DATA EXCELLENCE IN OIL & GAS INDUSTRY

Though oil & gas industry is known as capital and high-risk intensive business because of the complexity, vastness and sheer scale of the industry, it is not surprising that data and related technologies play an integral role in its evolution. While field automation in the past was about acquiring data or information, the focus is now shifting towards making it actionable by providing the information in real time in the right place (remote or localised) and increasingly on a wide variety of devices. The article details on new and emerging technologies in collecting data and real time information to provide contextual information for Oil & Gas workforce to do their job more efficiently and effectively.

The Oil and Gas Industry is amongst one of the few forerunners in collection and transmission of data from computing devices like sensors, control systems and storage and management of data as well has harnessing the power using big data and predictive analytics. This has traditionally helped oil and gas companies improve production and manage performance. With the recent fall in oil price, rapid regulatory change and unending search for natural resources this focus has to only get sharper if the industry wants to lower costs, improve operational efficiency and reduce capital expenditure.

Back in early 2014, when Google first publicised plans to pursue the enterprise opportunity for Glass, it called out two companies already at the forefront of exploring its possibilities[1]. One of those was energy multinational Schlumberger, where a modified version of the device had already been piloted to deliver workflow management tools[2] and real-time intelligence[3] to field workers and real-time performance metrics[4] to managers. It's not merely Glass; almost every emergent technology today has an immediate and exigent, application in the energy sector – be it Industrial Internet (automated remote operations), autonomous vehicles (surveying difficult terrain), unmanned aerial vehicles (inspecting remote installations), cognitive computing (appraising exploration blocks)[5], robotics (pipeline leakage detection)[6], Augmented Reality (visualising complex equipment)[7], nano-technology (self-healing pipelines) or 3D printing (on demand parts replacement in remote locations) to harness data in volume and in detail.

Given the complexity, vastness and sheer scale of the industry it is not surprising that data and related technologies play an integral role in its evolution. To start with, there is the challenge of building efficient operations in some of the remotest places on earth. Then comes the imperative of securing a supply chain transporting a hazardous, increasingly scarce commodity from these exacting environments to the pump on Main Street. Finally, the mandate to do all this without endangering health, safety or the environment[8]. By any measure this is an audacious task. But today's technological possibilities allow us to craft an equally audacious vision with which to accomplish it.

Contextualising the Physical World with Digital Information

Field automation in the past was about acquiring information (e.g. LWD, MWD) but the focus is now shifting towards making it actionable by providing the information in real time in the right place (remote or localised) and increasingly on a wide variety of devices. This shift to the concept of Digital Oil Field has markedly improved drilling efficiency and safety performance. Digital Oil Field helped accelerate the development of integrated asset and production models.

In recent years sensor technology is getting smarter and can capture precise, real-time information about drilling length, penetration rate, pressure, temperature, rock characterisation and other geotechnical data. With thousands of such smart sensors and microprocessors installed in topside, subsea and down-hole equipment capture and synthesise massive volumes of data which once interpreted by operational teams helps them make real time decisions and prevent costly errors. These technologies save millions of dollars in operational costs.

As data and software design become an organic part of the design of physical systems in the energy sector, it creates the foundation for the next layer of innovation. The logical next step should be to create a software platform that empowers an integrated rig-to-retail model of asset management. This unified data flow on secure high speed industrial class networks will form the backbone of the Industrial Internet.

A singular priority towards achieving this goal will be to integrate the digital and physical worlds to provide contextual information for Oil & Gas workforce to do their job more efficiently and effectively.

Streamlining Emergency Response using GIS and Remote Sensing

Oil and gas pipelines have to withstand some of the most punishing natural conditions imaginable e.g in the Arctic or in ultra-Deepwater. Until now it was not possible to instantly detect pipeline damage, let alone rectify it expeditiously. Imagine, for instance, pipeline corrosion damaging a portion of a pipeline in a remote location in Alaska. Sensors embedded in the pipe immediately detect the resultant drop in pressure and automatically transmit the exact coordinates to the closest control center. The center then deploys a surveillance drone that hones in on the affected pipe section to survey and report extent of the actual damage. This input is instantaneously transmitted back to the control center where image recognition software compares them against input received during regular operations to determine the exact point and quantum of damage. This information is then transmitted to the intervention team in the 'collaboration center' as well as to a pipeline expert, who sees them on an iPad application, and recommends an

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appropriate intervention strategy to the concerned team. Automated valves can be activated to cut off supply to the affected part of the pipeline to stem the leak till a task force can be deployed. The surveillance drone continues to collect atmospheric hydrocarbon information and relaying it to the command center until level come to an acceptable level and the task force is then quickly deployed to the affected location to secure the area and repair the damage.

Stretching the scenario further, nano-bots can be constantly monitoring the pipeline looking for corrosion damage and reporting pipeline health on a real time basis to the 'collaboration center' or even proactively repairing it without the need for costly downtime.

Ensuring Equipment Uptime using Analytics, 3D Printing and Augmented Reality

A single component failure in an offshore rig can potentially result in significant losses just from halted production. Imagine now an offshore oil and gas platform that has been in operation, and efficiently so, for an extended period of time. A number of sensors on equipment within the oil and gas platform are constantly transmitting operational data to big data analytics platform, which is also analysing data from many other oil and gas platforms. At a certain point in time, the software forecasts a high probability of compressor breakdown on the oil & gas platform if a particular metal spare part is not substituted. The required component is not readily available onboard the platform but is quickly printed off a 3D printer at the installation's mechanical workshop. A technician then proceeds to replace the component using an Augmented Reality interface built into glasses, which gives him hands-off access to the maintenance procedure workflow, the checks and balances required at each stage and all the relevant digital information required to complete the task. Even as maintenance process is underway, sensor values are being continuously transmitted to experts at an onshore location who are remotely supervising and guiding the technician.

Lean Operations through an Intelligent Central Terminal Control Hub

Imagine 100 fuel distribution terminals spread across continental USA, managed from one Central Control Hub and supplemented by a lean operations team present at each fuel terminal. Using a visualisation platform, personnel at the control hub will be able to monitor and control all entry/exit points, fuel loadings, tank levels and flow rates to optimise output and productivity at each terminal. The hub will also be able to proactively monitor and control all engineering equipment and sensors on tanks, pumps, valves and loading arms. By monitoring stocks at downstream retail sites, the hub will automate and optimise deliveries to those with low stocks.

In Conclusion

A confluence of new and emerging technologies is creating a transformative opportunity for the energy industry. The collective impact will be felt across every aspect of the business – from enhancing asset performance to increasing operational efficiencies to enabling real-time decisions. But to maximise the value realised from these technologies, energy companies have to ensure standardisation of data and real-time flow of information across all upstream and downstream assets and operations and across all key business processes and establish the industrial internet for the industry. Though the sector is awash in data, most of it still remains restricted to process silos. In an increasingly connected world, it will be critical to streamline the flow of data across the enterprise to empower more efficient and agile decision making. The strategic focus should be on gradually evolving into a unified platform model from which to monitor and manage all assets, key operations and performance metrics. Historically speaking, continuously harnessing power from data and produce value needs to be a CEO's agenda and requires sustained focus of leadership. ●

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References:

1) https://plus.google.com/+GoogleGlass/posts/2Vq4oTd1UkE

2) http://www.fastcompany.com/3031171/the-surprising-reason-oil-companies-love-google-glass

3) http://www.fool.com/investing/general/2014/04/13/google-glass-is-appearing-in-some-places-you-would.aspx

4) http://www.fastcompany.com/3031171/the-surprising-reason-oil-companies-love-google-glass

5) http://www.ibmbigdatahub.com/blog/5-ways-iot-technologies-are-enabling-oil-and-gas-industry

6) http://www.nanowerk.com/news2/robotics/newsid=36124.php

7) http://blog.augmentedev.com/augmented-reality-in-the-energy-sector/

8) http://www.dynamiccio.com/2014/08/internet-of-things-building-a-digital-oil-gas-business.php

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