Attractive opportunities for pump sales in upstream oil & gas

The upstream oil & gas industry suffered significant setbacks in 2015 and 2016, following the collapse of crude oil prices that had begun in mid-2014. Last year marked an inflection point in the market, and although far from complete, the much-anticipated recovery can be described as a 'good start', particularly for the North American market. Current projections for 2018 suggest a continuation of this positive trend.

By Matjaž Matošec, Research Manager, Resolute Research

The upstream oil & gas opportunities for pump sales are centered on two prominent applications: wellhead and pipeline, dealing with crude oil & gas production and transport, respectively. These applications are demanding on pumps due to harsh application conditions and the associated need for high reliability, performance and safety.

To address these conditions, petroleum-industry pumps are governed by a body of stringent design and performance standards. The most prevalent pump standard, published by the American Petroleum Institute, is API 610, which addresses the widely used end-suction centrifugal pumps. A similar standard, published by the International Standards Organization, is ISO 13709. Other standards include API 685 for sealless magnetic-drive pumps (MDPs) and canned-motor pumps (CMPs), API 620 for high-pressure and cryogenic pumps, and API 674 for positive displacement reciprocating pumps, to name just a few.

Sucker-rod pumps, colloquially referred to as 'nodding donkeys', are among the most common means of artificial lift for oil wells, particularly in North America where they are familiar to any road traveler. Photo © marrakeshh – stock.adobe.com.

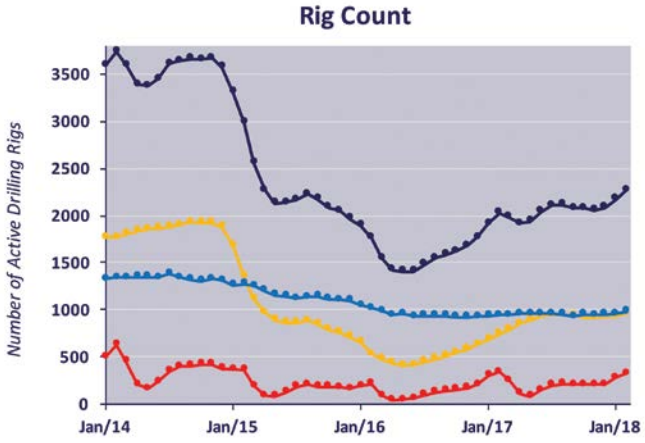


Chart 1. *In 2017, North America (U.S. and Canada) recorded a higher rise in the number of active drilling rigs (+444) than the entire world combined (+436). Excluding North America, worldwide rig count thus recorded a negative trend compared to 2016. The only other world region witnessing a rise in the number of active drilling rigs in 2017 was Asia-Pacific (+14). The rig count figures for the first two months of 2018 show not only continued rise in rig activity in North America, but also a modest uptick in the rest of the world. It is also worth observing that 2017 marked a year in which, for the first time since February 2015, rig activity in North America briefly surpassed that of the rest of the world (in September 2017). Source: Baker Hughes Worldwide Rig Count, and Resolute Research Analysis.*

Wellhead applications

Opportunities for wellhead applications are broadly projected based on the Baker Hughes Rig Count, which provides a leading metric for the upstream oil & gas industry. This metric turned positive in 2017 and in the early months of 2018, although almost exclusively in North America (see Chart 1).

Wellhead pumps are required in a range of applications, some during the drilling phase and others after the start of production.

Piston pumps (drilling phase)

A pump that has gotten quite a lot of ink over the past five to ten years, especially in North America, is the so-called 'fracking pump'. These pumps are positive displacement three-piston or five-piston (triplex or quintuplex) reciprocating types capable of developing

extreme pressures required to fracture shale formations to release entrapped oil and gas. They are a critical factor for unconventional wells with horizontal drilling. These pumps are also used at the wellhead for mud pumping, cement pumping and acid injection during the drilling phase. Smaller-size triplex pumps are often used for power washing, as well. The large fracking pumps are usually trailer-mounted and driven by large diesel engines. The duty is extremely demanding, and the pumps require nearly constant refurbishment at intervals of several months or less to replace critical components. In boom times, these pumps are big business, amounting to multiple hundreds of millions of dollars per year (collectively) for the relatively few suppliers. In down times, the opposite is true, and the market may be saturated with aftermarket sales of idled equipment.

Artificial lift pumps (production phase)

After a well has been drilled and completed, there is still a requirement for pumps of various types throughout the production lifetime of the well.

In many cases, it is necessary to 'refrack' a well by bringing back the mobile fracking truck at a certain interval after production has commenced. This may be required to keep product flowing at a profitable rate. Well-production drop-off profiles are the subject of ongoing and intensive study for fracked wells to optimize payback in a highly competitive environment.

Another prominent wellhead pumping application relates to artificial lift. Artificial lift provides a means to assist oil and gas extraction for well fields that do not provide sufficient natural pressure for the free-flow of product to the surface, or for older wells operating in partially depleted, low-pressure fields.

Although not all oil wells require pumps for artificial lift, the majority do, particularly in North America and especially later in the life-cycle of the well. In some regions, such as the Middle East, it may be more cost-efficient simply to move on to a new well, but that is changing. There are multiple types of artificial lift pumps, with the major ones being described below.

Possibly the most visibly prominent type of pump, at least in North America, is the sucker-rod positive displacement pump. Sometimes colloquially referred to as 'nodding donkey', it is familiar to any road traveler in the United States.

Another type, the centrifugal electric submersible pump (ESP), is growing in popularity, especially for subsea applications.

Other pumping systems include plunger lift systems, in which a plunger is lowered and then raised in the wellbore to bring product to the surface, and hydraulic pumping systems, in which a piston pump is lowered into the wellbore to provide hydraulic pressure for efficient lifting of product to the surface. Progressing cavity pumps (PCP) are becoming increasingly popular as well for artificial lifting because of their capacity to handle multi-phase liquids common to upstream oil & gas.

And finally, there is an additional system called a gas-lift system where high-pressure gas is injected into the fluid column to lower the density of the product and allow the natural reservoir pressure to bring the mixed oil, water and gas to the surface.

The specific pumping technology employed reflects consideration of cost, the characteristics of the reservoir and the characteristics of the product, including viscosity, gas content, water content, sand and gravel content and other factors.

The market for artificial lift systems is substantial and much larger than the already sizeable pressure-pumping (fracking) market. The market value for artificial lift systems is estimated to be considerably above $10 billion per year in boom times, but significantly lower in recessionary times. However, even in a down-market environment, there is still a demand for artificial lift pumps because they provide a more cost-effective alternative to drilling new wells.

Other wellhead pumps (production phase)

There are other wellhead pumping applications employed throughout the lifecycle of the well, such as downhole pumping of various chemicals for enhanced oil recovery (EOR). Chemicals may include diluents to lower the viscosity of the oil, antiscalants to prevent plating out of deposits on pipes and valves, anti-bacterial and anti-corrosion agents and mono-ethylene glycol (MEG). MEG injection is often accomplished using smaller sizes of triplex piston pumps to deliver the chemical at high pressure into the wellbore. MEG injection is instrumental in preventing the formation of hydrates (icing up) in the wellbore, particularly in subsea applications.

Pipeline applications

Pipeline and associated storage tank pumps are used in various applications including, but not limited to, pipeline charging pumps, pipeline booster station pumps, storage tank pumps, tank stripping pumps, equipment lubrication pumps and chemical injection pumps.

Storage tank pumps

Crude oil is generally gathered and stored in tanks, prior to launching into a pipeline system on the way to the refinery for distillation into various products including gasoline, diesel fuel, heating oil, aviation fuel and others. The temporary storage tanks are situated at the well site in groups of two or three tanks for crude

Crude oil and produced water storage tanks at well site. Photo © Resolute Research.

oil and produced water. These tanks may be serviced by gathering pipelines leading away from the wellsite or by periodic visits of tank trucks to remove the crude oil and produced water for over-the-road transport to a central storage facility or to the refinery. Pumps are generally small centrifugals in flange sizes of 2" to 4". Pumps located on board tanker vehicles may be positive displacement rotary vane pumps.

The other tank storage facilities of interest are the larger station batteries that may include dozens of tanks for collection of the output of numerous wells located in the immediate area. These tanks are the intermediate stop in the transport of the crude oil prior to launching into a major pipeline system leading to a refinery. The station batteries include tank loading and unloading pumps (transfer pumps), stripping pumps and pipeline charging pumps. These pumps are mostly centrifugal pumps, but may also be positive displacement vane pumps, progressing cavity pumps or screw pumps for high-viscosity product and tank-stripping applications.

Pipeline pumps

Pumps located along pipelines are typically found in pumping stations for crude pipelines and in compressor stations for gas pipelines. Compressor and pumping stations are generally installed at intervals of 50 miles along the pipeline, but this may vary depending on terrain.

Pipelines may operate at various pressures, but transmission gas pipelines are generally in the 1,000–1,500 psi range and oil pipelines in the 500–800 psi range. The pumping and compressor stations are designed to restore line pressures after pressure loss due to normal flow resistance through the pipe, valves, angles and other restrictions to flow. These pumps (for oil pipelines) are generally large-size centrifugal pumps for servicing high-flow transmission pipelines ranging from 20" up to 40" or larger. Pumps in gas compressor stations are mostly for chemical injections or oil lubrication. In the case of gas pipelines, reciprocating or rotary compressors (not pumps) provide the pressure boosting.

Pumping stations typically include banks of multiple multi-stage centrifugal pumps installed in parallel to handle variable pipeline loading. Drives for the pumps include diesel or gas-powered engines that require additional pumps for oil and cooling-water circulation. Engine-driven centrifugal pumps are also installed for fire protection. Smaller booster pumps may also be present for launching additional oil into the main pipeline from storage tanks located in the station.

In addition to these pumps, gas compressor stations will include pumps for tri-ethylene glycol (TEG) injection for dehydration (water removal) from raw gas and pipeline gas. These pumps may be gear, single piston or triplex plunger pumps.

Monoethanolamine (MEA) pumps are also used for treatment of sour gas and removal of hydrogen sulfide (H_2S) and CO_2. These pumps are associated with gas plants providing the necessary cleanup prior to feeding pipeline-quality gas into the pipeline system. Pumps are also required for handling natural gas liquids (NGLs) extracted from gas-processing operations. NGLs provide an important feedstock for refineries.

Currently, the greatest pipeline construction activity is in pipeline sizes of 22" and larger, and highly leveraged for gas pipelines. While also reflective of upstream crude oil and gas pipelines, this analysis does not address downstream distribution pipelines for refined products, which provide additional markets for pipeline pumps.

Pipeline construction in North America

According to the P&GJ's 2017 Worldwide Pipeline Construction Report, 83,802 miles of pipelines were planned and under construction worldwide at the beginning of 2017, with North America accounting for 31,814 miles, or 38%, of new and planned pipelines. In its February Oil Market Report, the International Energy Agency (IEA) forecasted that U.S. crude oil output will soon surpass that of Saudi Arabia and, by the end of this year, might also overtake Russia, which would make the U.S. the world's largest oil producer. As North American oil & gas production continues to rise, Canadian crude exports are on the verge of exceeding the country's pipeline and rail capacity, which is likely to further speed up pipeline construction. These are only some of many factors that make North America a world region of largest opportunity for pipeline expansion.

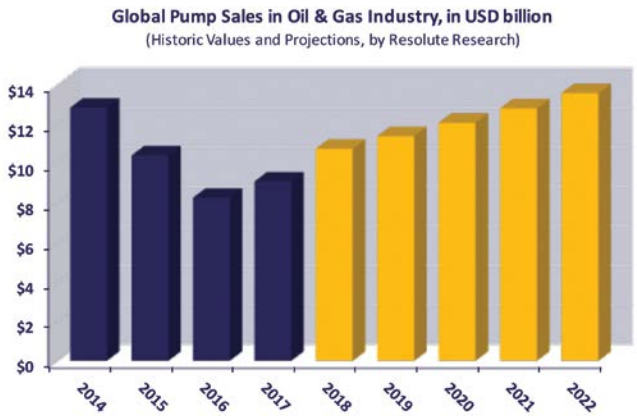
Specific geographic opportunities

The aphorism 'a rising tide lifts all boats' may well apply to oil & gas markets, but the rise is not necessarily identical in all geographic regions. A case in point is the upstream oil & gas industry in 2017, where the upturn was most pronounced in North America. This is reflected both in the number of active rigs and in new oil & gas pipeline construction.

The exceptional activity in North America (particularly in the United States) was driven by new wellhead and pipeline requirements. These requirements are related to new wells, plus previously drilled and capped gas and oil wells in the Permian Basin and the Marcellus and Bakken regions. A relaxation of legislative restrictions on pipelines and the oil & gas industry in general further assisted the recovery in the United States. Increasing demand for natural gas in Mexico has also stimulated pipeline construction from the United States into Mexico, and within Mexico itself, over the past several years and into 2017.

This trend is expected to continue through 2020 in the U.S., Canada and Mexico, as well as to pick up in other world regions including Asia (particularly China and India), the Middle East and Northern and Eastern Europe.

Prime movers driving this market expansion include the continuation of gas and oil shale development in the United States, continued movement of Russian oil & gas into the China markets and continued activities in Europe aimed at decreasing the current dependency of Europe on Russian gas. Broader use of LNG in various world regions is also driving the expansion of LNG liquefaction and regasification plants, along with the necessary gas pipeline infrastructure to and from those facilities.



On the way up. After a period of decline, pump sales in the oil & gas industry are bouncing back.

"Global industrial pump sales growth in 2017 was 9.7 %."

(Source: Resolute Research Pump Product Database)

Opportunities summary

Most of the sales revenue figures as reported by pump manufacturers are now in for 2017, and considerable progress in recouping some of the earlier losses is evident. The latest estimate from Resolute Research indicates an approximate 9.7% increase in global industrial pump sales over 2016, which is certainly good news for the pump industry following the disappointments in 2015 and 2016.

The gains in pump sales specifically in oil & gas in North America have been substantially higher than that, reflecting the market drivers discussed above. It is projected that a similar upward trend will be seen in 2018, including a broader distribution of the gains to other world regions.

Applications likely to see the greatest gains include artificial lift pumps (particularly electric submersible pumps), chemical pumps for MEG, TEG and MEA and water pumps for handling and treatment of produced water and return fracking water. These pumps are required for well optimization and for improved environmental protection.

About the Author

Matjaž Matošec is Research Manager at Resolute Research where he leads a dynamic team of market analysts. Resolute Research is a market research specialist providing global clients with world-class market intelligence on flow control equipment used in the process industries, in the form of market reports, databases and custom research. Collectively, Resolute Research possesses decades of experience in providing consulting services to professionals working in the flow control industry. For more information, you can contact Matjaž at m.matosec@resoluteresearch.com or visit www.resoluteresearch.com.