 billion from lowering emissions.
- Environmental benefits include reducing CO₂-equivalent (CO₂ e) emissions by approximately 1,300 million tonnes, saving about 800 million gallons of water, and avoiding oil spills equivalent to about 230,000 barrels of oil.
- This total estimated value from digitalisation may increase to \$2.5 trillion if existing organisational/operational constraints are relaxed, and the impact of "futuristic" technologies, such as cognitive computing, is taken into account.⁶

⁴ InnovOil, Oil industry embracing automation, digitisation, 12/04/2017

⁵ Market Insights, Digitalisation: A boon for oil and gas, 03/05/2017

⁶ World Economic Forum, Digital Transformation Initiative Oil and Gas Industry, 30/01/2017

Emerging digital technologies and trends in oil and gas operations



4D seismic imaging: By adding a time-lapse dimension to traditional 3D imaging, operators can measure and predict fluid changes in reservoirs, typically increases the recovery rate by as much as 40% and boosting upstream revenue by up to 5%.⁷



Big data and analytics: Modern offshore drilling platforms have about 80,000 sensors, which are forecast to generate approximately 15 petabytes (or 15 million gigabytes) of data during an asset's lifetime.⁸ About 36% of Oil and Gas companies are already investing in big data and analytics but only 13% make strategic use of their own data.⁹



Mobile technology: Oil and gas companies are investing massively in order to integrate mobile devices into everyday operations. The benefits of this approach include everything from workflow improvements to improved communications, increased productivity and heightened accuracy of recorded field data. By utilising specialised smartphones, tablets and even wearable devices, oil and gas workers can achieve real-time data monitoring and predictive maintenance while improving their safety by avoiding hazardous conditions.



Autonomous operations and robotics: Automation of appropriate processes not only improves the efficiency and safety levels of oil and gas assets, it will also help inform future design considerations such as portfolio planning, where to drill, improved maintenance, etc. As capital expenditures for exploration have dropped by about 25% since 2014, it's more important than ever to maximise the value of existing assets.¹⁰ Drones are perhaps the most prevalent and visible form of robotics currently being utilised to achieve the double aims of increasing operational efficiency and safety.



Digitally enabled marketing and distribution: Modern retailers have been very successful in using digital technologies to gain a more comprehensive view of their customer. Oil and gas companies are using similar tactics to discover consumer habits and preferences, and subsequently optimise their pricing models and manage supply chains more effectively. This approach can yield as much as a 3% revenue gain while lowering costs by 10%.¹¹



Blockchain: Emerging digital technologies like blockchain can also help with the critical issue of accelerating the industry's very slow payments process; freeing up resources for exploration, expansion and further digitalisation efforts.¹² Years of limited technological innovation regarding payments have left upstream companies with production to payment cycles of up to four months, a potentially terminal problem for many businesses.



Cybersecurity Solutions: As assets become more technologically sophisticated and their points of interface expand, they also become increasingly viable targets for hackers and cybercriminals looking to take control of them for political reasons or financial gain. The Saudi Aramco hack of 2012, the world's biggest hack ever seen with its disastrous results,¹³ is a constant reminder to the industry of the perils of lax cybersecurity. With this heightening threat landscape in mind, oil and gas companies are aiming to secure their digital infrastructure as quickly and successfully as they can.

7 McKinsey, The next frontier for digital technologies in oil and gas, 30/08/2017

8 World Economic Forum, Digital Transformation Initiative Oil and Gas Industry, 30/01/2017

9 Ibid

10 PwC, Not your father's oil and gas business: reshaping the future with upstream digitisation, 30/12/2016

11 Ibid

12 McKinsey, The next frontier for digital technologies in oil and gas, 30/08/2017

13 CNN Tech, The inside story of the biggest hack in history, 05/08/2015

14 Honeywell, Honeywell And Saudi Aramco Advance Digitization Of Oil And Gas Industry With New Agreement, 20/05/2017

Key digitisation efforts of leading ME Oil and Gas companies

Kuwait: Kuwait Oil Company (KOC)

KOC has been pioneering the creation of integrated digital oil and gas fields, with four major pilot projects launching from 2011 onwards.¹⁵ By utilising various suppliers for various technologies and skills, KOC has been able to bring a wide range of capability and expertise to its pilot projects, which have leveraged the following benefits to the company:

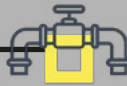
- Faster and better decision making through the availability of accurate data;
- Proactive production planning via real-time data monitoring and forecasting;
- Streamlining of current operations through use of latest digital technologies;
- Smarter and more clearly defined processes and personnel-based interactions;
- Increased operational efficiency leading to sustainable production at a reduced financial cost¹⁶

KOC have also signed a major agreement with Cisco in 2016 for the installation of powerful cybersecurity defences and are also working with Monitor and with other solution providers like Emerson and Halliburton to advance their digitalisation journey.¹⁷



Saudi Arabia: Aramco

In 2016 Aramco signed a \$700 million deal with Honeywell, a software-industrial company that delivers industry specific solutions, to rapidly advance their digitalisation efforts with a specific focus on exploring the benefits of cloud storage, big data and an Industrial Internet of Things (IIoT) approach within Saudi Aramco's operations. A new Memorandum of Understanding (MoU) between the two companies was signed in May 2017 to renew their efforts in this critical area of digital transformation.¹⁴



UAE: Dubai Petroleum

After a slower start to utilising unmanned aerial vehicles (UAV), the ME oil and gas industry is quickly coming to terms with the inherent value and capabilities of this dynamically evolving technology. In December 2016, Dubai Petroleum signed a three-year framework with inspection and survey firm Cyberhawk Innovations for UAV inspections across all of its offshore assets.¹⁸

"Our framework agreement with Dubai Petroleum is the first of its kind for the Middle East, an encouraging sign that UAV technology is being accepted and adopted in this region. We have invested significant resources into the Middle East, not only to build our own business but also importantly, to raise awareness of the safety, cost and time benefits on offer for the region's oil and gas industry." – Chris Fleming, CEO, Cyberhawk



¹⁴ Honeywell, Honeywell And Saudi Aramco Advance Digitization Of Oil And Gas Industry With New Agreement, 20/05/2017

¹⁵ Oil and Gas Journal, KOC pilots test integrated digital oil field approaches, 07/04/2011

¹⁶ Kuwait Oil Company, Here and now: KwiDF GC1 in South East Kuwait, 16/01/2014

¹⁷ Cisco, Kuwait Oil Company Opts for Cisco Security Solutions for High-Security Network, 18/01/2016

¹⁸ Offshore Engineer, Cyberhawk wins Dubai Petroleum framework deal, 19/12/2016

Developing digital responses to new and existing problems in the Oil and Gas industry

In the current oil and gas market conditions, it is essential that companies divorce themselves from the concept of “volume is everything” and reinvent themselves accordingly to improve the efficiency and overall productivity of their operations. Admittedly, any major capital expenditures or acquisitions during a time of low oil prices and cutbacks will give many executives pause for thought, but the development of digital capabilities is an inherently sound strategic decision which can bring a wide range of lasting benefits if implemented correctly.

Digital transformation has the ability to completely revolutionise the oil and gas industry, as it has already begun to do so with the likes of retail, banking and telecommunications. While the pace of change in oil and gas is currently slow, it is increasing, which means early adopters will secure greater profitability, sustainability and resilience during both boom and bust periods, while those who ignore the inevitable shift towards digital may quickly find themselves left behind.



Want to learn how you can use digitally-connected assets to reduce costs, shorten schedules and minimise risk using advanced technology and solutions in your oil and gas operations?

Join industry experts from KNPC, KOC, Saudi Aramco, SABIC, Shell, Vedanta, PDO and more at the World Digital Refineries Congress (30 September – 2 October) taking place in Kuwait. Learn from your peers from all major regional and international oil and gas companies who will guide you towards a robust and efficient digital strategy in order to maximise the use of the latest disruptive technologies at the industry's disposal to reach organisational goals.

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