Upstream INTELLIGENCE

DATA DRIVEN OIL & GAS PRODUCTION IN THE USA:

Devon, Hess and Dell EMC on Applications, Workflows & Barriers

By James Bourne

Introduction

While now a key element of many oil and gas companies' operations in the USA, the use and analysis of well and other oilfield data to optimize drilling and maximize production is arguably changing emphasis, from helping oil companies maximize production to helping them save money.

With the benchmark West Texas Intermediate (WTI) crude oil price trading at below $50/barrel on average so far this year, the number of oil and gas rigs drilling in the US, including offshore, has started to fall slightly, dropping by eight, to 936, in the week ending September 15, according to the most recent Baker Hughes data.

Although good data management and related applications can cut operating costs and boost production – for example through well optimization of flow rates and recovery from the reservoir to the sales point -- oil companies are cutting expenditure across the board and that can affect data-driven applications too.

Comparable statistics on US oil companies' expenditure on data acquisition, management and other related services and technologies do not exist, but some providers of digital solutions have seen a slowdown.

"Over the last couple of years the industry has been slow to spend money … but you can only wait so long before you have to update what you already have from a technology point of view," says Chris Lenzsch, Solutions Manager of Big Data Analytics and IoT at Dell EMC.

On the other hand, as automation increases, fewer people are needed. In a June 2017 article on HR in the oil industry, management consultancy McKinsey & Co said: "Profound technological advances are disrupting the old ways of working and enabling step changes in productivity. Automation is replacing workers (including knowledge workers) on a large scale, and the jobs that remain require increased human-machine interaction. As more devices connect to the cloud, data generation continues to grow exponentially. This explosion of data—combined with advanced analytics and machine-learning tools—lets companies fundamentally reimagine how and where work gets done." [1]

In addition, responses to climate change coupled with concerns over air pollution and advances in battery technology mean improved efficiencies and lower costs are crucial to the oil and gas sector's short to medium term prospects. France and the UK have committed to ban the sale of gasoline and diesel-powered vehicles by 2040, while Sweden-based car and truck manufacturer Volvo recently announced it will only make hybrid or electric cars from 2019 onwards.

Advances in technology that can be applied in the oil and gas sector, such as virtual reality, artificial intelligence and machine learning, are pushing the use of oilfield data use and interpretation away from number crunching toward wider employee engagement, better predictivity and simple visualization.

In the light of recent hacks into both state bodies and corporations around the world, cyber security -- always important to data managers and large corporations -- has become an even higher priority.

Rotary Rig Count 9/15/2017					
Location	**Week**	**+/-**	**Week**	**+/-**	**Year**
Land	915	-8	923	433	482
Inland Waters	4	-1	5	0	4
Offshore	17	1	16	-3	20
United States Total	936	-8	944	430	506
Gulf Of Mexico	17	1	16	-3	20
Canada	212	10	202	80	132
North America	1148	2	1146	510	638
U.S. Breakout Information	**This Week**	**+/-**	**Last Week**	**+/-**	**Year Ago**
Oil	749	-7	756	333	416
Gas	186	-1	187	97	89
Miscellaneous	1	0	1	0	1
Directional	74	-2	76	26	48
Horizontal	795	2	793	401	394
Vertical	67	-8	75	3	64
Canada Breakout Information	**This Week**	**+/-**	**Last Week**	**+/-**	**Year Ago**
Oil	112	10	102	37	75
Gas	100	0	100	44	56
Miscellaneous	0	0	0	-1	1
Major State Variances	**This Week**	**+/-**	**Last Week**	**+/-**	**Year Ago**
Alaska	4	0	4	-1	5
California	16	0	16	11	5
Colorado	35	-1	36	16	19
Louisiana	62	-3	65	21	41
New Mexico	67	-1	68	39	28
North Dakota	52	-1	53	25	27
Ohio	29	0	29	15	14
Oklahoma	130	0	130	65	65
Pennsylvania	33	0	33	12	21
Texas	452	-3	455	208	244
Utah	8	0	8	3	5
West Virginia	16	1	15	6	10
Wyoming	25	0	25	12	13
Major Basin Variances	**This Week**	**+/-**	**Last Week**	**+/-**	**Year Ago**
Ardmore Woodford	2	0	2	1	1
Arkoma Woodford	8	0	8	5	3
Barnett	7	0	7	6	1
Cana Woodford	64	-3	67	32	32
DJ-Niobrara	28	-1	29	12	16
Eagle Ford	71	-2	73	33	38
Granite Wash	15	0	15	6	9
Haynesville	46	0	46	33	13
Marcellus	47	1	46	18	29
Mississippian	4	0	4	2	2
Permian	380	-2	382	178	202
Utica	30	0	30	15	15
Williston	52	-1	53	25	27

Data Driven Production Applications

The main applications of data and related tools in the oil and gas sector are well known. They include lift optimization, reservoir analytics, well completion data, production metrics and injection management.

But the technology used to manage and interpret these and other data sets is developing quickly and many companies can now present the information generated in more easily understandable formats and media, including virtual reality applications.

"We're really starting to move towards the visual aspect of the data," says Hess' Senior Data Analyst Yvonne Storlie, adding that her team mainly uses Tibco's Spotfire software.

Artificial Intelligence (AI) is a fast-growing area too. As computer power grows, algorithms and AI models are becoming more sophisticated, fuelled by big data.

According to recent survey, most of the fast-growing investment in AI consists of internal R&D spending by the world's biggest digital-native companies such as Amazon, Baidu, and Google.[2]

But, the report added, AI adoption outside of the tech sector is at an early, experimental stage and few companies have yet deployed it at scale, although the early evidence suggests AI can deliver real value to companies willing to use it across operations and within their core functions.

The next step is for machines to 'learn' from big data, for example predicting the need for maintenance and repairs before problems occur, says Storlie at Hess.

Since Dell and EMC merged just over a year ago, the hardware-to-software group has been able to provide a wider range of data driven products and services to the oil industry, Lenzsch says.

"Now we've got the whole model, from the edge, to the core, to the cloud."

With the right level of IoT information Lenzsch's team can create a visual real-time representation of a well system, while in the background the data is creating predictive models of what needs to be worked on, either in tabular or map format, with video and audio.

These 'intelligent alerts', as opposed to simple threshold alerts, point engineers towards the most effective workflow and can be seen by them via an app or other interface. "The point is you can get this stuff closer to the edge, to help the systems in place run better….and then positively impact the business." Lenzsch says.

Workflow

With all this data, increased sharing between silos and employees, allied to employee drift and the use of contractors, cyber-security issues are front and center.

"It's definitely a huge concern. A lot of things that they kind of left us alone on, not so much anymore, they really watch what we're doing on the network now -- as they should," says Storlie of the company's IT team.

And it's not just raw data that can be stolen, key algorithims used to analyze data are also subject to theft, and are harder to protect, C. Erik Hawes of law firm Morgan, Lewis & Bockius, explained at Upstream Intelligence's Data Driven Drilling conference in Houston earlier this year.

An algorithm, as distinct from the source code used to implement it, is probably not protectable using patent or copyright laws and so can only likely be protected as a trade secret, Hawes said.

The US Federal Defend Trade Secrets Act was passed last year, but such legislation does not exist in many other jurisdictions.

Case study:
Devon Energy Data Governance Program.

Ken Dalton, Lead Engineering Data Steward at US independent Devon Energy, says it's crucial to understand that 'data' is not just about the actual data, but about people and processes too.

Devon asked the company's HR department to identify and promote people to become data specialists, so that they could be empowered as managers of their unit's data.

Devon also gave its data producers and consumers easy-to-use visual tools to review and monitor quality.

"Let's put more eyes on this stuff,' as Dalton says.

In order to achieve this, Dalton's team provides people working at Devon including foremen, engineers and lease operators, with template dashboards so that – for example -- an engineer can set filters on his or her dashboard to monitor production, review downtime activity or even drive a meeting with live enterprise data.

"We provide the template, they provide the viewing."

This allows people to communicate, the key to good data analytics, in Dalton's opinion -- so long as you build rules and provide learning techniques, something Devon did in collaboration with Noah Consulting.

Dalton also highlights the importance of engaging, and communicating, with other stakeholders, even to the extent of giving them simple courses on wells and well completions.

Devon also used change management consultancy Prosci's ADKAR knowledge sharing system to communicate with stakeholders, in part to avoid using emails, which are often ignored.

These, and other related initiatives, have led to huge improvements at Devon projects, Dalton says, including cutting the number of dropdown options on one menu from 1,750 to 15 and reducing "chaotic" and error-strewn downtime reports to a one page, correct, laminate.

Dell EMC's Lenzsch notes that customers now want to streamline and improve processes by leveraging technology and improve efficiencies -- "which is code for how can I do more with less people."

In this regard customers now want to use analytics to understand what they did and then optimize it moving forward – as a result there's been more spend recently on leveraging analytics, Lenzsch says.

Case Study:

US independent Hess Corporation has been working on a new way of working called 'Ops of the Future,' explains the company's Senior Data Analyst Yvonne Storlie.

"Basically operations run the business, it's not so much management telling operations what to do, but more every group has their role to play and operations runs the business," she says.

"We're trying to get to a point where we're doing predictive analytics, so we see what might happen before it happens," explains Storlie, who works mainly with the company's subsurface team in North Dakota.

This initiative is still at an early stage within the corporation, which means people have to change their way of thinking, "It's a different way to think, it's going to change the culture and that doesn't happen overnight," she says.

Barriers to Change

Key inhibitors to good data adoption and use in the oil and gas sector remain issues such as corporate silos, distance between data HQ and the field, and lack of leader support and short-termism. Historically, organizational change management has been the major barrier to implementing more digital technology products, services and solutions. This clearly applies to the adoption of AI in the oil and gas sector.

Noting that high tech and telecoms companies are leading AI adopters and have the most ambitious AI investment plans, and that even auto makers are using AI to develop self-driving vehicles, the McKinsey report's authors warned that "laggards will find it harder to catch up."

"AI is not going to allow companies to leapfrog getting the digital basics right. They will have to get the right digital assets and skills in place to be able to effectively deploy AI," McKinsey's report added.

However, the oil and gas business has been an early adopter of many other new technologies and digital products, such as robotics, remote operating centers and wearable technology.

Another inhbitor to adopting new data-driven solutions is the human factor. Many suppliers of data driven solutions say the biggest roadblock or hostile gatekeeper is often an oil company engineer who thinks that he is 'the smartest guy in the room' and doesn't need new technology or improved data management systems.

Many oil company field workers would counter that data-centered technologies, products, services and solutions are often introduced without suppliers understanding or focusing on the work processes they will be used in or explaining the associated behaviours required to make them effective.

Conclusions

With US benchmark crude price averaging less than US$50 per barrel since May 2017, many oil and gas companies are starting to hurt. As second quarter results came in below expectations earlier this year, companies ranging from ConocoPhillips to Sanchez Energy announced big cuts to their previously announced 2017 capital expendurure budgets. That leads to increased competition for a limited amount of capital dollars, both within companies and between competitors.

Some argue that a low price, reduced margin environment is the best time to pursue transformational change aggressively, because implementation costs can be minimized, allowing for enhanced and optimized performance when prices recover.

The extent to which cost cutting will affect data gathering, data management and related technology, tools and services is hard to quantify because different oil companies assign this kind of expenditure to different divisions. In the medium term new digital tools and technologies can replace or supplement human skills, while a short-term reduction in headcount can have a negative impact on the effective collection and management of drilling-related data.

McKinsey & Co's HR-focused article concluded: "The war for traditional technical talent is now less fierce, but the competition for new skills and capabilities has intensified. Most notably, companies seek digital business talent, especially people with industry, leadership, and digital skills who can act as 'translators' between business needs and the providers of digital solutions."

It is thus up to data management solutions providers to argue the case that, for a relatively small spend by industry standards, a whole range of savings and efficiencies can be achieved and production can be optimized. These gains will be achieved in part by reducing incidents and downtime, but also – increasingly – by reducing the human factor and, by implication, human error.

1 *The Future of HR in Oil and Gas*, by Torstein Hagen, Florian Pollner, Christer Tryggestad and Jannik Woxholth. McKinsey&Company, June 2017.

2 *Artificial intelligence: The Next Digital Frontier?* By Jacques Bughin, Eric Hazan, Sree Ramaswamy, Michael Chui, Tera Allas, Peter Dahlström, Nicolaus Henke, and Monica Trench. McKinsey Global Institute, June 2017