

COBALT

(Data in metric tons of cobalt content, unless otherwise noted)

Domestic Production and Use: With the exception of negligible amounts of byproduct cobalt produced as intermediate products from some mining operations, the United States did not mine or refine cobalt in 1997. U.S. supply was comprised of imports, stock releases, and secondary sources such as superalloy scrap, cemented carbide scrap, and spent catalysts. About 13 recyclers accounted for nearly all the cobalt recycled in superalloy scrap. There were two producers of extra-fine cobalt powder: One produced powder from imported primary metal and another produced powder from recycled materials. In addition to the powder producers, six companies were known to be active in the production of cobalt compounds. More than 100 industrial consumers were surveyed on a monthly or annual basis. About 85% of U.S. consumption of cobalt was in five major end uses. Superalloys, used mainly in aircraft gas turbine engines, accounted for about 46% of U.S. demand; cemented carbides, paint driers, and magnetic alloys each accounted for about 10%; catalysts about 9%; and other, 15%. The total estimated value of cobalt consumed in 1997 was \$420 million.

Salient Statistics—United States:	1993	1994	1995	1996	1997^e
Production: Mine	—	—	—	—	—
Secondary	1,570	1,570	1,540	1,670	2,000
Imports for consumption	5,950	6,780	6,440	6,710	7,400
Exports	795	1,360	1,300	1,660	1,700
Shipments from Government stockpile excesses	289	1,500	1,550	2,050	1,500
Consumption:					
Reported (includes secondary)	6,430	7,020	7,030	7,010	7,500
Apparent (includes secondary)	7,310	8,470	8,640	8,810	9,200
Price, average annual spot for cathodes, dollars per pound	13.79	24.66	29.21	25.50	23.00
Stocks, industry, yearend	1,460	1,490	1,080	1,030	1,030
Net import reliance ¹ as a percent of apparent consumption	79	81	82	81	78

Recycling: About 2,000 tons of cobalt was recycled from purchased scrap in 1997. This represented about 27% of estimated reported consumption for the year.

Import Sources (1993-96): Cobalt contained in metal, oxide, and salts: Norway, 21%; Zambia, 19%; Finland, 16%; Canada, 14%; and other, 30%. Since 1991, imports from Congo (Kinshasa)² and Zambia have decreased, while imports from Finland, Norway, and Russia have increased.

Tariff: Item	Number	Most favored nation (MFN)³ 12/31/97	Non-MFN⁴ 12/31/97
Unwrought cobalt, alloys	8105.10.3000	4.8% ad val.	45% ad val.
Unwrought cobalt, other	8105.10.6000	Free	Free.
Cobalt matte, waste, and scrap	8105.10.9000	Free	Free.
Wrought cobalt and cobalt articles	8105.90.0000	4.4% ad val.	45% ad val.
Chemical compounds:			
Cobalt oxides and hydroxides	2822.00.0000	0.1% ad val.	1.7% ad val.
Cobalt sulfates	2833.29.1000	1.4% ad val.	6.5% ad val.
Cobalt chlorides	2827.34.0000	4.2% ad val.	30% ad val.
Cobalt carbonates	2836.99.1000	4.2% ad val.	30% ad val.
Cobalt acetates	2915.23.0000	4.2% ad val.	30% ad val.
Cobalt ores and concentrates	2605.00.0000	Free	Free.

Depletion Allowance: 22% (Domestic), 14% (Foreign).

Government Stockpile: Sales of National Defense Stockpile cobalt began in March 1993. The Department of Defense's proposed annual materials plan includes a cobalt disposal limit of 2,720 tons (6 million pounds) during fiscal year 1998.

Stockpile Status—9-30-97⁵

Material	Uncommitted inventory	Committed inventory	Authorized for disposal	Disposal plan FY 1997	Disposals FY 1997
Cobalt	17,300	261	10,900	2,720	1,060

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Events, Trends, and Issues: World cobalt production is expected to increase significantly in the next 5 years with the opening of new nickel and copper mines and the startup of projects to recover cobalt from stockpiled tailings, slags, and concentrates. World demand is also expected to increase, particularly in the superalloy and battery end-use sectors. In 1997, cobalt exports from Russia and sales from the National Defense stockpile continued to contribute to supply. The free market price for cobalt cathode decreased from approximately \$22 per pound in January to a low of \$19 per pound in March. The price then increased and peaked at \$26 per pound in May, dropped to \$22 per pound in June, then increased to \$25 per pound in September.

World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves ⁶	Reserve base ⁶
	1996	1997 ^e		
United States	—	—	—	860,000
Australia	2,300	2,500	270,000	600,000
Canada	5,800	5,600	45,000	260,000
Congo (Kinshasa) ²	2,000	2,500	2,000,000	2,500,000
Cuba	1,970	1,950	1,000,000	1,800,000
New Caledonia ⁷	800	800	230,000	860,000
Philippines	—	—	—	400,000
Russia	3,300	4,300	140,000	230,000
Zambia	7,900	6,500	360,000	540,000
Other countries	<u>2,920</u>	<u>2,920</u>	<u>90,000</u>	<u>1,200,000</u>
World total (may be rounded)	27,000	27,000	4,000,000	9,000,000

World Resources: The cobalt resources of the United States are estimated to be about 1.3 million tons. Most of these resources are in Minnesota, but other important occurrences are in Alaska, California, Idaho, Missouri, Montana, and Oregon. Although large, most domestic resources are in subeconomic concentrations that will not be economical in the foreseeable future. In addition, with the exception of Idaho, any cobalt production from these deposits would be as a byproduct of another metal. The identified world cobalt resources are about 11 million tons. The vast majority of these resources are in nickel-bearing laterite deposits, with most of the rest occurring in nickel-copper sulfide deposits hosted in mafic and ultramafic rocks in Australia, Canada, and Russia, and in the sedimentary copper deposits of Congo (Kinshasa)² and Zambia. In addition, millions of tons of hypothetical and speculative cobalt resources exist in manganese nodules and crusts on the ocean floor. Cobalt reserves and reserve base for Australia have been revised to be consistent with data published by the Australian Bureau of Resource Sciences.

Substitutes: Periods of high prices and concern about availability have resulted in various efforts to conserve, reduce, or substitute for cobalt. In many applications, further substitution of cobalt would result in a loss in product performance. Potential substitutes include barium or strontium ferrites, neodymium-iron-boron, or nickel-iron alloys in magnets; nickel, cermets, or ceramics in cutting and wear-resistant materials; nickel base alloys or ceramics in jet engines; nickel in petroleum catalysts; rhodium in hydroformylation catalysts; nickel or manganese in batteries; and manganese, iron, cerium, or zirconium in paints.

^eEstimated.

¹Defined as imports - exports + adjustments for Government and industry stock changes.

²Formerly Zaire.

³No tariff for Canada or Mexico.

⁴See Appendix B.

⁵See Appendix C for definitions.

⁶See Appendix D for definitions.

⁷Overseas territory of France.