

Helium: A market update

By Phil Kornbluth

As has typically been the case, the helium business continues to be one of the more interesting sectors of the industrial gas business. Whether it is due to interesting applications like MRI or optical fibre manufacturing, sourcing projects in far flung parts of the world, sharp swings from shortage to over-supply or the influence of politics in the US, it seems like there is always a lot going on in the helium world – and 2015 has been no exception.

In this article, I will focus on four aspects of the helium business that I think have been particularly interesting this year: helium market conditions; new source development; the recent US Bureau of Land Management's (BLM) crude helium auction; and the increased interest in developing small fields of previously uneconomic helium-bearing gas.

Helium market conditions

After three years of severe shortage during the 2011-2013 period (Helium Shortage 2.0), global helium markets are now well into their second year of significant over-supply. By now, almost everyone who has any connection to the helium business is familiar with the basic story; the grinding shortage was caused by curtailed production of helium from the helium refining facilities tied to the BLM Pipeline, that were subject to the allocation of crude helium deliveries by the BLM for an extended period, as well as a series of significant outages at other sources and the delayed start-up of new sources.

The shortage finally came to an end early in 2014 when new supply came into the market from several sources, most notably the Qatar II plant, which added roughly 1.3 billion scf (standard cubic feet) to global supply, an expansion of the Skikda, Algeria source and a new Gazprom liquefier in Orenburg, Russia (pictured). Shortage quickly turned to

over-supply due to the roughly 25% increment to world capacity, demand destruction that took place during the shortage period, sluggish post-shortage demand for helium, and a relative lack of major maintenance outages throughout the industry in 2014 and 2015.

The magnitude of demand destruction seemed to catch many industry participants by surprise as the prevailing view was that demand for helium would quickly recover when the shortage abated. However, that was not the case, as the three-year period of scarce supply and the sharply higher prices that resulted drove helium users to become more efficient in their helium consumption, to substitute other gases for helium (where feasible), and to invest in recycling. Some sectors of the market, such as the packaged gas segment in the US, may have lost as much as much 20% of demand – and demand destruction at the global level may have been as high as 10%.

Demand growth coming out of the shortage has also disappointed industry participants, as the dearth of significant new helium applications, combined with sluggish manufacturing growth around the world and residual 'conservation momentum' have made it difficult to find growth in the market.

Helium suppliers have struggled to deal with the excess supply, as most helium is purchased at the source under Take-or-Pay contracts which require the buyer to pay for the helium even if they are unable to take delivery. Given the inability to store very large quantities of helium in purified form, these Take-or-Pay obligations have put some helium suppliers under extreme duress. Not surprisingly, after several years of sharp price increases during the shortage, helium prices have begun to moderate, especially in those markets that are most easily supplied by helium from Qatar.

The big question on many market



participants' minds is – when will helium supply and demand come back into balance, bringing the period of oversupply to an end? Answering this question requires careful consideration of a number of factors and assumptions.

- At what rate will helium demand grow?
- How quickly will capacity tied to the BLM Pipeline decline due to depletion of the US Federal Reserve?
- Will there be any significant plant outages?
- When will new sources enter the market?
- What steps will the Helium Refiners (Air Products, Linde, Praxair and Badger Midstream) or other suppliers take to curtail production?

The author's view is that the industry is going to continue to experience over-supply at least through much of 2016, or roughly another year. I do not foresee a near term spike in demand or any new applications that are significant enough to 'move the needle' for global demand. However, there are some encouraging

signs on the production side of the equation, as helium refiners have actually shutdown some of their production to temporarily remove supply from the market, and one or more of the major suppliers have taken the unprecedented and radical step of importing bulk liquid helium into the US from Qatar and injecting it into the BLM Pipeline and Storage System for future use. While doing this would be very costly, it is a better alternative than paying Take-or-Pay penalties and would temporarily remove supply from the market.

Another encouraging sign is that ExxonMobil, who operates the world's largest helium plant in Shute Creek, Wyoming (US), has informed its customers that it will be taking a significant maintenance outage during the July-September 2016 period. The lack of scheduled maintenance outages at ExxonMobil's plant in both 2014 and 2015, which was heretofore an annual event, has exacerbated the over-supply.

With only modest new capacity expected to enter the market before Qatar III in 2018, these actions and events may

curtail supply sufficiently to bring helium markets back into a more balanced state by late 2016. *But the author would like to remind the readers of this article that his experience over 33 years in the helium business has taught him that forecasting future market conditions tends to be a very humbling experience.*

New source developments

Despite the current over-supply in the market, and the fact that some market participants have had a great deal of difficulty coping with their Take-or-Pay commitments, there continues to be a lot of interest in the development of new sources. There are several factors that could explain what might appear to be irrational behaviour at first glance.

The helium refiners, who still have significant capacity dependent on the operation of the BLM Pipeline and Storage System could be taking a long-term view to the time when crude helium from the Federal Reserve will only be available for supply to US government users. The refiners need to replace the portion of their current capacity that

will be lost sometime during the 2020-2025 period. There are also factors that encourage the development of new North American capacity. With the US still the world's largest helium market, domestic supply in decline, and much of the new supply coming from countries that could be subject to political risk, there is significant incentive to develop new US or Canadian supply.

Some of the noteworthy recent developments include the following:

- Air Products commenced production from its new Doe Canyon plant located in Colorado, US earlier this year. This plant is expected to produce 230 million scf per year of bulk liquid helium extracted from a stream of carbon dioxide (CO₂) that is utilised for enhanced oil recovery (EOR). This is a first-ever example of helium extraction from a stream of naturally occurring CO₂.
- RasGas has announced that Air Products will supply the helium plant and purchase all of the liquid helium output from the Qatar III plant that is expected to produce 425 million scf per year commencing in 2018. After missing out on direct participation in both Qatar I and Qatar II, Air Products' more aggressive approach resulted in an important win at Qatar III.
- APMTG Helium LLC's Big Piney, Wyoming, project remains on hold due to problems with Denbury Resources' natural gas processing plant that will be providing the feedgas for the helium plant. The Big Piney Plant is expected to produce 200 million scf per year of liquid helium that will be shared between Air Products and the MATHESON subsidiary of Taiyo Nippon Sanso (TNSC). The latest estimate is that helium production may restart in mid-2016.
- Praxair has announced a tolling agreement with Castleton Commodities International (CCI) which includes plans to restart CCI's 160 million scf per year Moab, Utah helium refining facility which has been idle for several years

► due to a lack of feedgas. It is believed that Praxair will be taking delivery of most or all of the liquid helium output from this plant. The feedgas for the plant will be coming from nearby fields that are extracting helium from helium-bearing natural gas fields that were not economically viable until helium prices increased during the 2011-2013 shortage. Most of the crude helium feedgas for the Moab Plant will be transported to the plant via tube trailer. Helium production from the Moab Plant is expected to commence in 2016.

- QEP Resources has gone public with plans to develop a 700 million scf per year helium plant in the Dry Piney Creek area located in southwestern Wyoming. While QEP Resources is preliminarily targeting a third quarter (Q3) 2019 start-up, there is speculation that the timing of this project could be delayed due to lead time required to obtain environmental approvals as well as the impact of low oil prices, which could affect the demand for CO₂ (used for EOR) produced by this project.

- Last, but certainly not least, is Gazprom's huge project to produce helium at the Amur Natural Gas Processing Plant which is under construction in the Amur Region of Siberia, relatively close to the Russian border with China. This project is an offshoot of the well-publicised agreement between Russia and China, where Russia will supply huge quantities of natural gas from the Chyanda and Kovykta fields under a 30-year agreement with China. Helium production is expected to commence by early 2021, with capacity increasing in stages to 2.28 billion scf per year, eventually making this the world's largest source of helium. Potential helium production from this project could reach as high as 7.7 billion scf per year. However, unless the world's demand for helium increases dramatically from current levels, it is hard to conceive that helium production from the Amur facility will ever approach that level and more likely that much of the helium extracted from this

gas will be reinjected into the natural gas fields, or a dedicated underground storage facility, and stored for the future. Linde has been appointed by Gazprom as the technology provider for the plant.

Whether or not all of these projects come to fruition and the timing of when the new capacity reaches the market will have a great deal of impact on future market conditions.

BLM's crude helium sale

The US Bureau of Land Management (BLM) conducted its FY 2016 crude helium auction on 26th August 2015 in Amarillo, Texas, the BLM's second crude helium auction since the passage of The Helium Stewardship Act (HSA) of 2013. The BLM offered 300 million scf of crude helium for sale in 18 separate lots, with eight lots of 25 million scf, five lots of 15

million scf, and five lots of 5 million scf.

Many people were surprised by the average sale price of \$103.80/MCF that resulted from the auction, since the average sale price in the FY 2015 sale was 55% higher at \$161.32/MCF. However, the result of the FY 2016 auction was actually quite reasonable after a close examination of the differences between the BLM's ground rules for the two auctions.

By far the most important factor that contributed to the lower pricing was the BLM's announcement prior to the FY 2016 auction that the weighted average price resulting from the auction would be the primary factor in establishing the BLM's Posted Price for crude helium for FY 2016. This contrasts with the FY 2015 auction, where the auction results had little, if any, impact on setting the BLM's Posted Price. The BLM's Posted Price is the helium industry's primary benchmark for indexation of prices in the majority

of all wholesale transactions for the sale of bulk liquid and crude helium, and is an indirect factor in the price indexation in many other helium sales transactions. Over three billion scf per year of bulk liquid helium sales and well over one billion scf of crude helium sales per year, affecting all of the major players in the helium industry, are directly indexed to the BLM's Posted Price. This means that changes to the BLM's Posted Price have a very large impact on global helium costs and pricing. Given the new linkage between the BLM's Posted Price and the auction results, the auction participants had a significant disincentive to bid aggressively which was not the case at the time of the previous auction.

A second, less important factor in the lower pricing that resulted from the FY 2016 auction was the BLM's reinstatement of what it refers to as its Non-Allocated Sale of crude helium, after eliminating it at the time of the previous auction. While the majority of crude helium sold by the BLM has historically been allocated for sale to the helium refiners at the BLM's Posted Price (Allocated Sale), a smaller portion had been set aside for sale to non-refiners (everyone who is not a refiner) in the years leading up to the FY 2015 auction. The BLM eliminated the Non-Allocated Sale for FY 2015, which meant that the only practical way for a non-refiner to acquire crude helium from the BLM was via the auction. After the FY 2015 auction was dominated by two of the large refiners, Air Products and Praxair, leading to protests by some of the unsuccessful auction participants, the BLM decided to reinstitute the Non-Allocated Sale for FY 2016. This reduced pressure on the non-refiners to bid aggressively at the auction, since they knew that they had a fall-back option to participate in the Non-Allocated Sale and purchase crude helium for the BLM's Posted Price.

A third technical factor in the auction result was that the BLM set the auction reserve price (minimum bid price) at \$100 per thousand scf (MCF), or \$6/MCF below the previous BLM Posted Price of \$106/MCF. The author's opinion is that this was a tactical error by the BLM,

► since it most likely reduced the auction pricing (and the new BLM Posted Price) by approximately \$6/MCF. Since the BLM had a total of 900 million scf of crude helium for sale between the auction, the Allocated Sale and the Non-Allocated Sale, the \$6/MCF difference resulted in an estimated \$5.4m cost subsidy to the industrial gas industry courtesy of American taxpayers. Given the indexation of helium contracts to the BLM’s Posted Price, this \$6/MCF difference lowered costs and prices throughout the helium supply chain.

The fourth and final factor that I will mention is that due to the current over-supply of helium, the helium refining facilities tied to the BLM Pipeline and Storage System are operating at greatly reduced levels and the helium refiners had a less urgent need to purchase all of the crude helium that the BLM offered for sale. What conclusions should be drawn from all of this rather technical discussion? Simply, that the rules that the BLM set for the FY 2016 auction had far more to do with the 35.7% drop in the crude helium sales price than helium market conditions.

Small field development

One area of the helium business that has seen a sharp increase in activity, despite the current over-supply, is the recovery of helium from relatively small fields of helium bearing gas in North America that were previously uneconomic due to low concentrations of hydrocarbons. In most cases, helium will be the only commercial product from these projects.

Interest in developing these fields has been driven by the high prices for helium that resulted from the 2011-2013 shortage, the decline of the US Federal Reserve of crude helium, the refiners’ desire to secure crude helium feedgas to extend the life of existing plants, and the desire to replace depleting North American production.

At present, there are a handful of companies participating in this part of the helium business, with the greatest activity in the southwestern US (Arizona, New Mexico, Utah, Colorado), the US mid-continent area (Kansas, Oklahoma)

Summary of BLM FY 2016 Crude Helium Auction Results
Source: Kornbluth Helium Consulting, LLC


Company	Volume Purchased (MMCF)	Average Price (\$/MCF)	Total \$'s
Air Products	125	\$103.00	\$12,875,000
Praxair	90	\$104.06	\$9,365,000
Air Liquide	30	\$105.33	\$12,875,000
MATHESON	15	\$103.00	\$12,875,000
IACX Energy	15	\$105.00	\$12,875,000
Total	275	\$103.80	\$28,545,000

1 x 25 MMCF lot was unsold.

and the southern Saskatchewan, northern Montana area. Activity in the southwestern US has been spurred by very high helium concentrations that can exceed 5% in some fields, and the existence of Castleton Commodities aforementioned idle liquefier in Moab, Utah that can provide a ready market for crude helium. Likewise, production in the US mid-continent area can be sold as either crude helium for the helium refining facilities tied to the BLM Pipeline, or as balloon-grade helium to gas and welding or balloon gas distributors. In southern Saskatchewan and northern Montana, helium concentrations are not as high (typically +/-1%) and there is no liquefier in the vicinity, so commercialisation may prove more challenging.

Helium is typically recovered from these fields using either PSA technology or a combination of membrane and PSA purification for fields with relatively lower helium concentrations. The early leader in this space has been IACX Energy, based in Dallas, Texas. IACX already has five plants in operation in Arizona, Colorado, Kansas and Utah producing 98% pure helium that it is selling as either crude or balloon-grade helium. The company has several other projects in the works and, interestingly, has announced plans to tie its Otis, Kansas plant into the BLM Pipeline and become a new ‘mini-refiner’. IACX plans to produce high purity helium from the Otis Plant beginning in Q2 2016. Other participants include:

- Nacogdoches Oil & Gas, using IACX plants to produce up to 100 million scf per year of helium that will be sold to Praxair for processing at Moab.
- The Weil Group, building a 10 million scf per day (inlet capacity) plant in Mankota, Saskatchewan, Canada. Linde is supplying the plant and has committed to purchase its entire output of high purity helium.
- Quantum Helium Management Company, operating a small plant in southern Saskatchewan that produces balloon-grade helium.

With helium prices now trending downward, the economic viability of operating in this part of the helium business could prove challenging and there is a good chance of a future shakeout or consolidation among the companies operating in this space. 

ABOUT THE AUTHOR

Phil Kornbluth has worked in the helium business continuously for the last 33 years, including stints running the global businesses of BOC Gases and the MATHESON subsidiary of TNSC. He is currently President of Kornbluth Helium Consulting, LLC and can be reached at: phil@kornbluthheliumconsulting.com.

The views expressed here are those of the author and not gasworld.