2008 Minerals Yearbook

HELIUM [ADVANCE RELEASE]

U.S. Department of the Interior
U.S. Geological Survey

October 2009

Helium

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Sales of Grade-A helium (99.995% or greater purity) by private industry were 59.6 million cubic meters[2] (about 2.15 billion cubic feet) in the United States in 2008, and exports by private producers were 69.9 million cubic meters (about 2.52 billion cubic feet) for total sales of about 130 million cubic meters (about 4.67 billion cubic feet) of U.S. helium, a 6% decrease from that of 2007 (table 1). During 2008, domestic helium sales decreased by 19%, while helium exports increased by 9% compared with those of 2007.

Legislation and Government Programs

The Helium Privatization Act of 1996 [Public Law 104–273] directed the Federal Helium Program to discontinue production and sale of refined helium by April 9, 1998. The Act also directed the Government to offer for sale between January 1, 2005, and January 1, 2015, the Federal helium reserve in excess of 600 million cubic feet.

The Act called for a National Academy of Sciences (NAS) study to determine the impact of selling the reserve using the pricing mechanism described in the Act. The first study was completed in 1998. Recent challenges experienced by the helium market, such as the operational problems experienced by the helium plants in Algeria and Qatar during 2005, have had an impact on pricing and availability of cryogenic helium to the scientific community in particular. The NAS initiated a second study to reevaluate the impact of selling the reserve under the current pricing mechanism to determine whether adjustments are needed that would optimize future availability of helium for its many scientific and industrial uses. This second study was scheduled for completion in 2009.

The Government's Exell helium plant was shut down in March 1998, and all components of the legislation were implemented as directed by the Act. The screening and disposal process of the Amarillo Plant was completed by the General Services Administration (GSA), and the property was sold in October 2007. Environmental cleanup at the Exell helium plant had been completed, and final documents had been submitted to the Texas Commission on Environmental Quality (TCEQ) for the Certificate of Completion (COC). Upon receipt of the COC, documents will be forwarded to the GSA to start the final screening and disposal process.

Production

In 2008, 13 companies operated 19 of 21 domestic helium plants they owned; 14 of those plants extracted helium from natural gas (table 2). Two of the crude helium plants did not produce or extract helium during 2008. All but two extraction plants used cryogenic extraction processes. Total sales of U.S.-produced helium decreased by 6% compared with those of 2007. All natural gas processed for helium recovery came from gasfields in Colorado, Kansas, New Mexico, Oklahoma, Texas, Utah, and Wyoming (fig. 1). During 2008, 10 private plants purified helium by using pressure swing adsorption technology. Nine privately owned plants that produced Grade-A helium also liquefied helium.

Domestic production data for helium were developed by the U.S. Bureau of Land Management (BLM) from records of its own operations as well as from the 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 and shown in figure 2.

Most domestic helium production comes from the Midcontinent and Rocky Mountain regions of the United States. The measured helium reserves from which helium is produced are located in 102 gasfields in 11 States. Most of these reserves are contained in the Hugoton field in Kansas, Oklahoma, 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.

Increased helium from Algeria and Qatar helped meet the 2008 worldwide helium demand with fewer stocks coming from the United States Government's helium reserve at Cliffside field.

During 2008, the BLM analyzed 93 natural gas samples from 10 States in conjunction with its program to survey and identify possible new sources of helium.

Consumption

In 2008, private industry supplied 100% of domestic helium demand. The major domestic end uses of helium were cryogenics (32%), pressurizing and purging (18%), controlled atmospheres (18%), welding (13%), other uses (including chromatography/lifting gas/heat transfer) (13%), leak detection (4%), and synthetic breathing mixtures (2%) (fig. 3). Cryogenics, specifically magnetic resonance imaging applications, dominated liquid helium use. Estimated 2008 domestic consumption by end use was based on a 2008 end-use survey conducted by BLM's Helium Operations to determine trends in helium usage.

In 2008, U.S. domestic helium consumption decreased by 19% to 59.6 million cubic meters (2.15 billion cubic feet) compared with consumption in 2007. This was the fourth consecutive year that U.S. domestic helium sales have decreased. While U.S. consumption has decreased during the past 4 years, helium consumption outside the United States has increased. During 2008, U.S. helium exports increased by about 9% to 69.9 million cubic meters (2.52 billion cubic feet), compared with those of 2007 (table 1).

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[2]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).

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 2008, in-kind crude helium sales were about 5.7 million cubic meters (204 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 561 million cubic meters (20.2 billion cubic feet) on December 31, 2008. 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 2008, 21.6 million cubic meters (780 million cubic feet) of private helium was delivered to the BLM's helium conservation system, and 71.5 million cubic meters (2.58 billion cubic feet) was withdrawn for a net decrease of 49.9 million cubic meters (1.80 billion cubic feet) of private helium in storage (table 4).

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 2008, the price that the BLM charged private companies for crude helium was $2.181 per cubic meter ($60.50 per thousand cubic feet).

Foreign Trade

In 2008, exports of Grade-A helium increased to 69.9 million cubic meters (2.52 billion cubic feet) (table 1). Helium exports increased by about 9% compared with those of 2007 and accounted for about 54% of sales of U.S.-produced helium; private industry supplied all U.S. helium exports. The increase in helium exports is attributed to significantly increased shipments of helium to Belgium, Canada, China, France, Germany, Mexico, South Africa, Taiwan, and Venezuela. About 55% 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 98% of the helium exported to Europe. Other exports were as follows: Canada and Mexico, 14%; South America, 8%; Australia and New Zealand, 2%; the Middle East, 1%; and Africa, Central America, and the Caribbean, less than 1% each.

For 2008, import tariffs on helium remained at 3.7% for normal trade relations (NTR) nations and 25% for non-NTR nations. Although helium was imported into the United States, the volume was negligible when compared with exports. During 2008, the U.S. Census Bureau reported that 3,000 cubic meters (108 thousand cubic feet) of helium was imported into the U.S. from Angola and Mexico.

World Review

Excluding the United States, world production capacity of helium was estimated to be about 62 million cubic meters (2.25 billion cubic feet) (table 5). During 2008, the helium plants at Skikda, Algeria, and Ras Laffan, Qatar, that came onstream in late 2005 produced helium at much higher rates than during 2007. Production from these two plants during 2008 was 8.32 million cubic meters (300 million cubic feet) more than during 2007. These two plants are expected to continue to produce at increased production rates as they remedy the operational problems they have experienced during the past several years. Worldwide, nine new helium plant projects are scheduled for startup sometime during 2009 to 2015. Two of the nine projects are scheduled for startup in the United States during 2011 to 2012. These two plants will be located in the Riley Ridge, WY, and St. Johns, AZ, areas. The other seven plants will be located in Algeria, Australia, China, India, Indonesia, Qatar, and Russia. All known helium that was produced outside the United States in 2008 was extracted in Algeria, Poland, Qatar, and Russia.

Outlook

In 2008, total market sales for U.S.-produced helium decreased by about 6% compared with those of 2007. From 2003 to 2008, the market growth rate was about 1.2% per year, while from 1998 to 2008, the market growth rate was about 1.8% per year. Owing to the continued U.S. economic downturn, U.S. domestic helium consumption was expected to decrease slightly during 2009. With the anticipation that foreign helium production will continue to increase during 2009, total U.S.-produced helium sales were expected to decline by about 1% to 2%. However, foreign helium demand was expected to continue to increase during 2009. This increased foreign demand was expected to result in increased U.S. helium export demand of about 1% to 2% in 2009.

GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

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Helium Resources of the United States, 2007, U.S. Bureau of Land Management Technical Note 429, 2008.

TABLE 1

TOTAL SALES OF GRADE-A HELIUM PRODUCED IN THE UNITED STATES[1]

(Million cubic meters)

Year	Domestic sales	Exports[2]	Total sales
2004	85.1	44.9	130
2005	81.6	51.4	133
2006	75.2	61.9	137
2007	73.5	64.2	138
2008	59.6	69.9	130

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Source: U.S. Census Bureau.

TABLE 2

OWNERSHIP AND LOCATION OF HELIUM EXTRACTION PLANTS IN THE UNITED STATES IN 2008

Owner or operator	Location	Product purity
Air Products Helium, Inc.	Hansford County, TX	Grade-A helium.[1]
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.[1]
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.[1]
ExxonMobil Gas & Power Marketing Co.	Shute Creek, WY	Do.
K-L Energy Partners, LLC[2]	Lakin, KS	Crude helium.
Linde Global Helium, Inc.	Otis, KS	Grade-A helium.[1]
Midstream Energy Services, LLC[3]	Keyes, OK	Crude and Grade-A helium.[1]
ONEOK, Field Services Co., L.L.C.[2]	Bushton, KS	Crude helium.
Do.[4]	Scott City, KS	Do.
Pioneer Natural Resources Co.	Fain, TX	Do.
Do.	Satanta, KS	Do.
Praxair, Inc.	Bushton, KS	Grade-A helium.[1]
Do.	Ulysses, KS	Do.
SemKan, L.L.C.	Dodge City, KS	Crude helium.
Shiprock Helium[5]	Shiprock, NM	Grade-A helium.

Do. Ditto.
[1]Including liquefaction.
[2]Plant did not produce helium during 2008.
[3]Midstream Energy Services, LLC purchased plant from Nathaniel Energy in March 2006.
[4]Output is piped to Ulysses, KS, for purification.
[5]Shiprock Helium sold plant sometime during 2008, new owner unknown.

TABLE 3

HELIUM RECOVERY IN THE UNITED STATES[1]

(Thousand cubic meters)

	2004	2005	2006	2007	2008
Crude helium:					
Bureau of Land Management (BLM) sold (in-kind and open market)	29,300	41,400	63,500	58,800	50,300
Private industry:					
Private helium accepted and stored by BLM	19,100	17,000	18,100	15,800	21,600
Helium withdrawn from storage	-63,100	-74,100	-75,800	-76,500	-71,500
Total net helium put into storage	-44,000	-57,100	-57,700	-60,700	-49,900
Grade-A helium:					
Private industry sold	130,000	133,000	137,100	137,700	129,500
Total helium stored	-44,000	-57,100	-57,700	-60,700	-49,900
Helium recovery from natural gas	86,000	75,900	79,400	77,000	79,600

[1]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[1, 2]

(Thousand cubic meters)

	2006	2007	2008
Helium in conservation storage system on January 1:			
Stored under BLM conservation program[3]	699,000	634,200	583,500
Stored for private producers under contract	32,000	37,400	27,600
Total[3]	731,000	671,600	611,100
Input to system:			
Net deliveries from BLM plants	--	--	--
Stored for private producers under contract	18,100	15,800	21,600
Total[3]	18,100	15,800	21,600
Redelivery of helium stored for private producers under contract	-75,800	-76,500	-71,500
Net addition to system[3]	-57,700	-60,700	-49,900
Helium in conservation storage system on December 31:			
Stored under BLM conservation program[3]	634,200	583,500	532,500
Stored for private producers under contract	37,400	27,600	28,000
Total[3]	671,600	611,100	560,500

-- Zero.

[1]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.

[2]Negative numbers denote a net withdrawal from BLM's storage facility.

[3]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, 2008

(Million cubic meters)

	Capacity
United States[1]	177
Rest of world[e]	62
Total[e]	239

[e]Estimated.

[1]Includes plants on standby as well as operating plants.

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

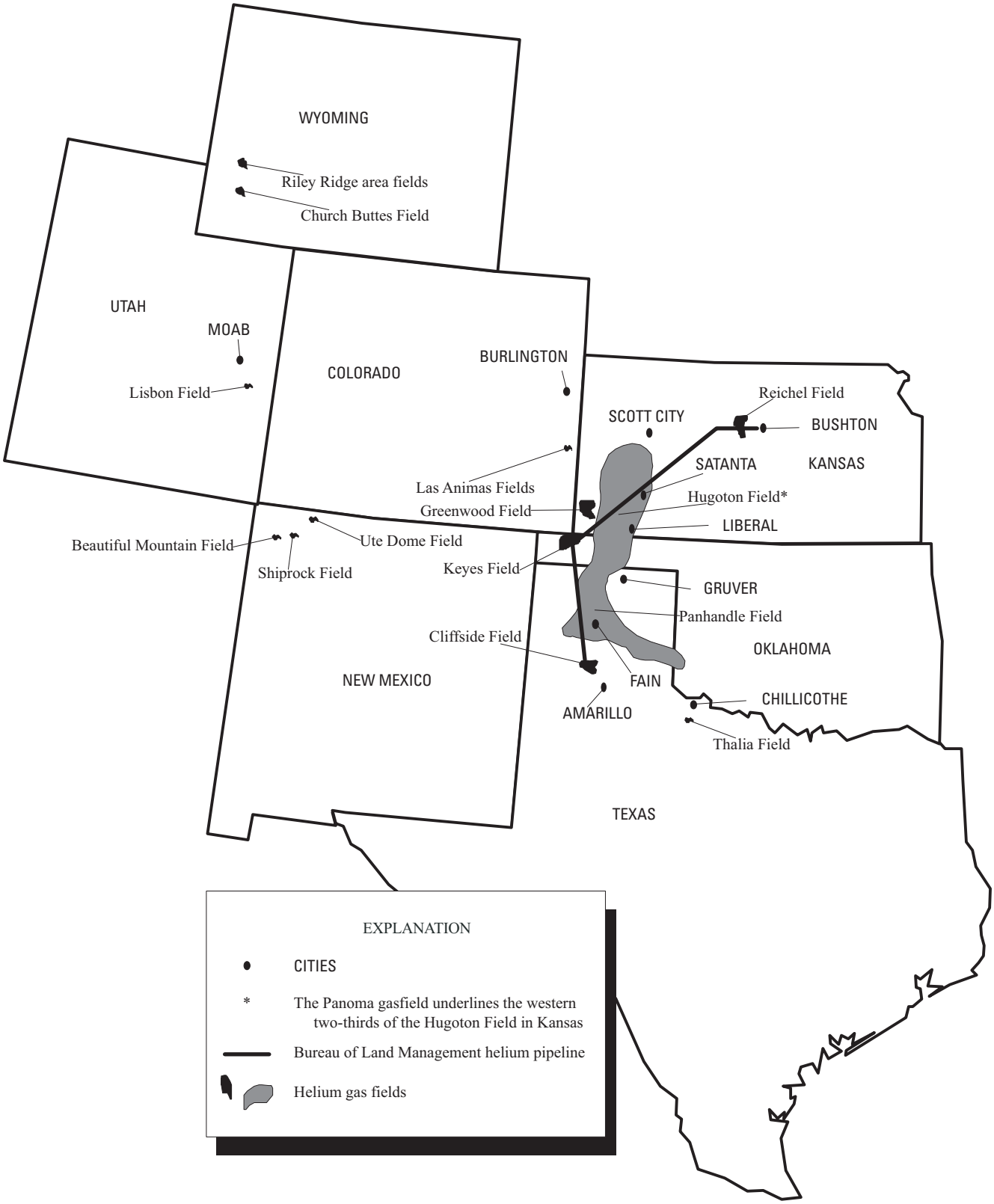


FIGURE 2
HELIUM RECOVERY IN THE UNITED STATES

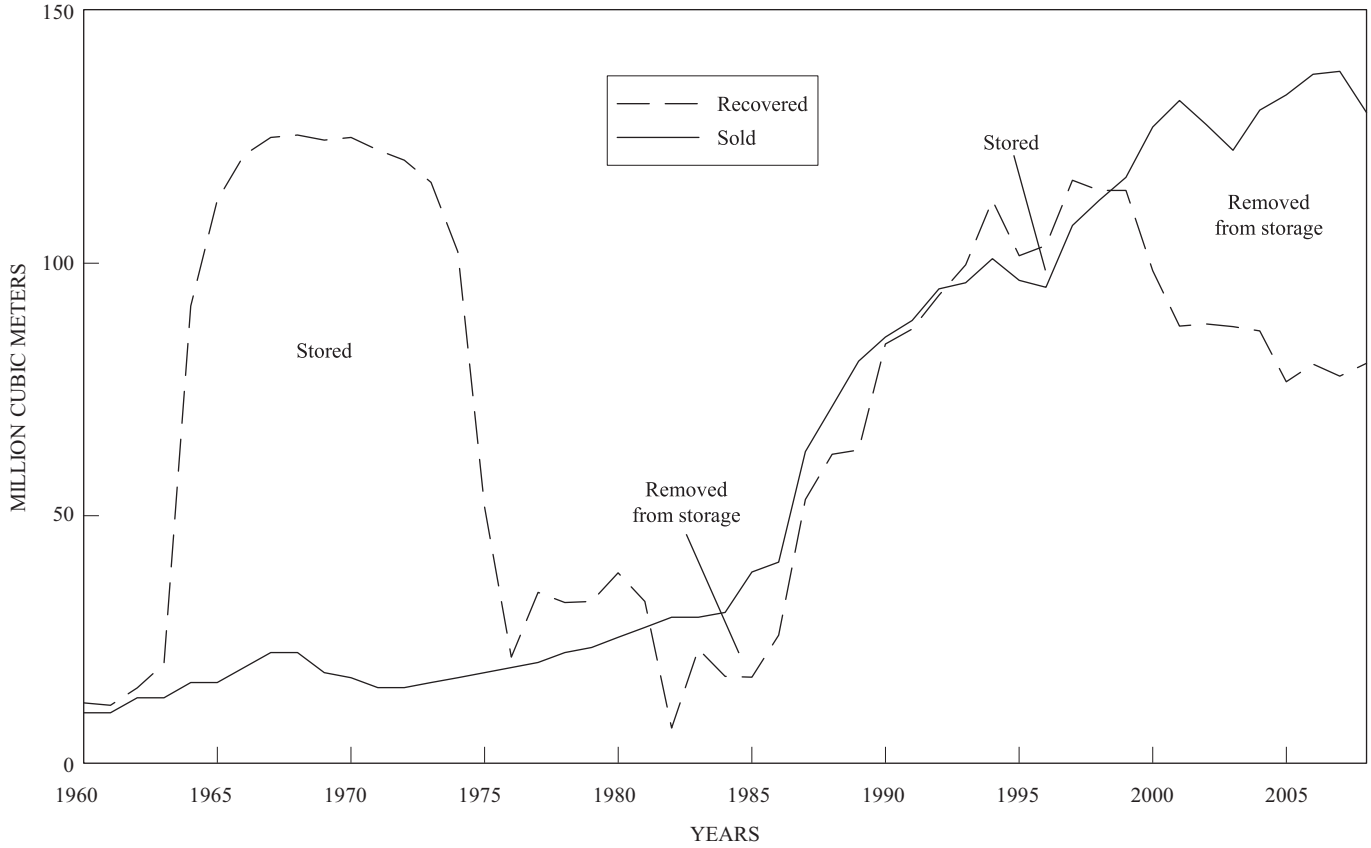
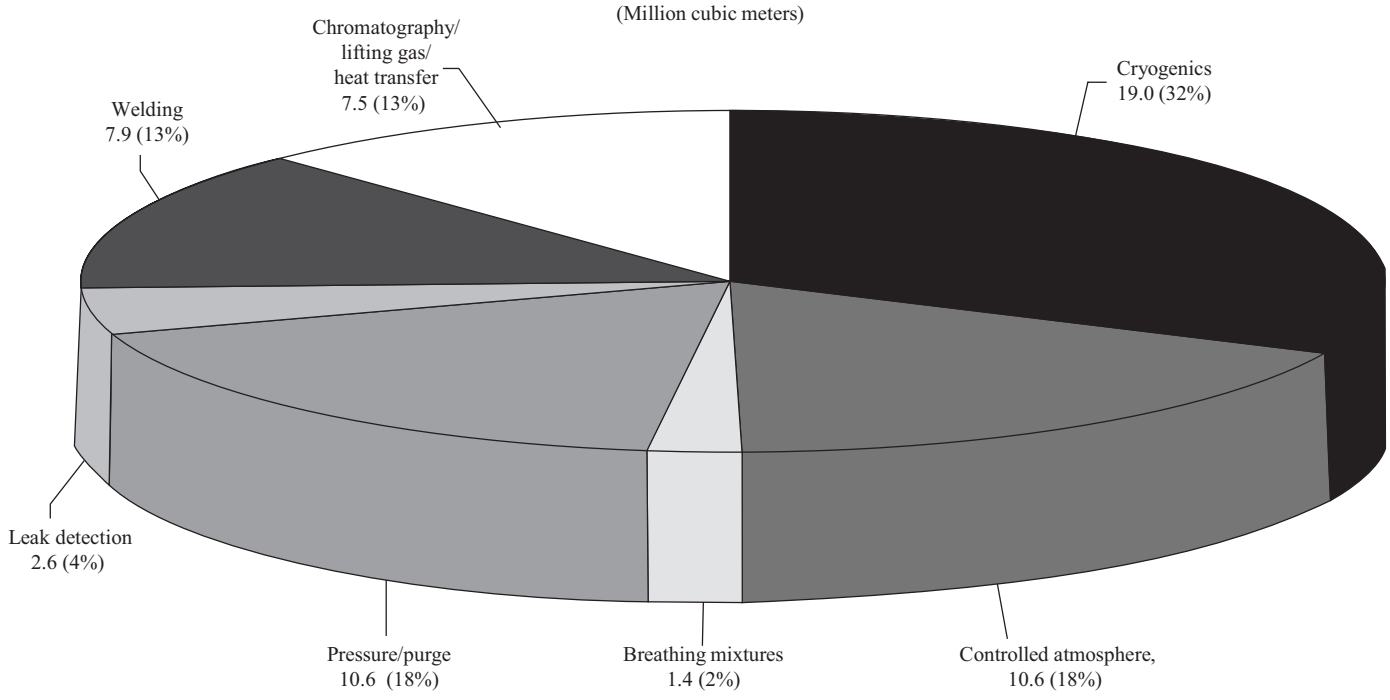


FIGURE 3
ESTIMATED HELIUM CONSUMPTION, BY END USE, IN THE UNITED STATES IN 2008[1]



[1]Total helium used in the United States in 2008 was estimated to be 59.6 million cubic meters.