

THINK ACT

BEYOND MAINSTREAM



November 2016

Lower for much longer

Adam Smith in the Permian

THE BIG

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1. THE INVISIBLE HAND

The US tight oil industry is a near-perfectly competitive system that is poised to see continued cost improvements.

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2. CHAOS IN THE CARTEL

OPEC countries' response to tight oil has been to win based on cost: as a result, members are individually maximizing output.

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3. FACING THE MUSIC

The world has entered a new pattern of oil production that will sustain low oil prices around USD 50 per barrel for the next 5 years.

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In the last 10 years, the emergence of massive US production of shale gas and tight oil has changed the global oil & gas industry.

When OPEC (read: Saudi Arabia) decided to stop managing oil supply in late 2014, one of its motives was to regain market share from US tight oil producers. Has it succeeded? At first glance, it seems it has. OPEC production has consistently risen, while in the US, tight oil capex has been more than halved and production has been declining. However, US producers have proven to be extremely resourceful and innovative. The decline has been slower than expected. Production costs have been compressing rapidly. Overall, the industry is becoming more resilient to lower oil prices. Adam Smith and his "invisible hand" have been at play!

For OPEC, this creates a conundrum. While a higher oil price is required for many countries to balance oil-dependent national budgets, restraining production at this point likely means losing more share to US producers. Increasing production and accepting lower prices may be the only way for OPEC countries to keep US tight oil growth in check and generate enough

national revenues to balance their budgets. It is the combination of continued US tight oil cost improvement, OPEC's incentive to increase production, and strong but stable demand that leads us to believe in a "lower for much longer" scenario with oil prices generally remaining in the USD 45-55 per barrel band for the next 5 years.

Lower for much longer: Adam Smith in the Permian is the latest article in a series on the future oil price environment and its potential impact on the oil and gas value chain, petrochemicals and oilfield equipment and services industries.

TIGHT OIL & PUMPKINS: THE INVISIBLE HAND

Tight oil production in the US is a recent and significant phenomenon. Although negligible in 2009, by 2014 tight oil production reached 5 million barrels per day, doubling US crude oil output, and basically meeting all of global oil demand growth over this time-

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frame. As a young industry, tight oil had a lot of runway for improvement. And improve it did. Fracture designs were perfected. The effectiveness of fracturing pumps and fluids increased. The number of fracturing stages per well grew by 200% between 2009 and 2014. These advances in technology and techniques drove average tight oil production costs (including a return on investment) down from just under USD 100 in 2009 to around USD 80 per barrel in 2014.

When prices fell in 2014, many industry observers were quick to bury the tight oil industry. Tight oil was a "flash in the pan" or the new "subprime crisis" and was not going to survive. Instead, low oil prices have been driving significant productivity and cost improvements, with the industry focusing on the best plays, the best equipment, with the best techniques and most qualified personnel. For example, in July of 2012, less than 40% of US horizontal rigs were of the most automated and efficient AC Drive variety. By July of 2014 this number had climbed to around 45% and notably by August of 2016 this number had accelerated to over 70%. Additionally, the amount of sand proppant used in some wells was multiplied by 5, driving up to 50% increases in initial production rates. The result of these improvements was a fast decrease in the average tight oil production cost to just above USD 50 per barrel.

We expect a continuation of these improvements in the future, even as operators exhaust the best drilling opportunities on their lists and shift to less attractive ones. Why? Our view is that the tight oil patch intrinsically has many attributes of a perfectly competitive market that can drive continued cost improvements. First, oil is a commodity. Second, there are thousands of producers and barriers to entry and exit are low relative to other resources like offshore or oil sands. Mineral rights law in the US makes it easy to access resources and tight oil well development costs are in the range of USD 5-10 million, a fraction of what an offshore well would cost. Finally, tight oil development technology and techniques are widely shared, with tight oil's typically younger, mobile workforce more likely to change jobs frequently and share best practices online than the preceding generations of oil workers. The downturn put this system in a pressure cooker and accelerated the forces of competition, driving significant performance improvements. And we expect these improvements to continue.

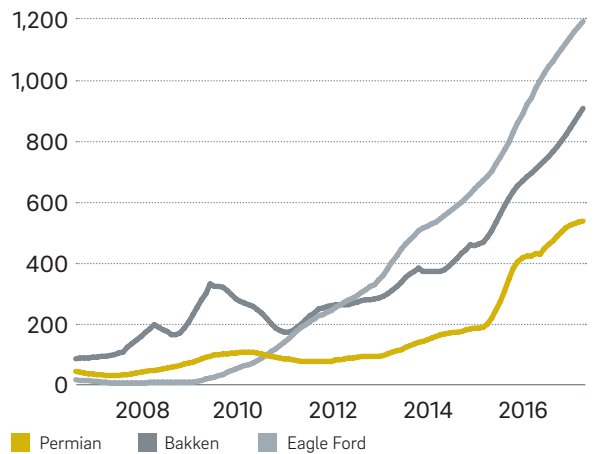
How fast and how far can tight oil economics improve? To answer this question, we often use the example of another patch – the pumpkin patch – with our clients. Growing the world's heaviest pumpkin has long been a key feature of state fairs across America. Despite the efforts of thousands of growers across the US, the weight of the heaviest pumpkin grew slowly from 400

A

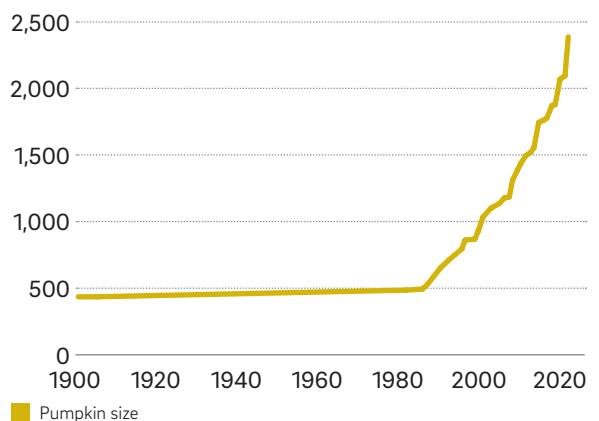
A TALE OF TWO PATCHES: OIL AND PUMPKINS

Performance improvement in tight oil and pumpkin growing experiences acceleration under the forces of perfect competition.

NEW WELL OIL PRODUCTION PER RIG [bbl/d]



LARGEST PUMPKIN GROWN IN THE US [lbs]

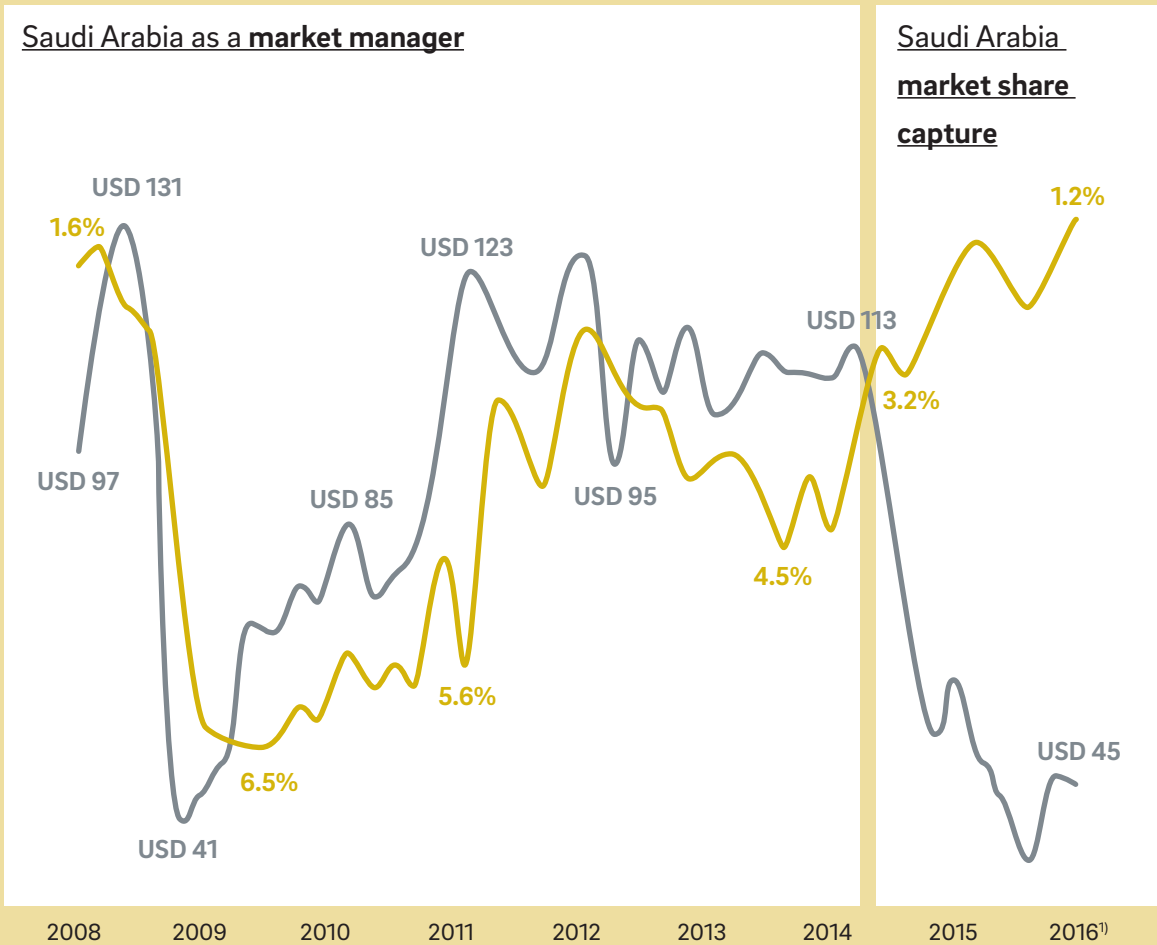


Source: EIA, Giantpumpkin.com, Roland Berger

B

THE OPEC ACCORDION

Until 2014, Saudi Arabia and the other OPEC nations could adjust their spare capacity to manage the market, effectively operating like an accordion. In 2014, OPEC changed strategies and began utilizing capacity regardless of the impact on oil price.



■ OPEC spare capacity [inverted % of global demand] ■ Brent [USD]

1) First nine months

Source: EIA, Schlumberger, Roland Berger

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to almost 500 lbs from the early 1900s until the early 1990s. After that, something radical happened: the pumpkin's weight began to grow almost exponentially each year and by 2014, the largest pumpkin grown weighed well over 2,300 lbs. The spread of Internet access in the US in the 1990s enabled sharing of information and best practices – previously kept private – across a large, competitive community of growers. Amassing these best practices quickly yielded a step change in the pumpkin size. Since 2000, each year's largest pumpkin breaks the prior year's record in this near-perfectly competitive "industry."

The same dynamic is clearly at play in the US tight oil patch: productivity and cost improvements have been accelerating in 2016. Adam Smith is alive and well, in the Permian. → **A**

THE OPEC ACCORDION MEETS ITS MATCH

With the emergence of tight oil, our view is that OPEC can no longer manage oil supply to influence oil prices.

Historically, OPEC could adjust their production on a month-by-month basis to ensure that the last barrel of oil demand was met by high-cost resources, such as offshore deepwater and oil sands. OPEC's supply was essentially acting like an accordion, growing and shrinking as needed to enable the high-cost resources to bid into the market and set the price of oil. This required discipline within the OPEC ranks so that all countries would follow the production quotas set by the cartel in its meetings. Saudi Arabia, whose production represents one third of OPEC, was acting as the clear leader. From 2004 to 2014, this accordion worked near-perfectly, driving higher oil prices as growing demand for oil was met by increasingly costly oil resources. OPEC countries reduced capacity utilization shortly after oil price dips, and increased it in response to high prices. → **B**

With the emergence of significant, highly responsive tight oil resources with rapidly improving costs, the OPEC-Saudi accordion met its match. Less than two months are now required for a tight oil well to go from drilling to production. If OPEC pulls back its production and oil prices increase, many individual US tight oil producers whose wells are profitable at that new price will jump in to fill the supply gap. This will quickly drive prices back to where they were initially. All that OPEC achieves with this strategy is a loss of market share and a decrease in its members' oil revenues. For the majority of OPEC countries who depend on such revenues to bal-

ance national budgets, this new dynamic creates an incentive to individually seek production maximization. Recent events underscore the OPEC conundrum. While OPEC countries recently agreed to production cuts, the agreement is based off the cartel's highest-ever production levels in September. Additionally, Nigeria, Libya, and Iran are exempt from the cuts and plan on increasing production, thereby largely offsetting other OPEC countries' reductions. Effectively, the tight oil accordion has destroyed OPEC's power.

LOWER FOR MUCH LONGER

Improvement in tight oil economics and the breakdown of OPEC will drive abundant oil supply. Combined with strong but stable annual oil demand growth in the range of 1.0-1.4 million barrels per day, this sets the stage for a protracted period of low oil prices. While there has been widespread talk of "lower for longer" oil prices within the oil industry, the general belief is that the barrel of oil will recover to USD 70 by late 2017, driven by insufficient investment to offset the decline of currently producing wells.

We have a different view. Our analysis suggests that continued cost improvements will make many tight oil reserves economic at low prices. By 2021, we estimate that US tight oil production could grow by as much as 5 million barrels per day above today's levels under an oil price of USD 50 per barrel. Apache's recent huge West Texas tight oil discovery confirms that the resource is still young and its potential is enormous. There is also strong potential for increased OPEC supply. Iran is returning to the market and is still well below historical peak levels. Nigeria and Libya seek to restore full production in the near-term after political disruptions took chunks of capacity offline. The United Arab Emirates and Kuwait have announced intentions to ramp up production in the next 5 years.

All of this suggests there will be significant competition for the incremental barrel of oil demand, and points towards a "lower for much longer" oil price environment. While discrete events could lead to temporarily higher prices, the inevitability of the underlying economic trends will eventually prevail and drive prices back down. Only a phenomenal shock to the oil supply or demand systems such as a major Middle East war or a China recession could lead to an enduringly different oil environment. "Lower for much longer" is here and it is time that the industry accepts it. ♦

ABOUT US

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FURTHER READING



OILFIELD EQUIPMENT AND SERVICES WINNERS

2015 was a very challenging year for the oilfield and equipment services industry. Facing a combination of reduced oil & gas activity and price pressures from E&P players, industry players struggled financially – all metrics were in the red. Industry returns were significantly lower than the cost of capital, a worsening of an already unprofitable 2012-2014 period. Though the industry structure did not change significantly, some changes may be expected if the tough environment persists through 2016.



RETOOLING FOR THE "NEW NORMAL" OIL & GAS INDUSTRY ENVIRONMENT

Oilfield equipment and services suppliers should adapt to survive and succeed in the "new normal" future oil industry environment characterized by lower oil prices and higher volatility and cyclicity. Oil & gas operators' needs are changing in this context and our recent study explores four themes that suppliers can embrace to rethink their strategies, operating models, and organizations. Industry leaders who proactively adopted the above four approaches have been performing better than their peers during the downturn.

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