

## COBALT

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

**Domestic Production and Use:** Significant U.S. cobalt mine production has not been reported since 1971, and production of refined cobalt from imported nickel-copper-cobalt matte ceased in 1985. U.S. supply comprised imports, stock releases, and secondary (scrap) materials. The sole U.S. producer of extra-fine cobalt powder, in Pennsylvania, used cemented carbide scrap as feed. Seven companies were known to produce cobalt compounds. More than 60 industrial consumers were surveyed on a monthly or annual basis. Data reported by these consumers indicate that 47% of the cobalt consumed in the United States was used in superalloys, mainly in aircraft gas turbine engines; 9% in cemented carbides for cutting and wear-resistant applications; 16% in various other metallic applications; and 28% in a variety of chemical applications. The total estimated value of cobalt consumed in 2011 was \$380 million.

<b>Salient Statistics—United States:</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011<sup>e</sup></b>
Production:					
Mine	—	—	—	—	—
Secondary	1,930	1,930	1,790	2,000	2,200
Imports for consumption	10,300	10,700	7,680	11,100	10,000
Exports	3,100	2,850	2,440	2,640	3,400
Shipments from Government stockpile excesses <sup>1</sup>	617	203	180	-8	—
Consumption:					
Reported (includes secondary)	9,320	8,820	7,470	8,030	9,000
Apparent <sup>2</sup> (includes secondary)	9,630	10,100	7,580	10,300	8,700
Price, average, dollars per pound:					
Spot, cathode <sup>3</sup>	30.55	39.01	17.86	20.85	18.00
London Metal Exchange (LME), cash	XX	XX	XX	XX	16.00
Stocks, yearend:					
Industry	1,310	1,160	780	880	930
LME, U.S. warehouse	XX	XX	XX	23	40
Net import reliance <sup>4</sup> as a percentage of apparent consumption	80	81	76	81	75

**Recycling:** In 2011, cobalt contained in purchased scrap represented an estimated 24% of cobalt reported consumption.

**Import Sources (2007–10):** Cobalt contained in metal, oxide, and salts: China, 18%; Norway, 16%; Russia, 13%; Canada, 10%; and other, 43%.

<b>Tariff: Item</b>	<b>Number</b>	<b>Normal Trade Relations<sup>5</sup> 12-31-11</b>
Cobalt ores and concentrates	2605.00.0000	Free.
Chemical compounds:		
Cobalt oxides and hydroxides	2822.00.0000	0.1% ad val.
Cobalt chlorides	2827.39.6000	4.2% ad val.
Cobalt sulfates	2833.29.1000	1.4% ad val.
Cobalt carbonates	2836.99.1000	4.2% ad val.
Cobalt acetates	2915.29.3000	4.2% ad val.
Unwrought cobalt, alloys	8105.20.3000	4.4% ad val.
Unwrought cobalt, other	8105.20.6000	Free.
Cobalt mattes and other intermediate products; cobalt powders	8105.20.9000	Free.
Cobalt waste and scrap	8105.30.0000	Free.
Wrought cobalt and cobalt articles	8105.90.0000	3.7% ad val.

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

### **Government Stockpile:**

<b>Material</b>	<b>Stockpile Status—9-30-11<sup>6</sup></b>			
	<b>Uncommitted inventory</b>	<b>Authorized for disposal</b>	<b>Disposal plan FY 2011</b>	<b>Disposals FY 2011</b>
Cobalt	301	301	301	—

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**Events, Trends, and Issues:** During the first half of 2011, the world availability of refined cobalt (as measured by production and U.S. Government shipments) was 12% higher than that of the first half of 2010. China showed the largest increase in production; production from Canada, Finland, and Zambia also increased significantly. In the next few years, global increases in supply from existing producers and new projects are forecast to outpace increases in consumption. If an oversupply of cobalt takes place, it could lead to a downward trend in prices.

Worldwide cobalt inventories in London Metal Exchange (LME) warehouses increased to 325 tons in late November from 278 tons at yearend 2010.

China was the world's leading producer of refined cobalt, and much of its production was from cobalt-rich ore and partially refined cobalt imported from Congo (Kinshasa). China was a leading supplier of cobalt imports to the United States.

**World Mine Production and Reserves:** Reserves for Brazil were revised based on information from a Government report. Reserves for Canada and "Other countries" were revised based on company reports.

	Mine production		Reserves <sup>7</sup>
	2010	2011 <sup>e</sup>	
United States	—	—	33,000
Australia	3,850	4,000	<sup>8</sup> 1,400,000
Brazil	1,600	1,700	87,000
Canada	4,600	7,200	130,000
China	6,500	6,500	80,000
Congo (Kinshasa)	47,400	52,000	3,400,000
Cuba	3,600	3,600	500,000
Morocco	2,200	2,500	20,000
New Caledonia <sup>9</sup>	1,000	2,000	370,000
Russia	6,200	6,300	250,000
Zambia	5,700	5,700	270,000
Other countries	6,800	7,000	990,000
World total (rounded)	89,500	98,000	7,500,000

**World Resources:** Identified cobalt resources of the United States are estimated to be about 1 million tons. Most of these resources are in Minnesota, but other important occurrences are in Alaska, California, Idaho, Missouri, Montana, and Oregon. With the exception of resources in Idaho and Missouri, any future cobalt production from these deposits would be as a byproduct of another metal. Identified world cobalt resources are about 15 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) and Zambia. In addition, as much as 1 billion tons of hypothetical and speculative cobalt resources may exist in manganese nodules and crusts on the ocean floor.

**Substitutes:** In some applications, substitution for 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; cerium, iron, lead, manganese, or vanadium in paints; cobalt-iron-copper or iron-copper in diamond tools; copper-iron-manganese for curing unsaturated polyester resins; iron-cobalt-nickel, nickel, cermets, or ceramics in cutting and wear-resistant materials; iron-phosphorous, manganese, nickel-cobalt-aluminum, or nickel-cobalt-manganese in lithium-ion batteries; nickel-based alloys or ceramics in jet engines; nickel in petroleum catalysts; and rhodium in hydroformylation catalysts.

<sup>e</sup>Estimated. XX Not applicable. — Zero.

<sup>1</sup>Negative numbers are the result of inventory adjustments.

<sup>2</sup>The sum of U.S. net import reliance and secondary production, as estimated from consumption of purchased scrap.

<sup>3</sup>As reported by Platts Metals Week.

<sup>4</sup>Defined as imports – exports + adjustments for Government and industry stock changes.

<sup>5</sup>No tariff for Canada or Mexico. Tariffs for other countries for some items may be eliminated under special trade agreements.

<sup>6</sup>[See Appendix B for definitions.](#)

<sup>7</sup>[See Appendix C for resource/reserve definitions and information concerning data sources.](#)

<sup>8</sup>Joint Ore Reserves Committee (JORC) compliant reserves for Australia were about 360,000 tons.

<sup>9</sup>Overseas territory of France.