



2007 Minerals Yearbook

HELIUM [ADVANCE RELEASE]

HELIUM

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Sales of Grade-A helium (99.995% or greater purity) by private industry were 73.5 million cubic meters² (about 2.65 billion cubic feet) in the United States in 2007, and exports by private producers were 64.2 million cubic meters (about 2.32 billion cubic feet) for total sales of 138 million cubic meters (about 4.97 billion cubic feet) of U.S. helium, a slight increase from that of 2006 (table 1). During 2007, domestic helium sales decreased by 2.3%, and helium exports increased by 3.7% compared with those of 2006.

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 the Federal helium reserve in excess of 600 million cubic feet, between January 1, 2005, and January 1, 2015.

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, have had an impact on pricing and availability of cryogenic helium to the scientific community in particular. The NAS has 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 industrial and scientific uses.

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 following part of the legislation is pending completion with applicable status as follows:

The screening and disposal process of the Amarillo Plant was completed by the U.S. General Services Administration (GSA), and the property was sold in October 2007. The environmental cleanup at the Exell helium plant has been completed, and final documents have 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 GSA to start the final screening and disposal process.

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²All 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).

Production

In 2007, 13 companies operated 19 of 21 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 2007. All but two extraction plants used cryogenic extraction processes. Total sales of U.S.-produced helium increased slightly compared with those of 2006. All natural gas processed for helium recovery came from gasfields in Colorado, Kansas, Oklahoma, Texas, Utah, and Wyoming (figure 1). During 2007, 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.

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 its 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 and data from BLM operations represent 100% of the total helium sales and recovery data listed in table 3.

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 approximately 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.

One of BLM's high helium producing wells watered out and the Helium Enrichment Unit (HEU) went down when the Unit's carbon dioxide still developed a hole in late 2006. The completion of the merger of Linde AG and The BOC Group plc to form The Linde Group during 2007 resulted in the companies having to divest some of their assets and business agreements. These events, along with the production problems in Algeria and Qatar, contributed towards helium supply interruptions and delayed deliveries during the latter part of 2006 and throughout most of 2007.

During 2007, the BLM analyzed 96 natural gas samples from 10 States in conjunction with its program to survey and identify possible new sources of helium.

Consumption

In 2007, private industry supplied 100% of domestic helium consumption. The major domestic end uses of helium were cryogenics (28%), pressurizing and purging (26%), welding (20%), and controlled atmospheres (13%). Other uses included chromatography/lifting gas/heat transfer (7%), leak detection (4%), and synthetic breathing mixtures (2%) (figure

3). Cryogenics, specifically magnetic resonance imaging applications, dominated liquid helium use. Estimated 2007 domestic consumption by end use was based on a 2003-04 end-use survey conducted by BLM's Helium Operations to determine trends in helium usage. A new helium end-use survey is scheduled to be completed by 2009.

In 2007, U.S. domestic helium consumption decreased by about 2.3% to 73.5 million cubic meters (about 2.65 billion cubic feet) compared with demand for 2006. This is the third consecutive year that U.S. domestic helium sales have decreased. While U.S. consumption has decreased during the past 3 years, helium consumption outside of the United States has increased. During 2007, U.S. helium exports increased by about 3.7% to 64.2 million cubic meters (about 2.32 billion cubic feet), compared with those of 2006 (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 2007, in-kind crude helium sales were about 5.5 million cubic meters (200 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 611 million cubic meters (about 22.0 billion cubic feet) on December 31, 2007. 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 2007, 15.8 million cubic meters (571 million cubic feet) of private helium was delivered to the BLM's helium conservation system, and 76.5 million cubic meters (about 2.76 billion cubic feet) was withdrawn for a net decrease of 60.7 million cubic meters (about 2.19 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 2007, the price that the BLM charged private companies for crude helium was \$2.118 per cubic meter (\$58.75 per thousand cubic feet).

Foreign Trade

In 2007, exports of Grade-A helium increased to 64.2 million cubic meters (2.32 billion cubic feet). Helium exports increased

by about 3.7% compared with those of 2006 and accounted for about 47% of sales of U.S.-produced helium (table 1); private industry supplied all U.S. helium exports. The increase in helium exports is attributed to significantly increased shipments of helium to Brazil, Canada, China, Japan, the Republic of Korea, Taiwan, and the United Kingdom. About 57% of the helium exported from the United States went to Asia, with Japan receiving about 25% of total exports. About 20% 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, 12%; South America, 7%; Australia and New Zealand, 2%; and the Middle East, Africa, Central America, and the Caribbean, less than 1% each. For 2007, 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 is currently estimated to be about 61 million cubic meters (2.20 billion cubic feet) (table 5). During 2007, the helium plants in Algeria and Qatar that came onstream in late 2005, continued to have operational problems, resulting in production outputs substantially below their capacities. All known helium that was produced outside the United States in 2007 was extracted in Algeria, Poland, Qatar, and Russia.

Outlook

In 2007, total market sales for U.S.-produced helium increased by less than 1% compared with those of 2006. From 2002 to 2007, the market growth rate was about 1.6% per year, while from 1997 to 2007, the market growth rate was about 2.6% per year. Sales of U.S.-produced helium are expected to remain level, while U.S. helium export demand is expected to rise slightly during 2008.

GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

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TABLE 1
 TOTAL SALES OF GRADE-A HELIUM
 PRODUCED IN THE UNITED STATES¹

(Million cubic meters)

Year	Volume		Total sales
	Domestic sales	Exports ²	
2003	80.8	41.3	122
2004	85.1	44.9	130
2005	81.6	51.4	133
2006	75.2	61.9	137
2007	73.5	64.2	138

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Source: U.S. Census Bureau.

TABLE 2
OWNERSHIP AND LOCATION OF HELIUM EXTRACTION PLANTS IN THE UNITED STATES IN 2007

Owner or operator	Location	Product purity
Air Products and Chemicals, Inc.	Hansford County, TX	Grade-A helium. ¹
Do.	Liberal, KS	Do. ¹
SemKan, L.P. ²	Dodge City, KS	Crude helium.
BOC Global Helium, Inc.	Otis, KS	Grade-A helium. ¹
BP America Production Company	Sunray, TX	Crude helium.
Do.	Ulysses, KS	Do.
Midstream Energy Services, LLC ³	Keyes, OK	Crude and Grade-A helium. ¹
K-L Energy Partners, LLC ⁴	Lakin, KS	Crude helium.
DCP Midstream	Cheyenne Wells, CO	Crude and Grade-A helium. ¹
Do.	Hansford County, TX	Crude helium.
Do.	Liberal, KS	Do.
Do.	Borger, TX	Do.
Exxon Mobil Corp.	Shute Creek, WY	Crude and Grade-A helium. ¹
Shiprock Helium ⁵	Shiprock, NM	Grade-A helium.
ONEOK, Field Services ⁶	Bushton, KS	Crude helium.
Do. ⁷	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. ¹
EnCana Oil & Gas (USA) Inc.	Moab, UT	Crude and Grade-A helium. ¹

Do. Ditto.

¹Including liquefaction.

²Plant back online in late 2005

³Midstream Energy Services, LLC purchased plant from Nathaniel Energy in March 2006.

⁴Plant did not produce helium during 2007.

⁵Shiprock Helium purchased plant from Newpoint Gas Services, Inc. during 2005. Plant back online January 2006.

⁶Plant did not produce helium during 2007.

⁷Output is piped to Ulysses, KS, for purification.

TABLE 3
HELIUM RECOVERY IN THE UNITED STATES¹

(Thousand cubic meters)

	2003	2004	2005	2006	2007
Crude helium:					
Bureau of Land Management (BLM) sold (in-kind and open market)	51,800	29,300	41,400	63,500	58,800
Private industry:					
Private helium accepted and stored by BLM	19,400	19,100	17,000	18,100	15,800
Helium withdrawn from storage	-54,500	-63,100	-74,100	-75,800	-76,500
Total net helium put into storage	-35,100	-44,000	-57,100	-57,700	-60,700
Grade-A helium:					
Private industry sold	122,000	130,000	133,000	137,100	137,700
Total helium stored	-35,100	-44,000	-57,100	-57,700	-60,700
Helium recovery from natural gas	86,900	86,000	75,900	79,400	77,000

¹Negative 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)

	2005	2006	2007
Helium in conservation storage system on January 1:			
Stored under BLM conservation program ³	741,000	699,000	634,200
Stored for private producers under contract	47,000	32,000	37,400
Total³	788,000	731,000	671,600
Input to system:			
Net deliveries from BLM plants	--	--	--
Stored for private producers under contract	17,000	18,100	15,800
Total³	17,000	18,100	15,800
Redelivery of helium stored for private producers under contract	-74,100	-75,800	-76,500
Net addition to system³	-57,100	-57,700	-60,700
Helium in conservation storage system on December 31:			
Stored under BLM conservation program ³	699,000	634,200	583,500
Stored for private producers under contract	32,000	37,400	27,600
Total³	731,000	671,600	611,100

-- Zero.

¹Crude 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.

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

³Net 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, 2007

(Million cubic meters)

	Capacity
United States ¹	152
Rest of world ^c	61
Total^c	213

^cEstimated.

¹Includes plants on standby as well as operating plants.

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

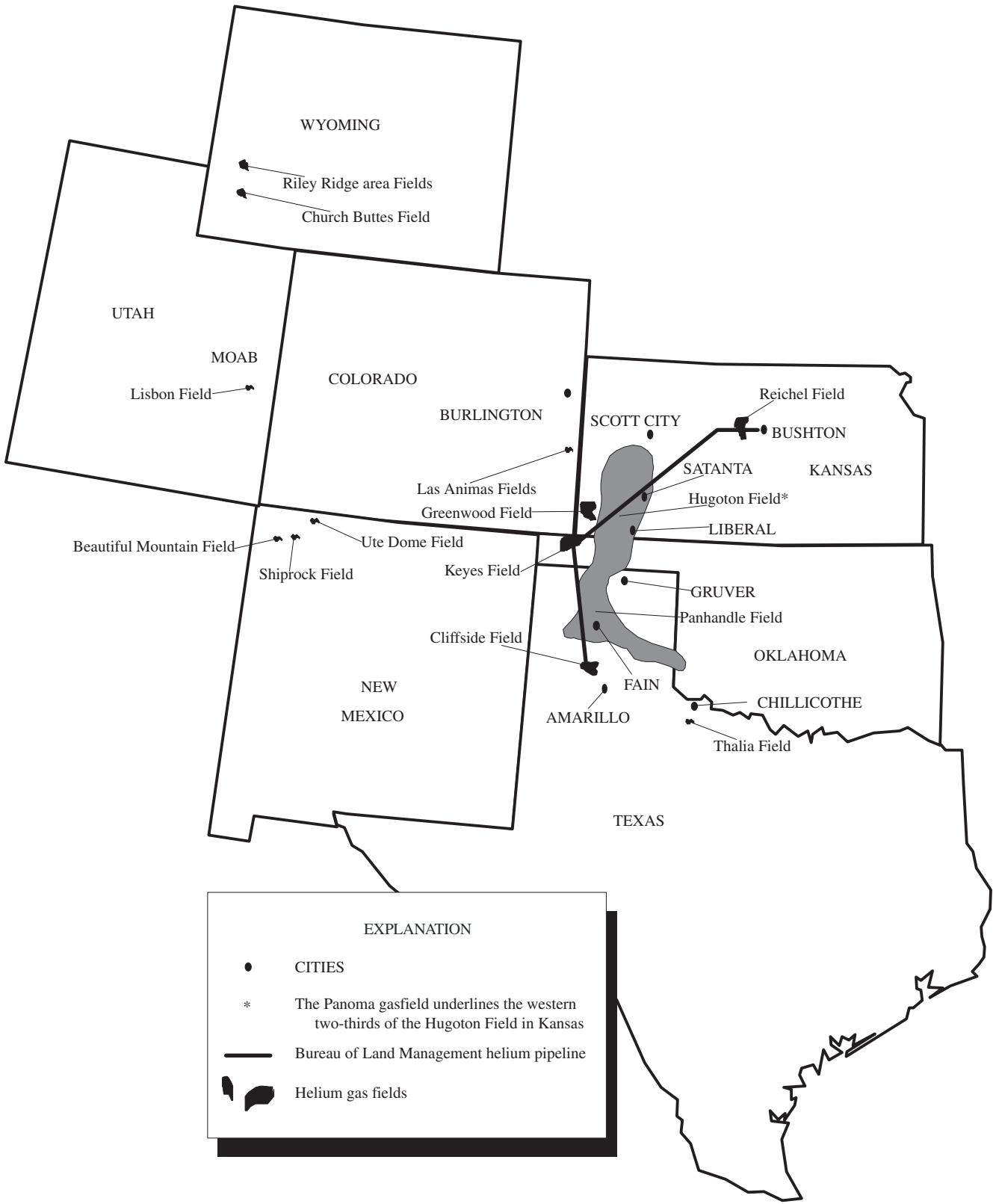


FIGURE 2
HELIUM RECOVERY IN THE UNITED STATES

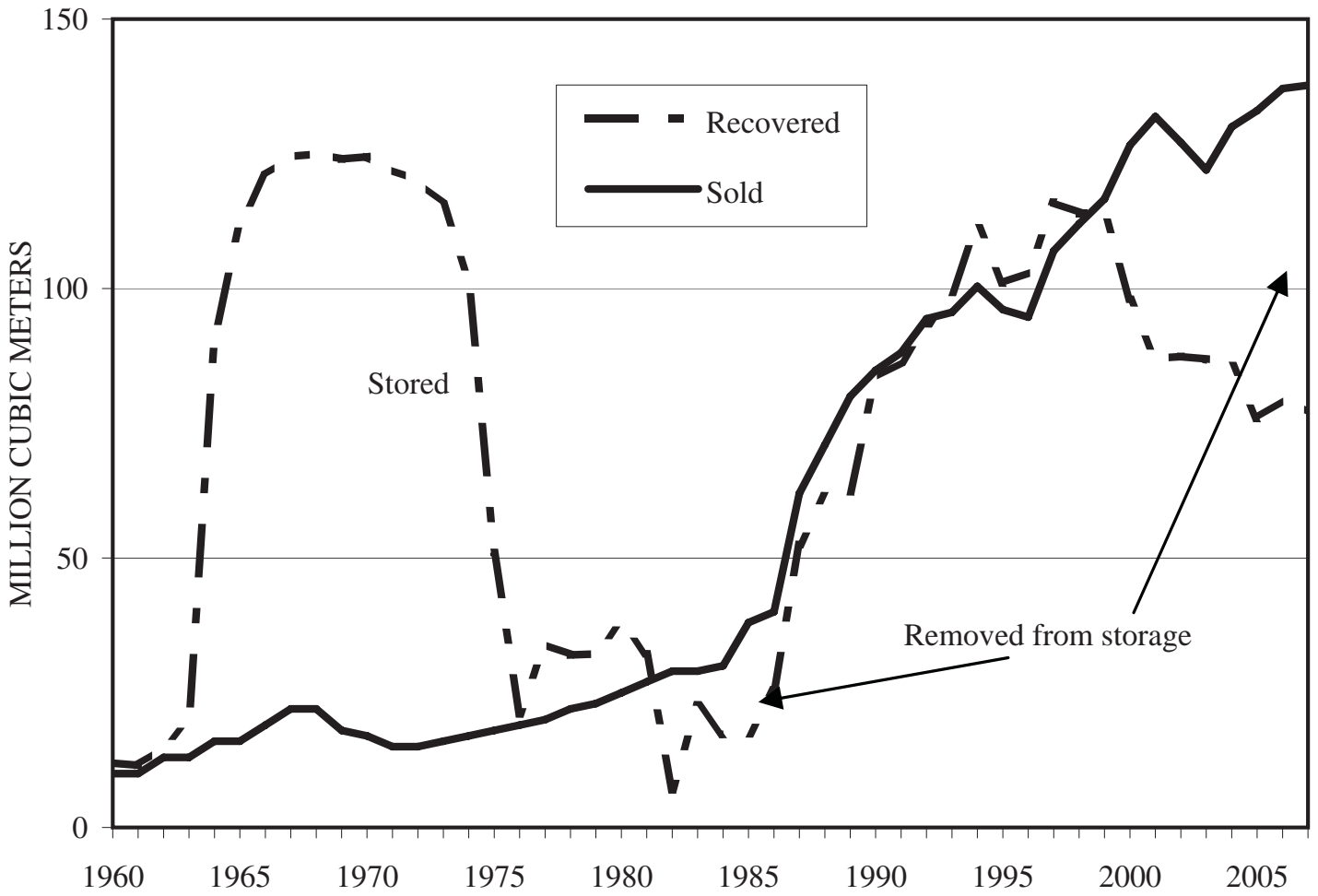
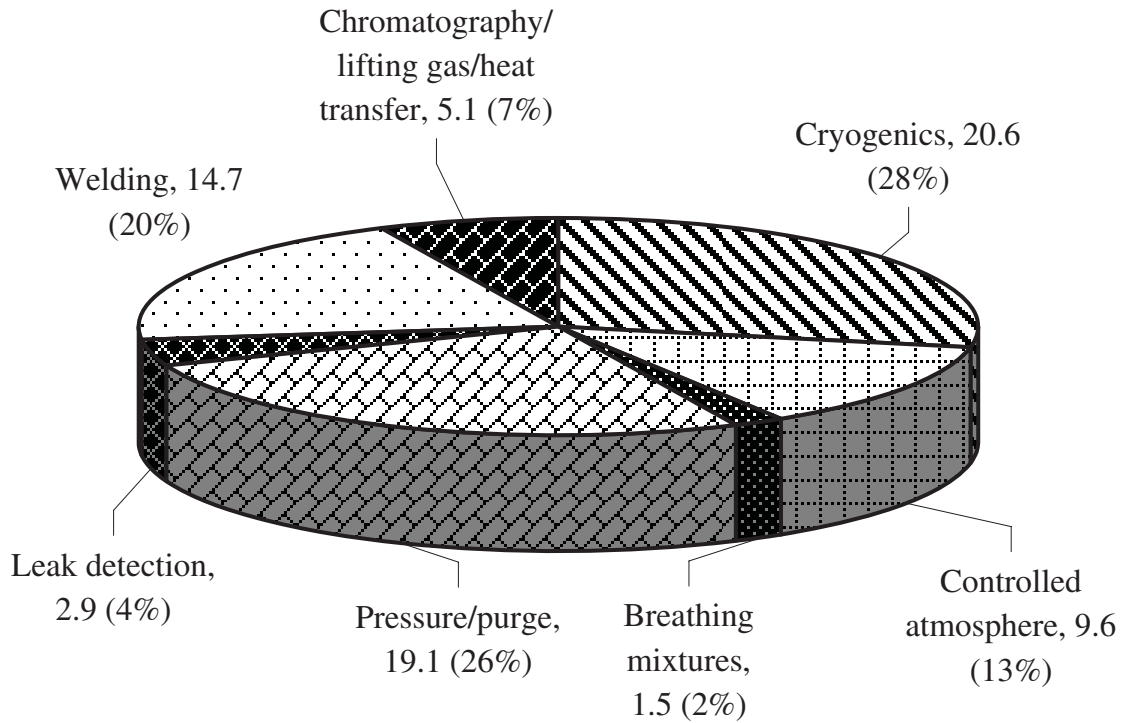


FIGURE 3
ESTIMATED HELIUM CONSUMPTION, BY END USE, IN THE UNITED STATES IN 2007¹
(Million cubic meters)



¹Total helium used in the United States in 2007 was estimated to be 73.5 million cubic meters.