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**4 WAYS BIG DATA  
IS TRANSFORMING  
OIL AND GAS**



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is Transforming  
Oil and Gas



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# INTRO



Chevron calls it the “i-field.” BP has the “Field of the Future” and at Shell it’s the “Smart Field.” Whatever you call it, the digital oil field is a huge opportunity for oil and gas companies.

The digital oil field has been described as a place where “**all the components integrate and communicate as well as your body does.**” A place where computers constantly analyze data sent in by hundreds of sensors to determine conditions of wellheads, pipelines, and systems, and constantly adjust flows to minimize downtime.

Chevron believes a “fully optimized” digital oil field can **boost production rates by 8 percent and result in 6 percent higher overall recovery.** In some ways, big data is actually the new oil. “It’s pretty sweeping,” Paul Siegele, president of the Energy Technology Company at Chevron, **told** MIT Technology Review. “Information technology is enabling us to get more barrels out of each asset.”

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Of course, big data brings along its own challenges. The more data you have, the more you have to store, process, and analyze. For example: BP uses Distributed Acoustic Sensor technology to better understand sand contamination in wells in Azerbaijan; the data from just that project is **already occupying 2 petabytes**, which is about 2,000 times bigger than the average consumer hard drive.

# INTRO



As the cost of sensors goes down, companies are installing more and more, which leads to more data. Further, communication technology to transmit data from the field has improved – now you can look at data via your cell phone or other handheld device.

**“Geoscientists in particular are always looking for more data,”** said Dale Sperrazza, a director of marketing at Landmark Software & Services, a Halliburton subsidiary.

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Big data is being used to improve exploration, pinpoint precise locations of reserves, prevent downtime and/or risks to the environment, and even recruit and train employees.

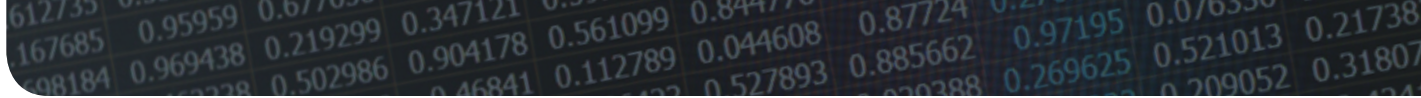
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As long as oil and gas companies can solve the (manageable) challenges of storing and processing big data, they can't go wrong. Big data is being used in the energy industry to improve exploration, pinpoint precise locations of reserves, prevent downtime and/or risks to the environment, and even recruit and train employees.

**IN THIS EBOOK, YOU'LL LEARN**  
how oil and gas companies in all stages  
of production are harnessing big data.

# #1

## EXPLORATION



Drilling a new deep-water well costs more than \$100 million, so nobody wants to be drilling in the wrong place. That’s where data comes in. Shell Oil, for example, is using special sensors to take not a few thousand readings of seismic waves – the distortion of which can be a clue that oil is nearby – but **a million or more**, giving a much more accurate handle on “what lies beneath.”

It’s a lot of data. One raw seismic dataset, according to **Analytics Magazine**, can use hundreds of gigabytes of data – and even more after processing and interpretation. But it is worth it; this data “vastly improves the picture of the Earth’s subsurface, and removes the need to drill a multi-million-dollar hole... to ‘explore’ what is in the rock.”

The push for more accurate exploration is why oil companies like Chevron are heavily investing in imaging technology to create maps of energy deposits thousands of feet below the ocean’s floor. “In this business... whoever images the best wins, because if you see it first, you’re going to get the lease, and if you see it better, you’re going to do a better job of managing the field,” Mark Koelmel, general manager of the earth sciences department at Chevron, told the **Wall Street Journal**.

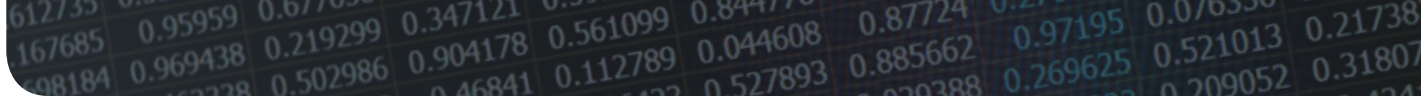
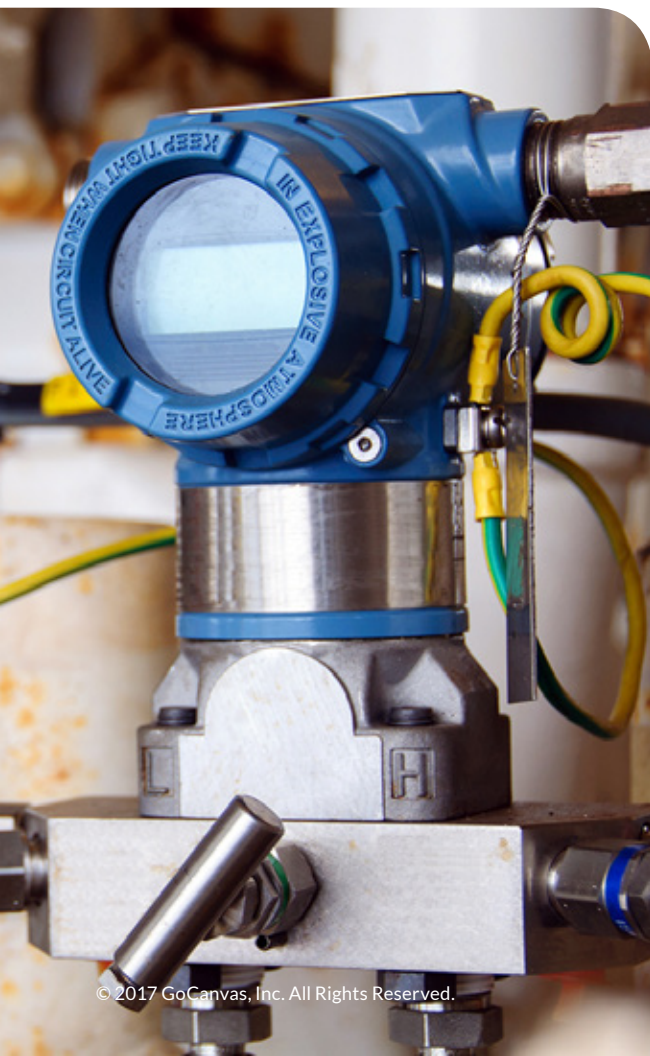
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Further data on weather, soil, and equipment **can help companies predict the success of drilling operations**. Recovery rates can be improved by giving all this data to reservoir engineers in a self-serve format, via their handheld devices.

# #2 MAINTENANCE



Drilling equipment is built to sustain the wear and tear from working in harsh conditions, but that doesn't mean it will last forever. Today, much oil and gas machinery is fitted with sensors that can compare a particular piece of equipment's performance — motion, vibration, current, pressures, temperatures — with the average, meaning that a computer program can flag if something is acting abnormally and needs to be replaced. Or a program can determine how reliable a particular machine is in certain circumstances and predict what conditions cause it to fail more or less often.

Big Data can provide not just historical analysis but predictions for the future. Dale Sperrazza, the marketing director for Landmark Software & Services, says that automation "will be critical to optimizing operations in a safe, efficient manner, particularly in ultra-deepwater exploration. Given the expense of rig day rates, as well as the engineering requirements and need to address safety and efficiency in operations, companies are doing 'whatever they can' to prevent downtime."

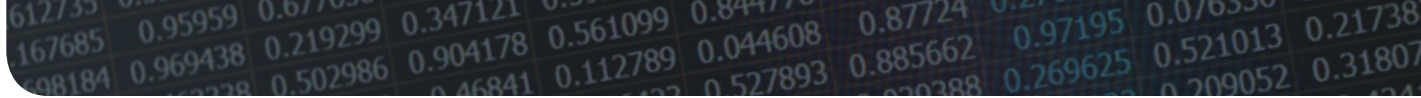
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## Big Data can provide not just historical analysis but predictions for the future.

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Here's an example, courtesy of **Technology Review**: Chevron engineers in Houston monitor analytics from places as far away as Kazakhstan and Colombia. In Chevron's Sanha Field off the coast of southern Africa, the staff noticed a problem with a gas-injection compressor that showed subtle signs of overloading. Once alerted, operators there fixed the problem and avoided a potential loss of millions of dollars in downtime. The analytics have now made it possible for Chevron to develop an automated early detection system based on the symptoms observed at that site.

# #2 MAINTENANCE



**Big data isn't just used to predict equipment blowouts before they happen; the same sensor data can also be used to push equipment to the limit.** If an oil company can safely drill 10 feet faster per minute, that lowers costs and drives profitability, Sperrazza notes.

With data gleaned from sensor technology, maintenance can be more accurately planned in advance. If you know when a machine is expected to fail or need servicing, you can better plan for these events (and even reduce on-hand inventory of spare parts).

Of course, although sensors and remote monitoring are making engineers' jobs a lot easier, equipment often still needs to be inspected in person. Technology can help there, too. Instead of using paper forms and lugging large binders to a remote jobsite, a **mobile form** on a ruggedized tablet can eliminate a lot of the hassles of creating and filing paperwork.

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A digital drilling rig inspection checklist can provide an exhaustive list of conditions and checkpoints to help ensure that blow-out preventers (BOPs) are safe and properly maintained.

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**Digital checklists can make this work easier and more effective.** A **drilling rig inspection checklist**, for example, can provide an exhaustive list of conditions and checkpoints — covering accumulator units, gauges, choke manifolds, and more — to help ensure that blow-out preventers (BOPs) are safe and properly maintained. Or use a mobile form to ensure that your **drill floor area** — covering such aspects as tong lines and IR components — is inspected consistently and thoroughly. All data that is collected is immediately saved to the cloud, and can be accessed in real time.

# #3

## HEALTH, SAFETY, AND ENVIRONMENTAL COMPLIANCE



**Blowouts and spills don't have to be inevitable, and real-time data analysis is going a long way toward keeping the upstream oil industry safer.**

Keeping employees safe and maintaining environmental compliance isn't just the right thing to do, it's also the smart thing from a cost perspective. Most oil and gas firms have between 15 and 25 zero-margin days due to accidents, **according to the Oil & Gas Financial Journal**, resulting in "enormous" losses. As these days mount, so do costs.

But now, sensors can detect drilling anomalies in real-time, helping engineers make decisions faster about whether to shut down if necessary.

As oil and gas production pushes into deeper waters and more untapped frontiers, the risks increase with the unpredictability of the environment. So companies must do everything they can to predict problems *before* they occur.

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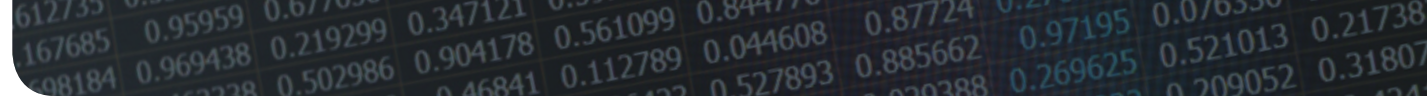
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A few years ago, a Chevron field off the coast of Brazil spewed 3,000 barrels of oil due to an unanticipated pressure spike. The **company was hit with a criminal lawsuit even after a \$150 million settlement**. A Chevron executive **says** that spills like this will become less likely as it implements its i-field program across the company. In addition to sensors monitoring motion, vibration, pressure, etc., data from weather and number of workers on site can be correlated and analyzed to find trends.



# #3

## HEALTH, SAFETY, AND ENVIRONMENTAL COMPLIANCE



Fracking is also an area where big data can help. The practice is under fire from many quarters for its heavy water use and the potential for chemical leakage. But, **according to RigZone**, by analyzing data from underground sensors, oil companies can use less fracking fluid more efficiently, as well as minimize the number of invasive exploratory wellheads.

**Ensuring health and safety compliance will use more and better sensors, but will still require humans to look at the big picture, make inspections, and synthesize information.**

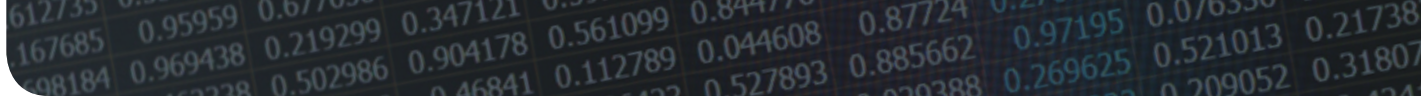
Many components of oil and gas drilling need constant monitoring — either by humans or computers — and mobile technology (in the form of digital forms and **checklists**) helps foster real-time data collection, summarization, analysis, and sharing — leading to better outcomes.

Operators, contractors, and subcontractors in the field can use **mobile forms** to monitor everything from asbestos exposure to naturally occurring radioactive materials, allowing them to create a safety program that will prevent illness and injury and keep oil and gas drilling workers safe.



#4 

IMPROVING EMPLOYEE  
TRAINING AND RETENTION



50% OF ALL GEOPHYSICISTS AND ENGINEERS WILL RETIRE BY 2018.

The global oil and gas industries are facing a “dire” talent shortage, due to strong job growth and the impending retirement of a huge sector of the employee pool. In fact, **Oil and Gas iQ** estimates that 50 percent of all geophysicists and engineers will retire by 2018.

Many coming into the oil and gas workforce are brand new to the industry. **So once an oil company makes a good hire, it wants to get that employee quickly up to speed, then hang on to him/her.**

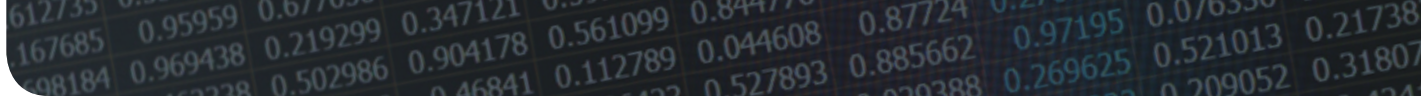
Big data can actually help here as well, by providing more effective employee training — which leads to better retention. A Society of Petroleum Engineers Survey found that 53 percent of oil and gas workers would consider leaving an employer if training wasn’t provided, according to **RigZone**.

Big data can help by providing more effective employee training — which leads to better retention.

First you need to ask: “How well are my new hires prepared to work for us?” You can start by using digital tests and checklists to **monitor an employee’s proficiency**. Then the real power comes in aggregate, when you compile all of your new hires’ responses. Are newbies consistently coming in unprepared in a particular area? What patterns can you discover that will reveal whether your new hires need extra preparation on certain topics?

#4 

IMPROVING EMPLOYEE  
TRAINING AND RETENTION



Thanks to the data gleaned through training offered in digital format, you can also get a handle on how your employees are interacting with the training content you provide. Are they clicking on every page, or are they skipping sections? **Knowing how employees are interacting with a carefully designed training program will help you improve it — and the effectiveness of your employees.**

One oil company may have employees all over the world, so big data also gives you the ability to **combine siloed data to see trends**. “Who are the best employees? Why is their performance so impressive? How can that be emulated elsewhere?”

One Australian company is taking this to the logical extreme. Woodside, an energy firm, has signed on to use IBM’s Watson (the computer software most famous for winning Jeopardy! in 2011). Watson offers a product called “Lessons Learned” that the company **says** will help improve operational processes and include more than 30 years of collective know-how. In other words, all those hacks and tricks stored inside one employee’s brain are now accessible to the whole company, and searchable using natural language.

Of course, another way to improve employee performance is to give them tools that provide safety tips and training **right from their mobile devices**. From there, it’s an easy step to monitor, recognize, and reward employees who use the **apps** the most frequently.

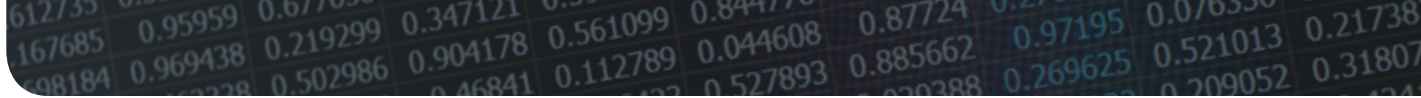
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**LOOKING TO  
THE FUTURE**



The amount of information and intelligence that can be gathered today is already impressive, but collecting data is only going to become easier and easier. With **billions of dollars** spent annually on seismology R&D, sensors will only become smaller and cheaper. With handheld mobile tools making it easier for you to take notes and log information in real-time, the amount of data you can collect will continue to grow. This means that your challenge is not only in collecting data but in making sense of it. As RigZone **says**, oil and gas companies will have to think not “what can we do with this data,” but, “what could be done if the right data were available?”

**Data tells a story** – one that can help with planning, operations, and your company’s bottom line.

Learn how mobile forms can help you collect and analyze data more efficiently in areas from maintenance to health and safety to employee performance and more. Then **sign up for a free trial of Canvas** and convert your paper forms to mobile.

**Get started today.**

*Want more detail about how data and mobile technology can help in the oil and gas industry?*

**DOWNLOAD THESE EBOOKS TODAY:**

- **5 Common Hazards in Oil and Gas Extraction and How to Address them**
- **3 Ways to Make Your Data Work for You**

**GET STARTED TODAY!**

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