

# Profits Possible at Low Oil Prices But Tough Changes Required

Stephen Rassenfoss, *JPT* Emerging Technology Senior Editor

Low oil prices look like something the industry needs to get used to. “This will be with us for a while,” said Rex Tillerson, chairman and chief executive officer (CEO) of ExxonMobil. While prices will swing up at times, he predicted a “difficult price environment for the next couple of years.”

The message was repeated over and over by the speakers at the annual IHS CERAWeek conference in Houston, which attracts executives from around the globe.

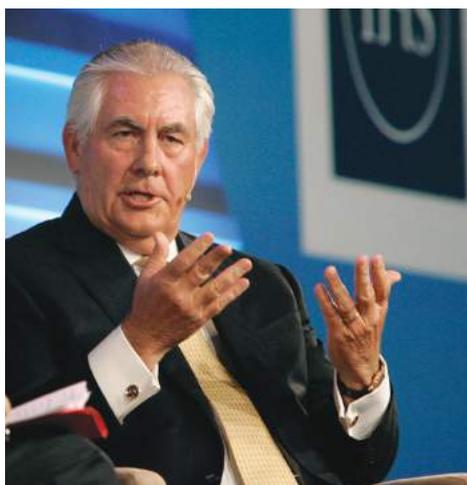
“You have to prepare for USD 60 and less,” said Stephen Chazen, president and CEO of Occidental Petroleum. To adapt to the new environment, “we cut costs by a third. Some projects are going away.”

Companies will need to concentrate on reducing their breakeven costs permanently or “you will have tough times,” said Patrick Pouyanné, CEO and president of the executive committee for Total. For many, tough times are already here, with announced layoffs from the global oil and gas industry surpassing 100,000 by April, according to *The Wall Street Journal*.

The number of drilling rigs working in North America is less than half of what it was at the peak last year, but that does not necessarily mean oil production will decline. Continued low prices led natural gas producers to sharply increase their productivity, allowing them to produce far more with a fraction of the rigs once needed.

“A significant decline in rig activity did not diminish the growth in capacity” in natural gas, Tillerson said. “Will we

Pictures of speakers taken at 2015 CERAWeek. *Courtesy of IHS.*



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chairman and chief  
executive officer,  
ExxonMobil*

see the same phenomenon in tight oil? I do not know, but that is why I believe this is a very resilient industry. I think people will be surprised.”

So far, the measures of drilling efficiency and well productivity in the US oil plays have improved at a rate that followed the path previously traveled by gas producers, he said.

Occidental’s plans for its key holdings in the Permian Basin in west Texas suggests as much. Chazen said that despite the more than 80 years of exploration and production in the enormous basin, “we are on the edge of a revolution in productivity” in the Permian. “We will find better ways to produce them,” he said. Progress over the next decade could add “another 10–20 billion barrels we do not see today” in that basin.

### New Roles

Following the lead of Saudi Arabia, the Organization of the Petroleum Exporting Countries (OPEC) has abandoned its role

as the swing producer in the oil markets. Rather than cutting production to limit price moves, it chose to raise production to defend its market share.

“OPEC is not dead. It will continue to matter, but it is not what it used to be,” said Jim Burkhard, chief researcher, global oil markets and energy scenarios, for IHS. It is no longer balancing the oil market, adjusting the supply as market conditions change.

That led to a discussion of whether the US is now the new swing producer in the global oil market. If so, it is likely to disappoint anyone hoping it will use its influence to stabilize the market and push prices back up. US companies have slashed drilling by 50%, but producers, who pushed production from 4 million B/D to 9 million B/D in 4 years, are not talking about cutting output.

Prices now are too low to expect growth. That led to numerous calls at IHS CERAWeek to lift the US oil export ban. This could relieve the current oversupply

## Inventor Seeking Oil Industry Customers in Search of New Frontiers of Stickiness

Bitumen is so viscous that the ultraheavy crude oil is often compared to peanut butter. Now a startup company has found a coating that prevents even peanut butter from sticking to the sides of a container, and it hopes to do the same for similarly sticky problems in the oil and gas business.

“Our mission is to solve the world’s stickiest problems,” said David Smith, the inventor and chief executive officer of LiquiGlide, during the new technology showcase held during IHS CERAWEEK.

A video of a clear jar filled with crude oil showed how the viscous fluid quickly slid off the treated surface, leaving it virtually clear. The coating could change the industry, he said. It could be used to ensure that pipes flow, instruments do not clog, and metals shed corrosive liquids.

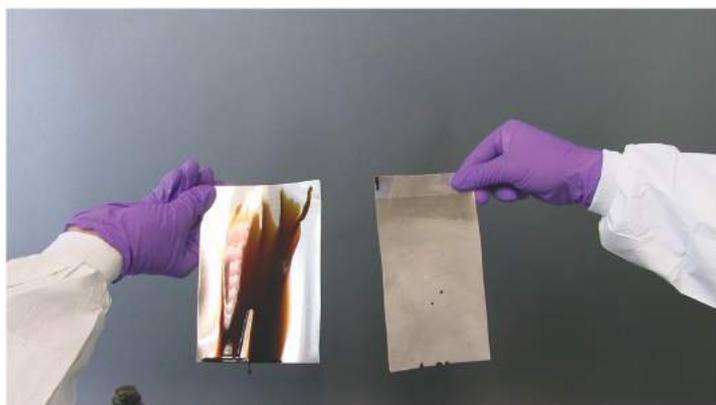
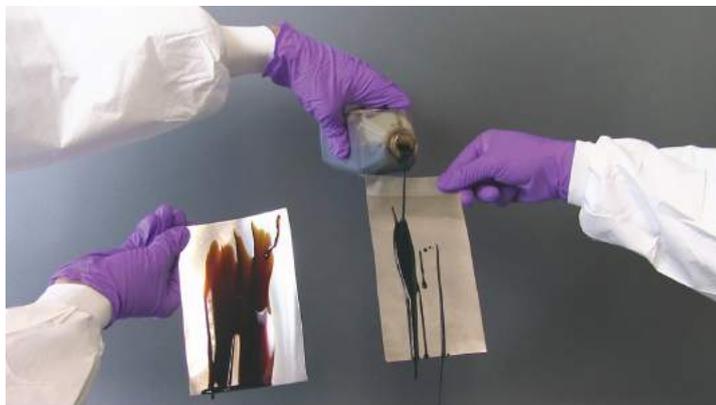
Originally, the researchers were looking for a way to prevent the buildup of methane hydrates that clog pipelines. The company is now looking into problems faced by those in oil transportation and storage and seeking exploration and production opportunities. But it has drawn the most interest from consumer product makers. A deal with the company that makes Elmer’s Glue to keep its sticky product from sticking to bottles was among the early deals for the company now employing 20 people.

Attention-grabbing videos, like the one showing peanut butter rolling around inside a jar like a dry lump of clay, quickly raised the company’s profile. This coating could allow something new: a squeeze bottle for peanut butter that otherwise clogs such containers. When asked about the price, Smith said it was far less than the value added by the spray-on treatment.

There are many potential applications in the oil and gas business. The sticky problems range from asphaltene fouling processing equipment to sludge building up in pipes.

Applying the method in the oil and gas business will be a test of how adaptable and durable these coatings can be. The method combines textured solid with a liquid to create a “liquid-impregnated surface.” The company likens the solid surface to a microscopic sponge, which holds the liquid in place by strong capillary forces.

When asked if the coating could be modified for applications with a longer lifespan than a bottle of peanut butter, and to stand up to harsher chemical mixes, Smith said it can be custom designed drawing from hundreds of materials to work “with almost every liquid,” and also at high temperatures.



**While oil coats a sheet of steel, it slides off one treated with a coating made by LiquiGlide. The startup company is commercializing a technology developed at the Massachusetts Institute of Technology that can be adapted to provide nonstick coating for a wide range of sticky substances.**

## CONFERENCE REVIEW



**“At USD 70 [per bbl] we can grow. At USD 80 we can grow more.”**

*Scott Sheffield,  
chairman and chief  
executive officer,  
Pioneer Natural  
Resources*

of light US crude, which is more than the domestic refineries’ need, and eliminate the large price gap between the value of US crude and the international standard, Brent crude.

The price will not need to rise far to bring back growth. Scott Sheffield, chairman and CEO of Pioneer Natural Resources, said, “At USD 70 we can grow. At USD 80 we can grow more.”

The breakeven price is falling for many companies. “We have seen 20% to 25% reduction in costs in four and a half months,” said Harold Hamm, chairman and CEO of Continental Resources. The company is also producing significantly more of the oil in the ground. “We are now seeing 16% to 20% recovery in the Bakken. It used to be 2%” of the hydrocarbons in the ground.

Another way to reduce costs is to target drilling in the most productive spots. This could significantly improve efficiency because “a relatively small number of wells does the heavy lifting,” said Raoul LeBlanc, managing director of IHS.

A recent IHS study sees early signs that oil producers are getting more selective. In US states with unconventional production, it divided oil-producing counties into three groups based on average production. LeBlanc said the study found that drilling declined more in low-productivity counties. Breakeven price levels for oil producers could be

significantly lowered by targeting the best reservoir rock, reducing service company costs, and improving methods for identifying drilling targets and completing wells.

Drilling fewer wells at carefully selected spots has been a major reason for the big productivity gains of natural gas producers, said Steve Mueller, chairman and CEO of Southwestern Energy, adding, “It is really about the rock.”

Southwestern focuses on finding the best drilling sites and the most productive intervals, targeting layers as narrow as 20 ft in formations hundreds of feet thick, said Bill Way, president and chief operating officer of Southwestern, in a recent investors meeting.

To Mueller’s mind, USD 100/bbl oil was too high. While low gas prices forced tough decisions, higher oil prices allowed operators to drill in marginal areas. As for whether oil can follow the path of gas, Mueller said that is hard to say if the same production gains can be achieved in this ultra-tight rock because “oil molecules are different.”

As the cost of producing oil falls, even a modest rise in prices could quickly increase production by North American producers holding thousands of wells that have been drilled but not completed, LeBlanc said. “The companies that drive the US production system are into growth, growth, growth. The key constraint [on that] is the amount of cash in their pockets,” he said.

While massive layoffs by US companies have been the clearest indication of the pain inflicted by lower prices, oil-producing countries can expect demands by international oil companies seeking better terms because they cannot afford high royalties and fees when oil prices are down, and operators will be expanding the use of cost-cutting methods used in unconventional formations.

“We will apply the lean culture we learned onshore to our offshore business,” said John Hess, CEO of Hess Corp. “Low oil prices will impose more cost discipline.”



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Hess Corp.*

## Software That Learns To Predict Trouble in Machines

Veros Systems is selling simplicity. The electric machine monitoring company promises accurate warnings of problems long before they occur, with a minimum of monitoring equipment to install.

But that minimal presence on site is built from the company's analysis programs that use machine learning, a branch of artificial intelligence, to learn to identify significant changes in the electrical signature of an induction motor, called a waveform, which can be used to predict potential trouble.

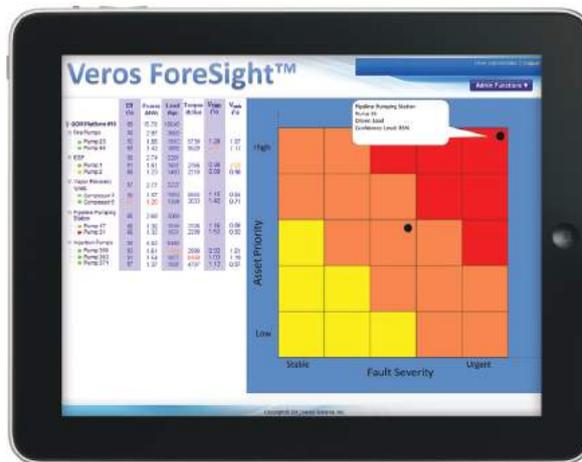
"We connect to the conductors that power motors," said Jim Dechman, president and chief executive officer at Veros Systems. The system "picks up subtle changes" that can be used to analyze how efficiently it is running, how fast a motor is spinning, and the condition of the motor and equipment it is driving.

During a presentation at an IHS CERAWEEK technology forum, he estimated that the market for equipment monitoring may include 50 million motors, pumps, compressors, and fans across many industries. Key early investor support has come from two oil industry giants, Shell and Chevron.

The startup company located in Austin, Texas, is based on the work of Alex Parlos, a professor of mechanical engineering at Texas A&M University. Its history dates back to 2006 when Veros licensed the technology from the university, and its development accelerated in 2013 when it received venture capital funding from two Austin-based funds and Chevron Technology Ventures.

Its challenge is to convince users that it is a lower cost and more reliable option than vibration analysis.

An article written by Parlos points out that tracking and analyzing small and slowly changing variations in electric waveforms—the chart of voltage and current over time—is a reliable indicator of performance. This software can learn to tell if variations in an engine are due to outside factors, such as differences in the plant's power supply, or an indication



This screen displays the results of the equipment monitoring system, Veros ForeSight. The software analyzes an induction motor's waveform, which charts variation in its voltage and current over time, to monitor its condition.

of ball bearing wear. It is attached to a motor relay, which is quicker and less costly than installing vibration sensors inside a device.

Waveform data is fed into a small monitor on site for analysis and is then sent to a user's computer network. The results are displayed on a dashboard offering real-time performance, and the software offers alerts of expected problems, Dechman said.

A customer testimonial on the company's website said the system identified a serious problem in a motor driving a compressor early enough to allow for repairs during a scheduled shutdown. It also accurately advised against heeding warnings from vibration analysis on other machines, which were caused by factors that could be addressed by adjusting their output.

## Financial Support

A factor making this downturn different is that investors are more willing to finance US oil companies, buying billions of dollars of stock and bonds in recent months, Burkhard said. This will help keep companies in business as they work to cut costs and adjust to this lower-price environment.

In the 1980s, there was a mass failure of energy lending banks, and in 2008 the price crash was triggered by the global financial meltdown, sharply limiting financial support. The main

source of funding now is from financial firms rather than bankers.

Growing US influence in oil prices is also expected to mean greater volatility. When Saudi Arabia was committed to stabilizing the market, traders betting on falling oil prices could lose big if Saudi Arabia moved to prop up prices. Now those traders are the ones providing price discipline, and discipline "is not what we think of when we think of financial markets," said Roger Diwan, vice president of financial services at IHS.

The lower-price case is also supported by weak demand from China, which had been the world's swing consumer, absorbing rising oil production in recent years. Growth has slowed in China. It has reported its gross domestic product (GDP) is growing 7% a year, which is down from what it was during booming years and at the minimum that is required to create the jobs needed by its growing workforce. But even that number may overstate the real growth rate.

"China will be lucky to get to 6%," said Nariman Behraves, chief econo-



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chief researcher,  
global oil markets  
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IHS*

mist at IHS. While China recently moved to stimulate bank lending, its options are limited because it has doubled its debt as a percentage of GDP in recent years to an unsustainable level.

“It will take a long time to unwind this debt situation,” he said, adding, “This is a nasty scenario. They can delay it but I do not see how they can avoid it.”

That scenario anticipates a long slowdown for China. But predictions of the future are no more reliable today than they were a year ago when the consensus was for oil to remain at USD 100/bbl.

Burkhard’s job is to consider a range of possibilities. One such scenario, which IHS calls “vertigo,” assumes that a large developing country, such as China, opts for a massive economic stimulation program that causes a short-term spike in oil prices.

A price spike still is possible, because while oil supplies are now high with a lot of oil stored in tanks and tankers, the margin between demand and production is relatively slim, at less than 2 million B/D. But based on recent experience, with a continued moderate global GDP growth rate of 2.5% to 3% and reduced oil production costs, Burkhard said “we could stay at USD 50 or so for a long time.” **JPT**

## Program Offers Turn-by-Turn Directions for Drilling in a Horizontal Well

Directional drillers who navigate the drill bit as it turns from vertical to horizontal are now being offered a computer software with turn-by-turn recommendations like a navigation program in a car. But drilling is far more complicated than just getting from Point A to Point B.

The new offering from Hunt Advanced Drilling Technologies advises the driller on when to turn or slide the drillstring, and the force to apply while drilling. It also is constantly tracking the current position of the drill bit, which can be seen on a 3D display comparing the actual path of the project with the planned one.

Based on about 50 wells drilled for its corporate parent, Hunt Oil, and for customers, the drilling navigator has significantly speeded drilling, said Todd Benson, a vice president for Hunt Advanced Drilling, during a presentation at a new technology showcase at IHS CERAWEEK in Houston.

In side-by-side tests using the same drilling rig crew for similar wells for Hunt, the advisory system reduced drilling time by an average of a day-and-a-half, he said. Just as important, the holes drilled using the advisor ended closer to the planned target and with less tortuosity, which leaves a crooked borehole that can make it difficult to install casing. Ups and downs, known as porpoising, can also trap fluid over time, reducing a well’s output.

“It doesn’t do you any good to drill really fast if you drill away from the target,” Benson said.

Using the advisor program, 80% of the wells drilled were within 5 ft of the target vs. 44% for traditional drillers,

he said. Located on the wellsite, the computer doing the calculations is constantly evaluating millions of options. The program considers the economics of every decision, balancing whether drilling faster now could result in a well that will produce less in the long term.

Wells drilled using the tool show it can narrow the difference in performance of the most skilled and least skilled directional drillers, he said. Like directional drillers, a day rate is charged by Hunt Advanced.

The software offers a shared view of the well for anyone working on the project in the field or in the office.

The dashboard display shows the current position of the drill bit, the angle it is drilling, the mechanical specific energy applied, and the rate of penetration. On the day he was showing the hardware, his pad computer displayed incoming drilling data from west Texas.

Directional drilling efficiency is the product of many adjustments. A computer keeps a record of each move, quickly computing how each decision should extend the hole and comparing how it actually did, and making adjustments as plans change.

One goal of the program is to limit the number of events that can destroy a tool. Convincing directional drillers to try the tool can be hard because they do not want to promote a tool that might someday do what they do. But Benson said that when they find it makes it easier for them to do the constant calculations needed to more efficiently drill a horizontal well, they “do not want to go back.”

# Upbeat Natural Gas Producers Show Value of Low Expectations

Stephen Rassenfoss, *JPT* Emerging Technology Senior Editor

The price declines for oil and natural gas are equally brutal, with roughly a 50% decline for both fuels. But the mood of those working in the gas sector was upbeat at the recent IHS CERAWEEK conference compared with those in oil.

The difference can be credited to the differing expectations. On the oil side, USD 100/bbl crude looked like a sure thing going forward until the price slid to around USD 50/bbl. Those on the gas side experienced a move within a low price range they have been living with for years.

That range roughly runs from a high of USD 5 to a low of USD 2 per MMBtu, which is near the recent price of about USD 2.50, said Dave Pursell, managing director, head of securities at Tudor, Pickering, Holt & Co.

“For the last 5 years, gas prices have been down,” said Steven Mueller, chairman and chief executive officer (CEO) of Southwestern Energy. While he said he would like to see prices rise, “we designed our company around low gas prices.”

The group has hammered down the cost of profitably producing gas and maximized output by targeting the best reservoir rock, most of which is in the Marcellus Shale. The same can be said of the other companies working in formations that mostly produce dry gas.

“Production has not only increased, it has accelerated,” Mueller said. He described the combination of ingredients that led to the surge as a “power function.”

The fortunes of oil and gas diverged in fall 2008. Initially, both oil and gas exploration plunged after the financial crisis led to a recession. While oil recovered in late 2009, setting the stage for the booms in the Bakken, Eagle Ford,



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*Steven Mueller,  
chairman and chief executive  
officer, Southwestern Energy*

and Permian formations, gas prices stayed low.

Both oil and gas drilling reached nearly the same peak when measured by the number of drilling rigs working. The top week for gas was 1,606 working rigs in mid-September 2008, while oil reached 1,601 in September 2014, according to the Baker Hughes weekly rig count totals. Since they hit their peaks, the number of rigs drilling for gas has sunk to 225 in late April while oil has fallen to 701.

While the spotlight shifted to the oil boom, a group of efficiency-driven producers focused on driving down the cost of producing dry gas, particularly in the Marcellus in Pennsylvania and adjoining states in the eastern United States.

During that time, production from these formations played a key role in fueling a national surge in gas demand. Consistently low gas prices have led to chemical plant expansions and to the start of US liquefied natural gas (LNG) exports. And growing supplies, matched by equally large demand increases, dampened the

wide price swings that have long been an argument against gas use.

“What made the difference is production. It is still a supply story,” said Mary Lashley Barcella, director of North American natural gas at IHS. In the past year, she said “gas producers added 6 Bcf/D in the Lower 48. That is astonishing.”

Gas production needs to continue growing at that pace to meet equally rapid growth in demand, which she predicted would rise by about 25 Bcf/D by 2020. More than half of that would come from the rising use of gas in power plants built to produce more power and replace aging generators, many of them coal-burning. By 2020, gas and coal are both expected to represent one-third of US electric generating capacity.

A new group of customers represents nearly one-quarter of expected demand growth: LNG export terminals. The balance of the rising demand will come from industrial users, exports to Mexico by pipelines, and natural gas burned for oil sands production.



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natural gas, IHS

Those added reserves came with two ingredients needed for profitable operations: thick, rich reservoir rock and major markets nearby. “Demand in the US is in the eastern half of the country,” for now, he said. That handicaps those with gas production in distant markets such as western Canada or the Rockies.

A growing number of LNG export terminals concentrated along the US Gulf Coast will create demand for producers in Texas and nearby states. While the first LNG export facility has yet to ship gas, Michael Smith, chairman and CEO of Freeport LNG Development, said projects likely to actually get built could push demand for US gas to 12 Bcf/D.

While 30 company groups are seeking permits to export LNG, he said about seven facilities have a good chance of getting built. Those projects would be enough to make the US one of the world’s leading LNG exporters, and the cost of expanding established facilities is far less than building a new export facility. **JPT**

Southwestern’s annual production has jumped from 195 Bcfe in 2007 to 768 Bcfe last year, including acquisitions. Its finding and development costs dropped from USD 2.70 to USD 1.29 per Mcf, according to a recent company presentation.

Southwestern’s average drilling time per well in the Fayetteville Shale has sunk from 17.6 days to 6.8 days, even though

the average lateral length shown on the chart more than doubled. The company owns drilling rigs and can drill the wells it needs, many with laterals up to 12,000 ft. The company analyzes a lot of data to find ways to become more efficient, which allowed it to rapidly improve its productivity on acreage acquired in Pennsylvania and West Virginia, Mueller said.

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