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## Helium Shortage Affecting Instrument Users To Extend Into 2013

Global production shortfall means the element will be scarce into 2013

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### SITTING IDLY BY

Scientists at the University of Illinois, Urbana-Champaign, are unable to cool down this 800-MHz NMR magnet, which arrived in late June, until they locate 4,500 L of helium.

Credit: Dean Olson, U of Ill., Urbana-Champaign

For the second time in five years, liquid helium consumers are having trouble buying the inert and buoyant element. The situation is dire for some users, and helium suppliers say it is going to get worse before it gets better.

Dean Olson, nuclear magnetic resonance lab director in the School of Chemical Sciences at the **University of Illinois, Urbana-Champaign**, says he needs 4,500 L of helium to cool a new 800-MHz NMR magnet now sitting unused at the school. Olson is crossing his fingers that he will get the helium he needs in September so users can conduct the analyses of small molecules, natural products, and proteins for which the university bought the \$2 million instrument.

Back in 2007, global project delays and a production outage at **ExxonMobil's** helium plant in Wyoming caused shortages of the element, which is used to make items such as semiconductors and optical fiber and to float weather and party balloons. Today, a different set of production shortages and project delays is to blame.

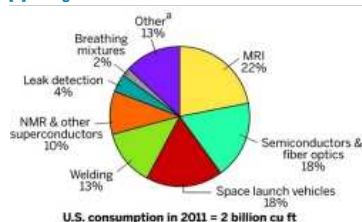
"The world is not running out of helium by any stretch of the imagination," says Phil Kornbluth, executive vice president of industrial gas supplier **Matheson Tri-Gas**, a subsidiary of Japan's **Taiyo Nippon Sanso**. Plenty of helium is in the ground in places such as Qatar, Algeria, Iran, and Russia, Kornbluth says. Getting at it is the problem.

The **U.S. Geological Survey** estimates the size of helium reserves outside the U.S. at 1.1 trillion cu ft, whereas U.S. reserves are just 153.2 billion cu ft. But even though overseas reserves are formidable, today the U.S. supplies nearly three-quarters of the more than 6 billion cu ft of helium used annually worldwide.

Supply interruptions, some in the U.S. and some overseas, have conspired to cause the current helium shortage, says John K. Van Sloun, helium general manager for **Air Products & Chemicals**, which claims to be the leading supplier of the element. Other suppliers include **Praxair**, **Air Liquide**, and **Linde**.

In the Texas Panhandle and extending into Oklahoma and Kansas, the U.S. government helium pipeline and storage facilities—which mete out about 30% of global supply—were scheduled to shut down for about two weeks of maintenance on July 15. Natural gas firms along the pipeline inject crude helium, which they cryogenically separate from natural gas. Refiners such as Air Products withdraw and process the helium to a 99% pure liquid.

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### BUOYANT MARKETS

Magnetic resonance imaging is the largest single use for helium. It includes weather balloons, blimps, party balloons, and gas chromatography. MRI = magnetic resonance imaging. NMR = nuclear magnetic



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resonance. SOURCES: U.S. Geological Survey, IHS Chemical  
Credit: U.S. Geological Survey, IHS Chemical

To the north, ExxonMobil's helium plant in La Barge, Wyo., which accounts for about 20% of global helium supply, is undergoing maintenance from June through August. ExxonMobil says it will "meet its contractual supply obligation." But industrial gas suppliers say the Wyoming facility won't run at full capacity

during the maintenance period, putting pressure on supply.

Two helium plants in Algeria run by the national oil firm **Sonatrach** have recently been operating at about half of their normal capacity because of low natural gas demand, says Air Products' Van Sloun. When demand for gas from helium-containing wells goes down, or wells deplete, less helium is available. Production shortfalls from small plants in Russia, Poland, and Australia have also limited global helium supply, Van Sloun points out.

Some relief will come starting later this year when nearly 2 billion cu ft of capacity fires up. A 200 million-cu-ft-per-year plant in Big Piney, Wyo., originally planned to open in 2011, should begin operating by the end of 2012. Owned by Air Products and Matheson Tri-Gas, the plant sits idle while the project's crude helium supplier, **Cimarex Energy**, completes work on its own facility.

Sometime next year, an expansion in Algeria will add 350 million cu ft of capacity, industrial gas suppliers say. But the biggest addition of them all is the 1.3 billion-cu-ft Qatar Helium 2 project, scheduled to open in early 2013 by the Qatari firm **RasGas**. Together with the 660 million-cu-ft Qatar Helium 1 plant already in operation, RasGas says, the new capacity will make the country the world's second-largest helium producer.

And Russia could also enter the major leagues of producers. In 2014 or sometime thereafter, large new helium reserves are likely to be tapped in Siberia, says Peter J. Madrid, a helium analyst with the U.S. **Bureau of Land Management** (BLM), which manages the government's pipeline.

The capacity additions should fix matters in the long run, but right now, the University of Illinois' Olson is worried about getting enough helium to fill his new NMR machine and maintain the 10 NMR instruments now being used by 350 researchers at the school. He recently learned that he won't get his full allocation for July.

Olson is considering the installation of an elaborate system, at a cost of \$40,000, to capture and recycle helium that bleeds off his instruments. "I spend \$30,000 per year on helium that is just blowing out of the roof," he says.

In a way, Olson is lucky. The \$40,000 he would spend on a capture system doesn't include purification and refrigeration equipment. For that he can tap into a recycling facility housed in the university's physics department, which uses helium in atomic structure characterization experiments.

Benjamin Kohn, a research associate in the department of chemical and biological engineering at **Colorado State University, Fort Collins**, isn't so lucky. He says he isn't sure his department can afford the high cost of recycling helium from its eight NMR instruments. In addition, the department's instruments are not centralized, making helium capture difficult.

Until recently, the low cost of helium meant that recycling wasn't a consideration, Kohn says. But the university's helium costs have climbed from \$5.00 per L in 2008 to \$15 today, making recycling worth considering. Other U.S. researchers report that they are now paying up to \$34 per L.

Helium's retail price, Air Products' Van Sloun explains, is benchmarked to the price BLM charges for helium. That price rose 16% in October 2009, 1% in 2011, and is scheduled to increase another 11% later this year. Industrial gas firms are charging users more for helium to recover their higher costs, Van Sloun says.

Large users have installed recycling equipment to keep a lid on helium costs. Optical fiber maker **Corning** says it captures and recycles helium used in its plants. The Royal **Philips Electronics** plant in Latham, N.Y., had Air Products install a capture, liquefaction, and reuse system for helium needed to fill new magnetic resonance equipment for medical imaging.

Air Products' sales of new helium to the Philips facility dropped 40% as a result, Van Sloun says. Philips was delighted to see its costs go down, and other users are eager to buy the helium freed up by the New York plant, he says.

Alternatives to helium-recycling systems for NMR users are either instruments with built-in capture and recycling capabilities or ones that rely on rare-earth permanent magnets instead of helium-dependent superconducting magnets.


Recondensing systems, at an additional cost up to \$150,000, seal an NMR magnet in a liquid helium bath. A closed-loop refrigeration system keeps the helium at a stable low temperature without the need for refills, says Michael Cuthbert, business group manager for **Oxford Instruments**, a maker of the systems.

Italian NMR producer Aspect Italia, a unit of NMR and MRI maker Aspect AI of Israel, is one firm that makes an instrument with a permanent rare-earth magnet that does not require helium. Paul J. Giammatteo, an owner of **Process NMR Associates**, the firm's U.S. distributor, says the AI-60, a 60-MHz bench-height NMR system introduced earlier this year, has no magnet-cooling requirements whatsoever.

The \$85,000 AI-60 can in some cases substitute for other highly sensitive NMRs. However, for very small samples, more sensitive helium-cooled instruments at 600 MHz or higher are preferred, he acknowledges.

In the midst of the helium shortage, U.S. users of the gas must contend with a long-term decline in helium production from domestic natural gas wells and the possibility that the U.S. government's pipeline and helium storage facility could be shut down.

The government built up its helium stocks over decades, considering them strategic reserves for military use. In 1996, under the Helium Privatization Act, Congress authorized the sale of the government's 30 billion cu ft of helium by 2015, except for a permanent reserve of 600 million cu ft. A bill now before Congress, the Helium Stewardship Act, would keep the government helium system open longer.

Regardless of legislation, industry executives point out, the government reserves are depleting and are likely to last for only another decade or so. Still, that's enough time for other producers to bring on new helium resources. "Yes, helium is scarce now," BLM analyst Madrid says, "but in five years the supply situation could be good through 2030." 

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