



# 2009 Minerals Yearbook

HELIUM

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In the United States in 2009, sales of Grade-A helium (99.995% or greater purity) by private industry were 46.5 million cubic meters<sup>2</sup> (about 1.68 billion cubic feet) and exports by private producers were 71.1 million cubic meters (about 2.56 billion cubic feet) for total sales of about 118 million cubic meters (about 4.25 billion cubic feet), a 9.2% decrease from that of 2008 (table 1). During 2009, domestic helium sales decreased by 22%, while helium exports increased slightly compared with those of 2008.

## Legislation and Government Programs

In 2009, the National Academy of Science initiated a second study, as required by the Helium Privatization Act of 1996 (Public Law 104–273), to reevaluate the impact of selling the helium contained in the Federal helium reserve under the existing pricing mechanism in order to determine if adjustments were needed that would optimize future availability of helium for scientific and industrial uses. This study was completed at the end of 2009 and was released to the public on January 20, 2010 (National Research Council of the National Academies).

Also required by the Act, the Texas Commission on Environmental Quality (TCEQ) issued a conditional certificate of completion for the cleanup of the Exell Helium Plant and was working with the U.S. Environmental Protection Agency to issue a ready-for-reuse determination for the property. Disposal documents were forwarded to the General Services Administration to start the final screening and disposal process.

## Production

In 2009, 14 companies operated 20 of 22 privately owned domestic helium plants, 14 of which extracted helium from natural gas; two of the crude helium plants did not produce or extract helium during 2009, and one new small crude plant in Otis, KS, came online in May. All but two extraction plants used cryogenic extraction processes. Total sales of U.S.-produced helium in 2009 decreased by about 9.2% compared with those of 2008. All natural gas processed for helium recovery came from gasfields in Colorado, Kansas, Oklahoma, Texas, Utah, and Wyoming (figure 1). During 2009, 10 private plants purified helium by using pressure swing adsorption technology. Nine privately owned plants that produced Grade-A helium also liquefied helium. The plant operators and plant locations are listed in table 2.

<sup>1</sup>Resources Evaluation, U.S. Bureau of Land Management, Amarillo Field Office—Helium Operations, Amarillo, TX.

<sup>2</sup>All metric helium volumes herein are at 101.325 kilopascals absolute (14.696 pounds per square inch absolute) and 15 °C (59 °F). Helium volumes, reported in parentheses following metric units, are measured in cubic feet at 14.7 pounds per square inch absolute and 70 °F—1,000 cubic feet (14.7 pounds per square inch absolute and 70 °F) equals 27.737 cubic meters (101.325 kilopascals absolute and 15 °C) and 1 cubic meter (101.325 kilopascals and 15 °C) equals 36.053 cubic feet (14.7 pounds per square inch absolute and 70 °F).

Domestic production data for helium were developed by the U.S. Bureau of Land Management (BLM) from records of the BLM operations as well as from a high-purity helium survey, an annual voluntary canvass of private U.S. operations. Of the eight operations to which a survey request was sent, all responded, and those data plus data from BLM operations represent 100% of the total helium sales and recovery data listed in table 3.

About 9% less helium was withdrawn from the Government's helium reserve at Cliffside field in 2009 than during 2008. Most domestic helium production comes from the midcontinental and Rocky Mountain regions of the United States. The measured helium reserves from which helium is produced are located in approximately 102 gasfields in 11 States. Most of these reserves are contained in the Hugoton field in Oklahoma, Kansas, and Texas; the Panoma field in Kansas; the Keyes field in Oklahoma; the Panhandle West and Cliffside fields in Texas; and the Riley Ridge area in Wyoming.

In conjunction with its program to survey and identify possible new sources of helium, the BLM analyzed 25 natural gas samples from 3 States in 2009.

## Consumption

In 2009, private industry supplied 100% of the domestic helium demand. The major domestic end uses of helium were cryogenics (26%), controlled atmospheres (22%), pressurizing and purging (17%), and welding (17%). Other uses included chromatography, lifting gas, and heat transfer (12%); leak detection (4%); and synthetic breathing mixtures (2%) (figure 3). In cryogenics, magnetic resonance imaging applications dominated liquid helium use. The estimated domestic consumption by end use in 2009 was based on revised figures from a 2008 end-use survey conducted by BLM's Helium Operations to determine trends in helium usage.

In 2009, U.S. domestic helium consumption decreased by 22.0% to 46.5 million cubic meters (about 1.68 billion cubic feet) compared with consumption for 2008. This is the fifth consecutive year that U.S. domestic helium sales have decreased. While U.S. consumption decreased during the past 5 years, helium consumption outside the United States has continued to increase. During 2009, U.S. helium exports increased slightly to 71.1 million cubic meters (about 2.56 billion cubic feet) compared with those of 2008 (table 1).

In-kind crude helium sales regulations (43 CFR part 3195) require helium refiners that sell helium to Federal agencies and their contractors to buy an equivalent amount of crude helium from the BLM. In 2009, in-kind crude helium sales were about 4.9 million cubic meters (175.7 million cubic feet). The sales were made to eight companies through contracts with the BLM.

## Stocks

The volume of helium stored in the BLM helium conservation storage system, including the conservation pipeline network

and the Cliffside field, totaled 519 million cubic meters (about 18.7 billion cubic feet) on December 31, 2009. The storage system contained crude helium purchased under contract by the Government from 1962 to 1973 and privately owned helium extracted by industry from natural-gas-supplying fuel markets and stored under contract. This privately owned helium is returned to the owners as needed for purification to supply private demand. During 2009, 15.8 million cubic meters (568 million cubic feet) of privately owned helium was delivered to the BLM's helium conservation system, and 55.4 million cubic meters (about 2.00 billion cubic feet) was withdrawn, for a net decrease of 39.6 million cubic meters (about 1.43 billion cubic feet) of private helium in storage (table 4, figure 2).

## Transportation

Private producers and (or) distributors shipped helium, predominantly as a liquid, in semitrailers, which delivered the liquid helium to distribution centers where some of it was gasified and compressed into trailers and small cylinders for delivery to end users. The remaining liquid helium was sold as bulk liquid or repackaged in dewars of various sizes for delivery.

## Prices

In fiscal year 2009, the price that the BLM charged private companies for crude helium was \$2.25 per cubic meter (\$62.25 per thousand cubic feet), about 3% higher than that of 2008. The BLM crude helium price was set using guidelines included in the Act and is adjusted annually based on the Consumer Price Index for the previous year.

## Foreign Trade

In 2009, exports of Grade-A helium increased slightly to 71.1 million cubic meters (2.56 billion cubic feet), and accounted for about 60% of sales of U.S.-produced helium; private industry supplied all U.S. helium exports. The increase in helium exports was attributed to increased shipments of helium to Australia, Belgium, Brazil, Canada, Germany, the Republic of Korea, and Singapore. About 54% of the helium exported from the United States went to Asia, with Japan receiving about 23% of total U.S. exports. About 19% of the exported helium was shipped to Europe; collectively, Belgium, France, Germany, Italy, and the United Kingdom received 97% of the helium exported to Europe. Other exports were as follows: Canada and Mexico, 14%; South America, 8%; Australia and New Zealand, 3%; Africa and the Middle East, 1% each; and Central America and the Caribbean, less than 1% each. For 2009, import tariffs on helium remained at 3.7% for normal trade relations (NTR) nations and 25% for non-NTR nations.

## World Review

Excluding the United States, world production capacity of helium was estimated to be about 70 million cubic meters (2.53 billion cubic feet) for 2009 (table 5). In 2009, the helium plants in Algeria and Qatar produced about 10% less helium than in 2008 as a result of a worldwide helium demand decline of about 10% for 2009. During 2009, one small new helium plant

came onstream in Australia. Worldwide, eight new helium plant projects were scheduled for startup between 2011 and 2015. Two of the eight projects were scheduled for startup in the Riley Ridge, WY, and St. Johns, AZ, areas between 2011 and 2012. The other new plants will be constructed in Algeria, China, India, Indonesia, Qatar, and Russia. All known helium that was produced outside the United States during 2009 was extracted in Algeria, Australia, Poland, Qatar, and Russia.

## Outlook

From 2004 to 2009, the total market for U.S. produced helium declined by about 2% per year, while from 1999 to 2009, the market growth rate was flat. Owing to the slow U.S. economic recovery, U.S. domestic helium consumption was expected to decrease in 2010. Foreign helium demand, however, was expected to increase slightly in 2010. With the anticipation that foreign helium production will remain stable or decline during 2010, increased foreign demand was expected to result in increased U.S. helium exports of about 1% to 2% compared with 2009 exports.

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TABLE 1  
TOTAL SALES OF GRADE-A HELIUM  
PRODUCED IN THE UNITED STATES<sup>1</sup>

(Million cubic meters)

Year	Volume		Total sales
	Domestic sales	Exports <sup>2</sup>	
2005	81.6	51.4	133
2006	75.2	61.9	137
2007	73.5	64.2	138
2008	59.6	69.9	130
2009	46.5	71.1	118

<sup>1</sup>Data are rounded to no more than three significant digits, may not add to totals shown.

<sup>2</sup>Source: U.S. Census Bureau.

TABLE 2  
OWNERSHIP AND LOCATION OF HELIUM EXTRACTION PLANTS IN THE UNITED STATES IN 2009

Owner or operator	Location	Product purity
Air Products Helium, Inc.	Hansford County, TX	Grade-A helium. <sup>1</sup>
Do.	Liberal, KS	Do.
BP America, Inc.	Sunray, TX	Crude helium.
Do.	Ulysses, KS	Do.
DCP Midstream, LLC	Cheyenne Wells, CO	Crude and Grade-A helium. <sup>1</sup>
Do.	Hansford County, TX	Crude helium.
Do.	Liberal, KS	Do.
Do.	Borger, TX	Do.
EnCana Oil & Gas (USA) Inc.	Moab, UT	Crude and Grade-A helium. <sup>1</sup>
ExxonMobil Gas & Power Marketing Co.	Shute Creek, WY	Do.
IACX Energy <sup>2</sup>	Otis, KS	Crude helium.
K-L Energy Partners, LLC <sup>3</sup>	Lakin, KS	Do.
Linde Global Helium Inc.	Otis, KS	Grade-A helium. <sup>1</sup>
Midstream Energy Services, LLC	Keyes, OK	Crude and Grade-A helium. <sup>1</sup>
Nacogdoches Oil & Gas, L.L.C. <sup>4</sup>	Shiprock, NM	Grade-A helium.
ONEOK Field Services Co. <sup>3</sup>	Bushton, KS	Crude helium.
Do. <sup>5</sup>	Scott City, KS	Do.
Pioneer Natural Resources Co.	Fain, TX	Do.
Do.	Satanta, KS	Do.
Praxair, Inc.	Bushton, KS	Grade-A helium. <sup>1</sup>
Do.	Ulysses, KS	Do.
SemGas, LP <sup>6</sup>	Dodge City, KS	Crude helium.
Do. Ditto.		

<sup>1</sup>Including liquefaction.

<sup>2</sup>Plant came online in May 2009.

<sup>3</sup>Plant did not produce helium during 2009.

<sup>4</sup>Nacogdoches Oil & Gas, L.L.C. purchased plant from Shiprock Helium in 2008.

<sup>5</sup>Output is piped to Ulysses, KS, for purification.

<sup>6</sup>Plant shut down in April 2009.

TABLE 3  
HELIUM RECOVERY IN THE UNITED STATES<sup>1</sup>

(Thousand cubic meters)

	2005	2006	2007	2008	2009
<b>Crude helium:</b>					
Bureau of Land Management (BLM) sold (in-kind and open market)	41,400	63,500	58,800	50,300	30,200
<b>Private industry:</b>					
Private helium accepted and stored by BLM	17,000	18,100	15,800	21,600	15,800
Helium withdrawn from storage	-74,100	-75,800	-76,500	-71,500	-55,400
Total net helium put into storage	-57,100	-57,700	-60,700	-49,900	-39,600
<b>Grade-A helium:</b>					
Private industry sold	133,000	137,100	137,700	129,500	117,600
Total helium stored	-57,100	-57,700	-60,700	-49,900	-39,600
Helium recovery from natural gas	75,900	79,400	77,000	79,600	78,000

<sup>1</sup>Negative numbers denote a net withdrawal from BLM's underground storage facility, a partially depleted natural gas reservoir at the Cliffside field near Amarillo, TX.

TABLE 4  
SUMMARY OF BUREAU OF LAND MANAGEMENT HELIUM CONSERVATION STORAGE SYSTEM OPERATIONS<sup>1,2</sup>

(Thousand cubic meters)

	2007	2008	2009
<b>Helium in conservation storage system on January 1:</b>			
Stored under BLM conservation program <sup>3</sup>	634,200	583,500	532,500
Stored for private producers under contract	37,400	27,600	28,000
Total <sup>3</sup>	671,600	611,100	560,500
<b>Input to system:</b>			
Net deliveries from BLM plants	--	--	--
Stored for private producers under contract	15,800	21,600	15,800
Total <sup>3</sup>	15,800	21,600	15,800
Redelivery of helium stored for private producers under contract	-76,500	-71,500	-55,400
Net addition to system <sup>3</sup>	-60,700	-49,900	-39,600
<b>Helium in conservation storage system on December 31:</b>			
Stored under BLM conservation program <sup>3</sup>	583,500	532,500	500,500
Stored for private producers under contract	27,600	28,000	18,600
Total <sup>3</sup>	611,100	560,500	519,100

-- Zero.

<sup>1</sup>Crude helium is injected into or withdrawn from BLM's underground storage facility, a partially depleted natural gas reservoir at the Cliffside field near Amarillo, TX.

<sup>2</sup>Negative numbers denote a net withdrawal from BLM's storage facility.

<sup>3</sup>Net additions to system do not include in-kind crude sales or transfers. Totals, however, do include crude sales and transfers.

TABLE 5  
WORLD GRADE-A HELIUM ANNUAL PRODUCTION  
CAPACITY AS OF DECEMBER 31, 2009

(Million cubic meters)

	Capacity
United States <sup>1</sup>	177
Rest of world <sup>e</sup>	70
Total <sup>e</sup>	247

<sup>e</sup>Estimated.

<sup>1</sup>Includes plants on standby as well as operating plants.

FIGURE 1  
 MAJOR U.S. HELIUM-BEARING NATURAL GAS FIELDS

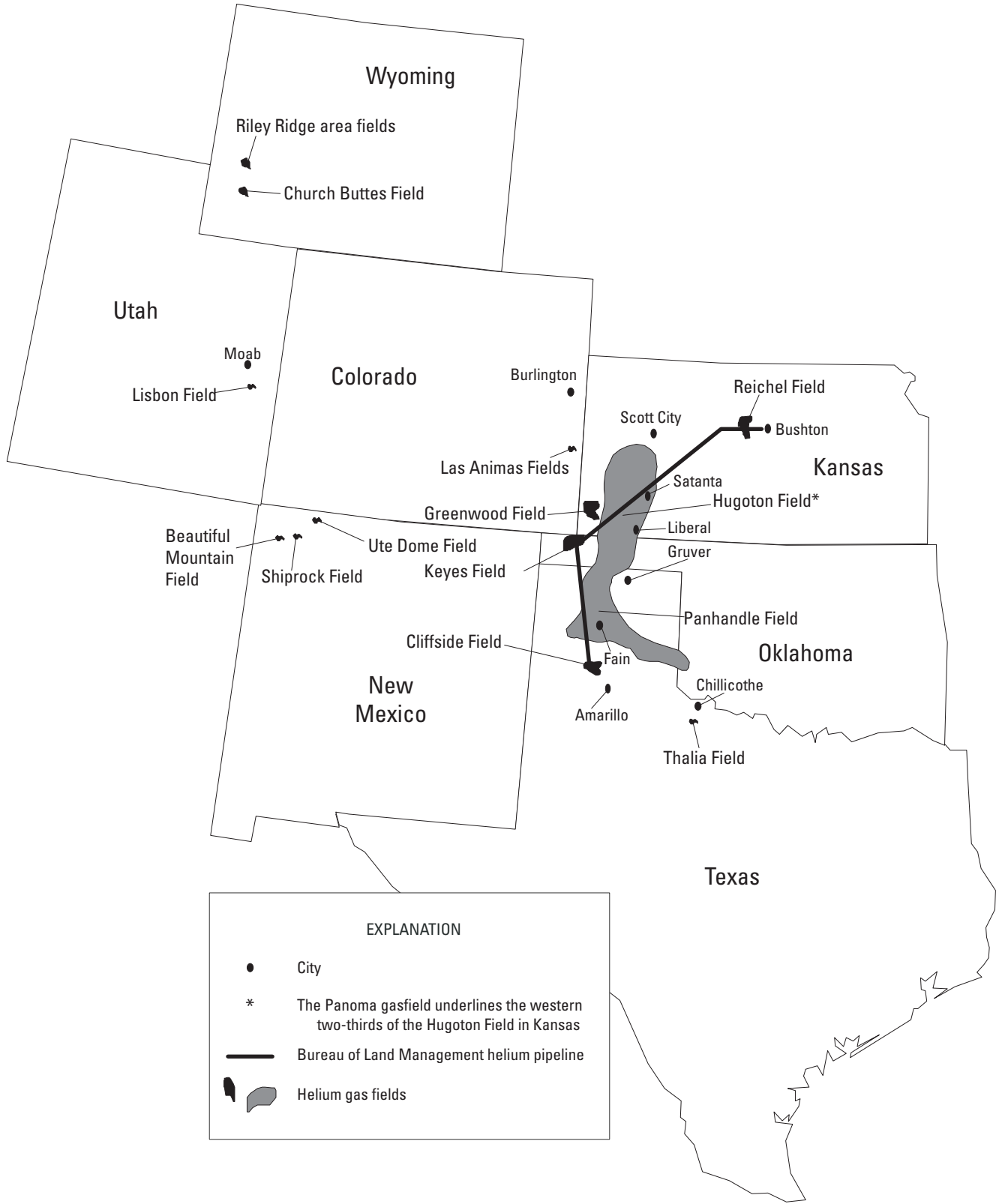


FIGURE 2  
HELIUM RECOVERY IN THE UNITED STATES

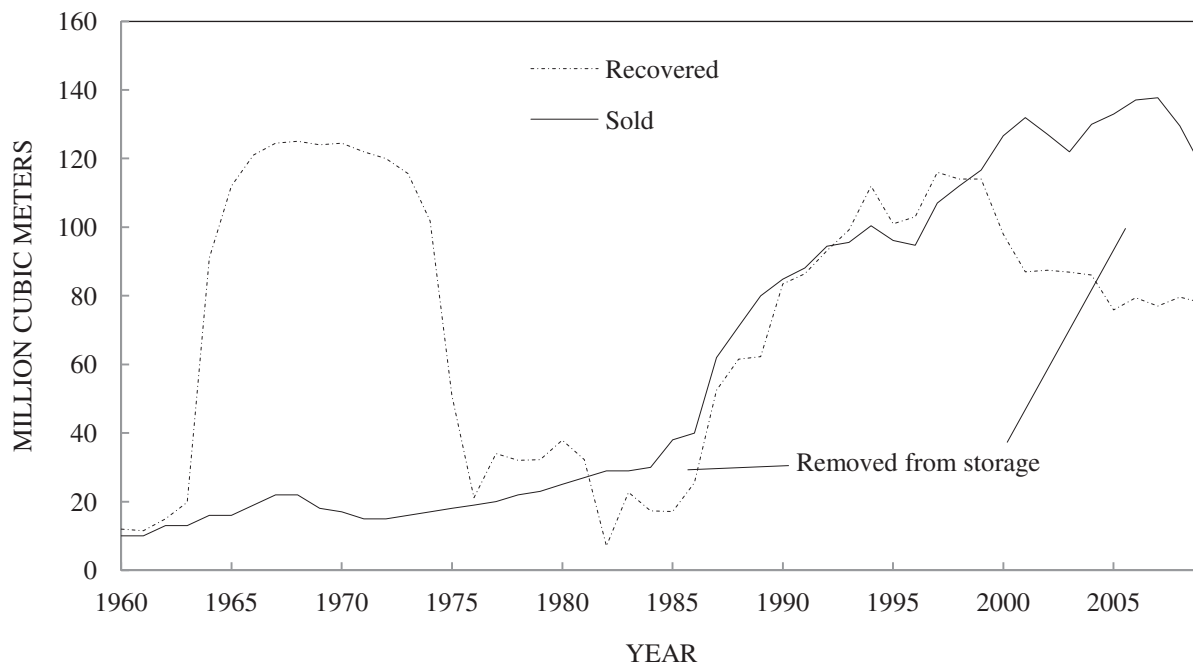
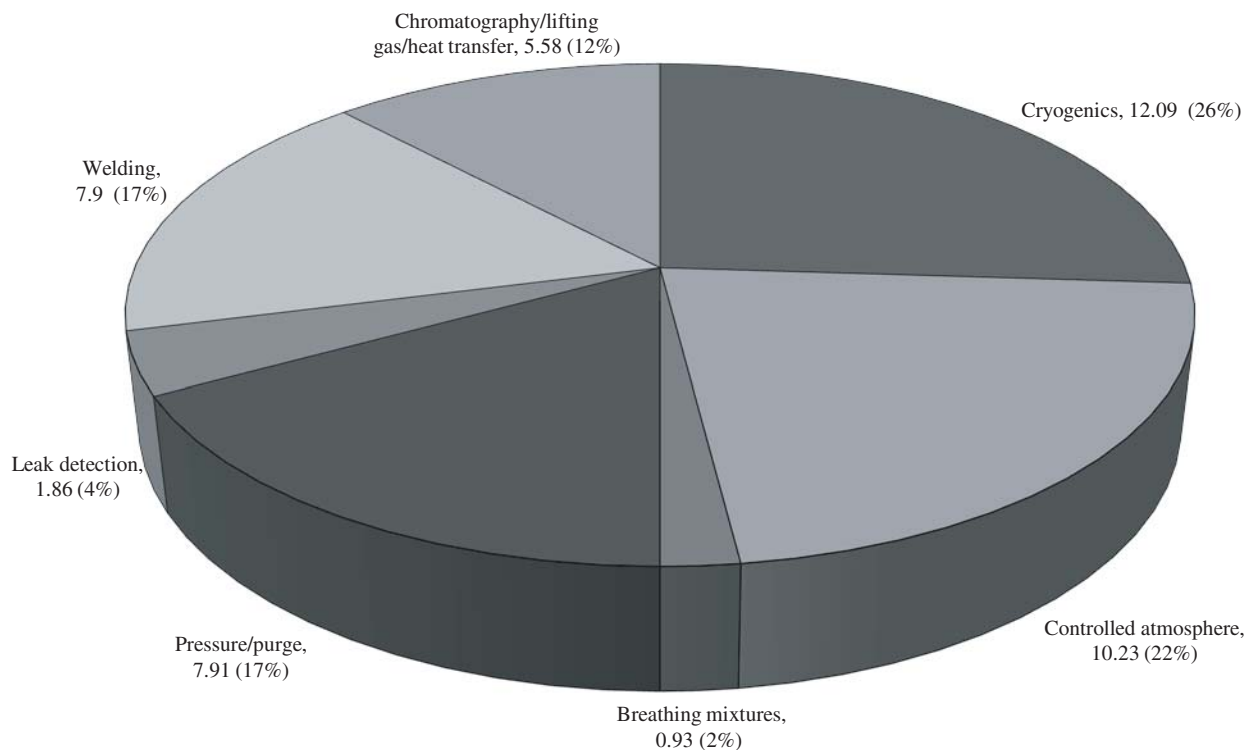


FIGURE 3  
ESTIMATED HELIUM CONSUMPTION, BY END USE, IN THE UNITED STATES IN 2009<sup>1</sup>



<sup>1</sup>Total helium used in the United States in 2009 was estimated to be 46.5 million cubic meters.