

## **As Demand Balloons, Helium Is in Short Supply**

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Syracuse University physicist Gianfranco Vidali spends most of his time studying how molecules are made in outer space, but a couple of months ago he abruptly dropped his interstellar research to address an earthly issue: the global shortage of helium.

The airy element best known for floating party balloons and the Goodyear blimp is also the lifeblood of a widening world of scientific research. Mr. Vidali uses the gas, which becomes the coldest liquid on earth when pressurized, to recreate conditions similar to outer space. Without it, he can't work. So when his helium supplier informed him it was cutting deliveries to his lab, Mr. Vidali said, "it sent us into a panic mode."

### HELIUM'S POPULARITY RISES

- **The News:** Helium has become scarce amid increasing demand and glitches at facilities where it is produced.
- **What It Means:** Helium prices have doubled for some users, while others have received fewer supplies.
- **The Upshot:** Lacking the ready cash of commercial customers, the scientific community has been hit particularly hard by the helium shortage. Some research has been slowed or abandoned.

Helium is found in varying concentrations in the world's natural-gas deposits, and is separated out in a special refining process. As with oil and natural gas, the easiest-to-get helium supplies have been tapped and are declining. Meanwhile, scientific research has rapidly multiplied the uses of helium in the past 50 years. It is needed to make computer microchips, flat-panel displays, fiber optics and to operate magnetic resonance imaging, or MRI, scans and welding machines.

The technology explosion is sucking up helium supplies at dizzying rates. U.S. helium demand is up more than 80% in the past two decades, and is growing at more than 20% annually in developing regions such as Asia.

"We've not seen the supply and demand at this imbalance in the past. We're running on the edge of the supply-demand curve," says Jane Hoffman, global helium director for Praxair Inc.

Supplies in the world's largest helium reserve near Amarillo, Texas, are expected to run out in eight years. Finding and developing new helium sources will take years and millions of dollars in investment.

Glitches at some of the world's biggest helium-producing plants have put a further pinch on supplies in the past year. As supplies have tightened, prices have surged in recent months. For one New York laboratory, prices have increased to \$8 a liquid liter, from close to \$4 at the end of the summer.

The upshot: Helium users -- from party planners to welding shops -- are having to do with less. Large industrial manufacturers are better able to weather the helium shortage, taking steps like installing equipment that can recycle the gas. So it is the nation's cash-strapped scientific community that is getting the worst of the crunch.

Soaring helium expenses could shut the doors of some independent labs, many which have produced important research over the years, and slow down work at bigger research centers. Helium is used in research to find cures to deadly diseases, create new sources of energy and answer questions about how the universe was formed.

Helium is essential to cool the magnets in nuclear magnetic resonance, or NMR, instruments used to map the chemical structure of molecules. Dale Ray, from The Cleveland Center for Structural Biology, an association that groups researchers from several institutions, says he is considering selling or shutting down two machines at the NMR lab he manages. The increase in helium prices is making it unaffordable to run the equipment, which is used to study proteins responsible for Alzheimer's disease, among other things.

Physicists are particularly affected by the helium shortage because their equipment requires more frequent helium refills. After experiencing interruptions in his helium deliveries, Moses Chan, a physicist at Penn State, launched a poll among his colleagues to find out how widespread the problem was. The results: the majority of helium users at 26 different institutions experienced canceled deliveries at least once, as well as price increases, some of them as much as 100%.

Myriam Sarachik, a physicist at City University of New York, might have to shut down her research. Among other things, Ms. Sarachik studies new materials that could bring a quantum leap in computing capabilities. Helium now absorbs most of her lab's budget, leaving little extra for everything else.

"I'm going to retire. That's the handwriting on the wall," says Ms. Sarachik, who has been doing experiments with helium for more than 40 years.

For one project, Ms. Sarachik and her students use 150 liters of liquid helium a week to cool the inside of a four-foot-high metal vessel to temperatures close to zero degree Kelvin, or about minus 459 Fahrenheit. Inside, they place tiny samples of materials mounted on chips and send electric currents to measure their properties. Without the helium, it would be impossible to monitor how the electrons respond because their behavior is masked by heat vibrations.

The National High Magnetic Field Laboratory, home of the world's strongest magnets, also is being affected. Hundreds of scientists travel from all over the world to Tallahassee, Fla., to use its magnets. They use the lab free of charge, but pay for their helium consumption. Many of them are on a very tight budget. To keep them coming, lab director Greg Boebinger will allocate \$300,000 of his own tight budget to offer free helium.

"They need whatever relief we can provide," he says. "If they stop coming we're dead in the water."

There are a few helium projects scheduled to come on line in the next couple of years, but experts predict supplies will remain tight in coming years. Despite its higher prices, helium isn't expensive enough yet to warrant projects devoted to its extraction, so it must piggyback on investments made by natural-gas producers.

Additionally, the biggest helium reserve in the world, which is operated by the U.S. government, is in steady decline. Stored in a depleted natural-gas cavern known as the Bush Dome near Amarillo, it supplies 35% of the helium consumed in the world. The government started the reserve in 1925, but by the mid-90s decided to sell it to pay off debt it incurred from stockpiling helium over the years.

Under law, the entire contents of the Bush Dome should be sold by 2015. Helium is very expensive to store because, like a stranded party balloon, it floats up and disappears into the atmosphere. As a result, there is little storage capacity for the gas. Virtually all helium is processed and shipped to its final user as soon as it is extracted from the ground. Once the Bush Dome reserve is gone, there will be no stored helium to supply the market in case of disruptions at production facilities, making for even spottier deliveries and higher prices.

Experts predict this situation will eventually price out many helium users, who will find substitutes or modify their technology. Some party balloon businesses are filling balloons with mixtures that contain less helium. Some welders are using argon. Industrial users are installing recovery systems. In places where helium isn't easily available, like India, scientists already focus on experiments that can be done using liquid nitrogen, says Michael Cuthbert, a sales manager for Oxford Instruments, a company that sells scientific instruments all over the world.

Reem Jaafar, a researcher at Ms. Sarachik's lab at CUNY, says she will go into another area of physics if helium prices stay at their current levels. "If you have a fixed amount in a grant, and you have to spend it all on helium, you don't have anything left over," she says.

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