

2006 Minerals Yearbook

HELIUM

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Sales of Grade-A helium (99.995% or greater purity) by private industry were 75.2 million cubic meters¹ (about 2.71 billion cubic feet) in the United States in 2006, and exports by private producers were 61.9 million cubic meters (about 2.23 billion cubic feet) for total sales of 137 million cubic meters (about 4.94 billion cubic feet) of U.S. helium, a 3.1% increase from that of 2005 (table 1). During 2006, domestic helium sales decreased by 7.8%, and helium exports increased by 20.4% compared with those of 2005.

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 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 U.S. General Services Administration (GSA) continues the screening and disposal process of the Amarillo Plant per Federal property management regulations. 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).

Production

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

In 2006, 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 2006. All but two extraction plants used cryogenic extraction processes. Total sales of U.S.-produced helium increased by 3.1% compared with those of 2005. All natural gas processed for helium recovery came from gasfields in Colorado, Kansas, Oklahoma, Texas, Utah, and Wyoming (fig. 1). During 2006, 10 private plants purified helium by using pressure swing adsorption technology. Ten privately owned plants that produced Grade-A helium also liquefied helium. The plant operators and plant locations are listed in table 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 approximately 102 gasfields in 11 States. About 98% 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.

During 2006, the BLM analyzed 78 natural gas samples from 10 States in conjunction with its program to survey and identify possible new sources of helium.

Consumption

In 2006, 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%) (fig. 3). Cryogenics, specifically magnetic resonance imaging applications, dominated liquid helium use. Estimated 2006 domestic consumption by end use was based on a 2003-04 end-use survey conducted by the BLM's Helium Operations to determine trends in helium usage.

In 2006, U.S. domestic helium consumption decreased by about 7.8% to 75.2 million cubic meters (about 2.71 billion cubic feet) compared with that for 2005. This was the second consecutive year that U.S. domestic helium sales decreased. While U.S. consumption has decreased during the past 2 years, helium consumption outside the United States has increased. During 2006, U.S. helium exports increased by about 20.6% to 61.9 million cubic meters (about 2.23 billion cubic feet) compared with those of 2005 (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 2006, in-kind crude helium sales were about 5.2 million cubic meters (187 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 672 million cubic meters (about 24.2 billion cubic feet) on December 31, 2006. The storage system contained crude helium purchased under contract by the BLM 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 2006, 18.1 million cubic meters (653 million cubic

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¹All 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).

feet) of private helium was delivered to the BLM's helium conservation system, and 75.8 million cubic meters (about 2.73 billion cubic feet) was withdrawn for a net decrease of 57.7 million cubic meters (about 2.08 billion cubic feet) of private helium in storage (tables 3, 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 2006, the price that the BLM charged private companies for crude helium was \$2.037 per cubic meter (\$56.50 per thousand cubic feet).

Foreign Trade

In 2006, exports of Grade-A helium increased by 20.4% to 61.9 million cubic meters (2.23 billion cubic feet) from those of 2005 and accounted for about 45% 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 increased demand for helium from Belgium, Brazil, Canada, China, Japan, the Republic of Korea, Mexico, Taiwan, and the United Kingdom. About 56% of the helium exported from the United States went to Asia, with Japan receiving about 26% of total exports. About 23% of the exported helium was shipped to Europe; collectively, Belgium, France, Germany, and the United Kingdom received 95% of the helium exported to Europe. Other exports were as follows: Canada and Mexico, 10%; Australia and New Zealand, 3%; South America, 6%; the Middle East, 2%; and Africa, Central America, and the Caribbean, less than 1% each. For 2006, 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). All known helium that was produced outside the United States in 2006 was extracted in Algeria, Poland, Qatar, and Russia.

Outlook

In 2006, total market sales for U.S.-produced helium increased by about 3.1% compared with those of 2005. From 2001 to 2006, the average annual market growth rate was less than 1%, while from 1996 to 2006, the average annual market growth rate was about 3.8%. Sales of U.S.-produced helium are expected to increase by about 3% for 2007. With the problems encountered in bringing on the new helium production from Algeria and Qatar, United States helium exports are expected to rise again during 2007.

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 STATES

(Million cubic meters)

	Domestic		Total
Year	sales	Exports ¹	sales ²
2002	87.6	39.5	127
2003	80.8	41.3	122
2004	85.1	44.9	130
2005	81.6	51.4	133
2006	75.2	61.9	137

¹Source: U.S. Census Bureau.

²May not add to totals shown because of independent rounding.

TABLE 2
OWNERSHIP AND LOCATION OF HELIUM EXTRACTION PLANTS IN THE UNITED STATES IN 2006

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

¹Including liquefaction.

²Plant did not produce helium during 2006.

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

⁴Output is piped to Ulysses, KS, for purification.

⁵Plant back online in late 2005.

⁶Shiprock Helium purchased plant from Newpoint Gas Services, Inc. during 2005. Plant back online January 2006.

TABLE 3 HELIUM RECOVERY IN THE UNITED STATES¹

(Thousand cubic meters)

	2002	2003	2004	2005	2006
Crude helium:					
Bureau of Land Management (BLM) sold (in-kind and open market)		51,800	29,300	41,400	63,500
Private industry:					
Private helium accepted and stored by BLM ¹	16,600	19,400	19,100	17,000	18,100
Helium withdrawn from storage	-56,300	-54,500	-63,100	-74,100	-75,800
Total net helium put into storage	-39,700	-35,100	-44,000	-57,100	-57,700
Grade-A helium:					
Private industry sold	127,100	122,000	130,000	133,000	137,100
Total helium stored	-39,700	-35,100	-44,000	-57,100	-57,700
Helium recovery from natural gas	87,400	86,900	86,000	75,900	79,400

-- Zero.

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)

	2004	2005	2006
Helium in conservation storage system on January 1:			
Stored under BLM conservation program ³	770,000	741,000	699,000
Stored for private producers under contract	62,000	47,000	32,000
Total ³	832,000	788,000	731,000
Input to system:			
Net deliveries from BLM plants			
Stored for private producers under contract	19,100	17,000	18,100
Total ³	19,100	17,000	18,100
Redelivery of helium stored for private producers under contract	-63,100	-74,100	-75,800
Net addition to system ³	-44,000	-57,100	-57,700
Helium in conservation storage system on December 31:			
Stored under BLM conservation program ³	741,000	699,000	634,200
Stored for private producers under contract	47,000	32,000	37,400
Total ³	788,000	731,000	671,600

-- 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, 2006

(Million cubic meters)

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

^eEstimated.

¹Includes plants on standby as well as operating plants.

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

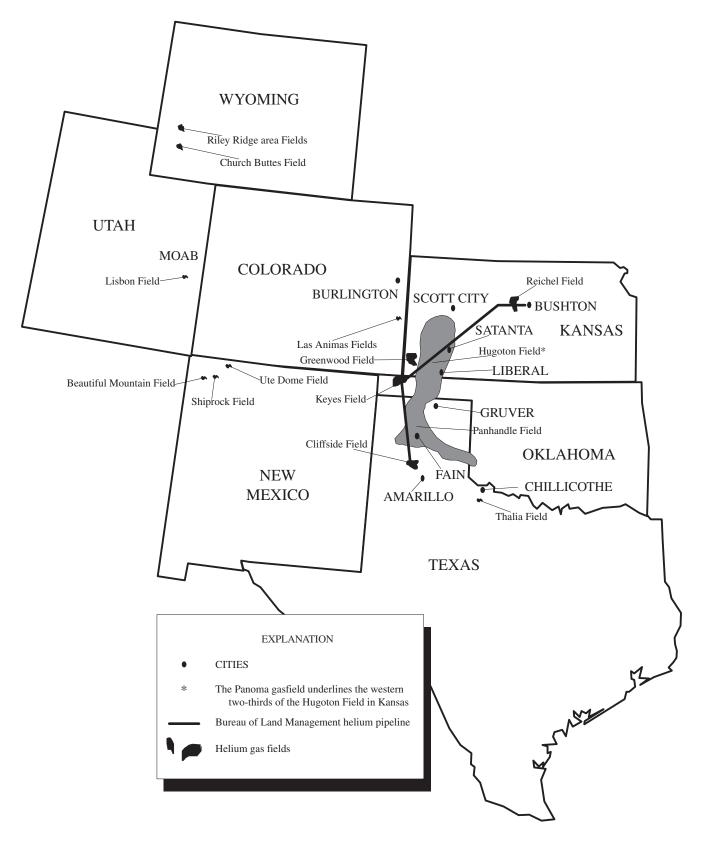


FIGURE 2 HELIUM RECOVERY IN THE UNITED STATES

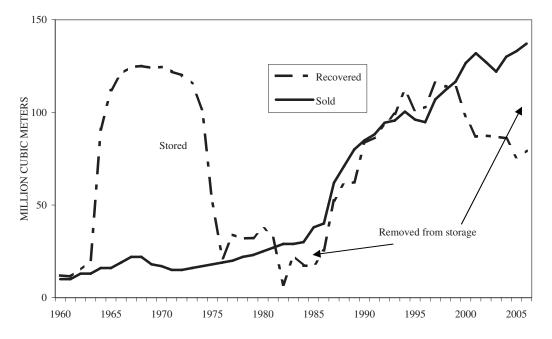
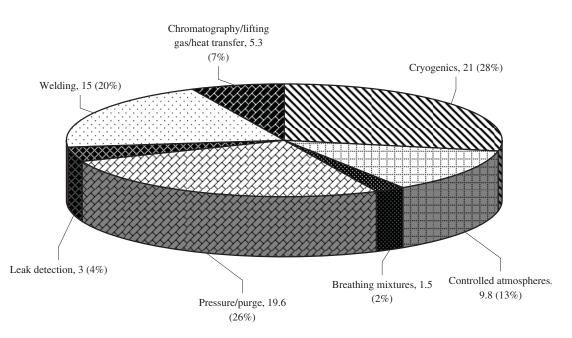


FIGURE 3 ESTIMATED HELIUM CONSUMPTION, BY END USE, IN THE UNITED STATES IN $2006^{\rm l}$

(Million cubic meters)



¹Total helium used in the U.S. in 2006 was estimated to be 75.2 million cubic meters.