## HELIUM

(Data in million cubic meters of contained helium gas, unless otherwise noted)

Domestic Production and Use: During 1999, the estimated value of Grade-A helium (99.995% or better) extracted by private industry was about \$215 million. There are 13 private industry plants (5 in Kansas, 4 in Oklahoma, and 4 in Texas) that extract helium from natural gas and produce only a crude helium product that varies from 50% to 80% helium. There are six private industry plants (two in Colorado, and one each in Oklahoma, Texas, Utah, and Wyoming) that extract helium from natural gas and produce an intermediate process stream of crude helium (about 70% helium) and continue processing the stream to produce a Grade-A helium product. There are five private industry plants (four in Kansas and one in Texas) that accept a crude helium product from other producers and the Bureau of Land Management (BLM) pipeline and purify this to a Grade-A helium product. The BLM Exell Helium Plant extracted helium from natural gas, combined this product with crude helium from the BLM pipeline, and purified it to Grade-A helium. This plant ceased operation in March 1998. The estimated 1999 domestic consumption of 78.7 million cubic meters (2.84 billion cubic feet) was used for cryogenic applications, 24%; for pressurizing and purging, 20%; for welding cover gas, 18%; for controlled atmospheres, 16%; leak detection, 6%; breathing mixtures, 3%; and other, 13%.

Salient Statistics—United States:	<u> 1995</u>	<u>1996</u>	<u> 1997</u>	1998	<u>1999</u> °
Helium extracted from natural gas <sup>2</sup>	101	103	116	112	118
Withdrawn from storage <sup>3</sup>	(5.2)	(8.3)	(9.3)	(0.7)	(10)
Grade-A helium sales	96	95	107	112	108
Imports for consumption	_	_		_	_
Exports <sup>4</sup>	27.7	22.8	29.5	27.8	29.3
Consumption, apparent <sup>4</sup>	68.1	67.1	77.4	83.5	78.7
Employment, plant, number <sup>e</sup>	635	631	605	531	500
Net import reliance <sup>5</sup> as a percent of apparent consumption	Е	Е	Е	Е	Е

Price: The government price for helium contained in crude helium was \$1.767 per cubic meter (\$49.00 per thousand cubic feet) in FY 1999. For FY 2000 the price will be \$1.785 per cubic meter (\$49.50 per thousand cubic feet). The price for the government-owned helium is mandated by Public Law 104-273. Private industry's estimated price for Grade-A gaseous helium was about \$1.514 per cubic meter (\$42 per thousand cubic feet), with some producers posting surcharges to this price.

**Recycling:** In the United States, helium used in large-volume applications is seldom recycled. Some low-volume or liquid boil-off recovery systems are used. In Western Europe and Japan, helium recycling is practiced when economically feasible.

Import Sources (1995-98): None.

<u>Tariff</u> : Item	Number	Normal Trade Relations
		<u>12/31/99</u>
Helium	2804.29.0010	3.7% ad val.

<u>Depletion Allowance</u>: Allowances are applicable to natural gas from which helium is extracted, but no allowance is granted directly to helium.

Government Stockpile: The Federal Helium Reserve is an operation run pursuant to Public Law 104-273. Since the BLM can no longer supply Grade-A helium to federal agencies, private suppliers that sell Grade-A helium to the federal agencies are now required to purchase a like amount of crude helium (in-kind) from the BLM. During FY 1999, BLM's Amarillo Field Office, Helium Operations (AMFO) accepted more than 24.9 million cubic meters (898 million cubic feet) of private helium for storage and redelivered nearly 25.5 million cubic meters (919 million cubic feet). Also in 1999, privately owned companies purchased nearly 6.04 million cubic meters (218 million cubic feet) of in-kind crude helium for a total net increase in privately owned storage of more than 5.46 million cubic meters (197 million cubic feet). As of September 30, 1999, 136 million cubic meters (4.9 billion cubic feet) of helium was owned by private firms, which is the largest amount to date.

## Stockpile Status 9-30-99<sup>6</sup>

	Uncommitted	Committed	Authorized	Disposal plan	Disposals
Material	inventory	inventory	for disposal	FY 1999	FY 1999
Helium	832.4	16.6	832.4	_	6.04

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**Events, Trends, and Issues:** During 1999, merger and acquisition activity involving companies such as BOC Gases, Inc., Air Products and Chemicals Inc., and Air Liquide appear ready to significantly reshape the United States' private helium industry. The new AMOCO plant began full crude helium production replacing the decommissioned Trident plant in Kansas. There were also capacity expansions made at some of the purification plants along the BLM pipeline. The AMFO continued crude helium sales, operation of the pipeline and storage field, and collection of helium royalties and fees. There was also a proposal to expand the helium handling capacity of the Algerian plant which would have a significant impact on the private helium industry in the United States.

It is estimated that in 1999 domestic production of helium will be near 118 million cubic meters (4.25 billion cubic feet) and that U.S. consumption will be more than 78.7 million cubic meters (2.84 billion cubic feet). Exports from the United States are expected to increase slightly more than 1998 levels. With the apparent mitigation of the economic uncertainties of the previous year in Asia, normal growth patterns are expected to return.

## World Production, Reserves, and Reserve Base:

	Production		Reserves <sup>8</sup>	Reserve base <sup>8</sup>	
	1998	1999°			
United States	112	118	6,000	<sup>9</sup> 11,100	
Algeria	16	16	NA	2,100	
Canada	NA	NA	NA	2,100	
China	NA	NA	NA	1,100	
Poland	1.4	1.4	40	280	
Former Soviet Union <sup>10</sup>	4.2	4.2	1,700	6,700	
Other countries	<u>NA</u>	<u>NA</u>	NA	2,800	
World total (rounded)	134	140	$\overline{NA}$	26,200	

World Resources: The identified helium resources of the United States were estimated to be about 11.1 billion cubic meters (400 billion cubic feet) as of January 1, 1999. This includes 0.971 billion cubic meter (35 billion cubic feet) of helium stored in the Cliffside Field, 6.0 billion cubic meters (215 billion cubic feet) of helium in helium-rich natural gas (0.30% helium or more), and 4.1 billion cubic meters (148 billion cubic feet) in helium-lean natural gas (less than 0.30% helium). The Hugoton (Kansas, Texas, and Oklahoma), Panhandle West, Panoma, and Riley Ridge Fields are currently depleting gasfields and contain an estimated 4.4 billion cubic meters (159 billion cubic feet) of helium. Future supplies will probably come from known helium-rich natural gas with little fuel value and from helium-lean resources.

Helium resources of the world exclusive of the United States were estimated to be about 15.1 billion cubic meters (544 billion cubic feet). The locations and volumes of the principal deposits, in billion cubic meters, are the Former Soviet Union, 6.7; Algeria, 2.1; Canada, 2.1; China, 1.1; Poland, 0.3. As of January 1, 1999, AMFO had analyzed nearly 21,000 gas samples from 26 countries and the United States in a program to identify world helium resources.

<u>Substitutes</u>: There is no substance that can be substituted for helium if temperatures below -429° F are required. Argon can be substituted for helium in welding, and hydrogen can be substituted for helium in some lighter-than-air applications in which the flammability of hydrogen is not objectionable. Hydrogen is also being investigated as a substitute for helium in deep-sea diving applications below 1,000 feet.

<sup>&</sup>lt;sup>e</sup>Estimated. E Net exporter. NA Not available.

<sup>&</sup>lt;sup>1</sup>Measured at 101.325 kilopascals absolute (14.696 psia) and 15° C. 27.737 cubic meters of helium at 15° C, 101.325 kPa (absolute) = 1 Mcf of helium at 70° F and 14.7 psia.

<sup>&</sup>lt;sup>2</sup>Helium content of both Grade-A and crude helium (consisting of approximately 70% helium and 30% nitrogen).

<sup>&</sup>lt;sup>3</sup>Extracted from natural gas in prior years (injected in parentheses).

<sup>4</sup>Grade-A helium.

<sup>&</sup>lt;sup>5</sup>Defined as imports - exports + adjustments for Government and industry stock changes.

<sup>&</sup>lt;sup>6</sup>See Appendix B for definitions.

<sup>&</sup>lt;sup>7</sup>The author is a petroleum engineer with the Bureau of Land Management, Amarillo Field Office, Helium Operations, Amarillo, TX.

<sup>&</sup>lt;sup>8</sup>See Appendix C for definitions.

<sup>&</sup>lt;sup>9</sup>All domestic measured and indicated helium resources in the United States.

<sup>&</sup>lt;sup>10</sup>As constituted before December 1991.