COBALT STATISTICS[1]
U.S. GEOLOGICAL SURVEY
[All values are in metric tons (t) cobalt content unless otherwise noted]
Last modification: December 18, 2012

Year	Primary production	Secondary production	Mine shipments	Government shipments	Imports	Exports	Stocks	Reported consumption	Apparent consumption	Unit value ($/t)	Unit value (98$/t)	World mine production	World refinery production
1900	NA	NA	NA	0	20	NA	NA	NA	20	4,930	97,000	NA	NA
1901	NA	NA	NA	0	20	NA	NA	NA	20	5,590	110,000	180	NA
1902	NA	NA	NA	0	30	NA	NA	NA	30	5,600	106,000	540	NA
1903	NA	NA	NA	0	20	NA	NA	NA	20	6,050	110,000	640	NA
1904	NA	NA	NA	0	10	NA	NA	NA	10	6,210	113,000	540	NA
1905	NA	NA	NA	0	20	NA	NA	NA	20	6,060	110,000	450	NA
1906	NA	NA	NA	0	10	NA	NA	NA	10	5,940	108,000	450	NA
1907	NA	NA	NA	0	20	NA	NA	NA	20	4,680	82,000	910	NA
1908	NA	NA	NA	0	70	NA	NA	NA	70	230	4,300	1,360	NA
1909	NA	NA	NA	0	5	NA	NA	NA	5	2,920	53,000	1,450	NA
1910	0	NA	NA	0	5	NA	NA	NA	5	1,270	22,000	1,000	NA
1911	0	NA	NA	0	200	NA	NA	NA	200	300	5,200	820	NA
1912	0	NA	NA	0	260	NA	NA	NA	260	320	5,400	860	NA
1913	0	NA	NA	0	70	NA	NA	NA	70	1,390	22,900	820	NA
1914	0	NA	NA	0	110	NA	NA	NA	110	2,470	40,300	360	NA
1915	0	NA	NA	0	70	NA	NA	NA	70	3,180	51,200	230	NA
1916	0	NA	NA	0	110	NA	NA	NA	110	3,220	48,200	410	NA
1917	0	NA	NA	0	170	NA	NA	NA	170	3,890	49,600	360	NA
1918	NA	NA	NA	0	240	NA	NA	NA	240	3,900	42,100	450	NA
1919	NA	NA	NA	0	70	NA	NA	NA	70	4,770	45,000	360	NA
1920	NA	NA	NA	0	120	NA	NA	NA	120	6,150	50,000	360	NA
1921	NA	NA	NA	0	70	NA	NA	NA	70	6,450	58,600	180	NA
1922	NA	NA	NA	0	120	NA	NA	NA	120	6,590	64,000	820	NA
1923	0	NA	NA	0	193	NA	NA	NA	193	5,950	56,700	640	NA
1924	0	NA	NA	0	128	NA	NA	NA	128	5,810	55,400	1,090	NA
1925	0	NA	NA	0	185	NA	NA	NA	185	5,450	50,900	1,090	NA
1926	0	NA	NA	0	291	NA	NA	NA	291	5,260	48,300	820	NA
1927	0	NA	NA	0	308	NA	NA	NA	308	5,120	47,800	1,180	NA
1928	0	NA	NA	0	371	NA	NA	NA	371	5,140	48,900	1,180	NA
1929	0	NA	NA	0	550	NA	NA	NA	550	4,940	47,100	1,360	NA
1930	0	NA	NA	0	360	NA	NA	NA	360	4,990	48,900	1,270	NA
1931	NA	NA	NA	0	186	NA	NA	NA	186	3,620	38,800	910	NA
1932	0	NA	NA	0	137	NA	NA	NA	137	3,000	35,800	1,090	NA
1933	NA	NA	NA	0	349	NA	NA	NA	349	2,550	32,000	1,270	NA
1934	NA	NA	NA	0	454	NA	NA	NA	454	2,350	28,600	1,450	NA
1935	NA	NA	NA	0	529	NA	NA	NA	529	2,530	30,100	2,000	NA
1936	NA	NA	NA	0	717	NA	NA	NA	717	2,780	32,600	2,720	NA
1937	NA	NA	NA	0	787	NA	NA	NA	787	3,140	35,500	3,800	NA
1938	NA	NA	NA	0	567	NA	NA	NA	567	3,030	35,000	4,500	NA
1939	NA	NA	NA	0	1,210	NA	NA	NA	1,210	3,100	36,400	4,500	NA
1940	40	NA	40	NA	1,910	NA	NA	NA	1,940	2,620	30,600	5,000	NA

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1941	150	NA	150	NA	2,120	20	NA	NA	2,250	2,600	28,800	4,000	NA
1942	210	NA	190	NA	1,940	40	NA	NA	2,100	2,220	22,200	3,500	NA
1943	210	20	220	NA	2,050	160	NA	1,780	2,140	2,920	27,600	4,200	NA
1944	240	21	160	NA	1,710	180	NA	1,810	1,710	4,200	38,900	3,900	NA
1945	320	14	380	NA	2,090	10	NA	1,680	2,470	3,660	33,200	4,700	NA
1946	150	4	150	NA	1,570	5	NA	1,860	1,710	3,400	28,300	3,500	NA
1947	187	2	198	NA	3,720	0	NA	1,880	3,920	2,920	21,400	5,000	NA
1948	198	9	170	NA	4,000	1	852	2,280	3,330	3,040	20,500	6,100	NA
1949	150	7	197	NA	3,380	10	621	2,130	3,810	3,550	24,300	5,900	NA
1950	232	57	193	NA	4,130	10	NA	3,760	4,990	3,670	24,800	7,170	NA
1951	267	406	221	NA	4,690	5	438	4,510	4,870	4,420	27,600	8,440	NA
1952	438	621	254	NA	6,820	25	491	4,910	7,620	5,000	30,700	10,100	NA
1953	398	699	577	NA	7,820	20	545	4,880	9,020	5,070	30,900	11,300	NA
1954	652	358	733	NA	7,650	140	538	3,330	8,610	5,470	33,200	13,100	NA
1955	842	233	787	NA	8,500	170	589	4,420	9,300	5,460	33,300	13,300	NA
1956	1,150	179	1,200	NA	7,070	140	564	4,340	8,330	5,570	33,400	14,400	NA
1957	1,500	165	1,490	NA	7,880	70	443	4,150	9,590	4,410	25,600	14,400	NA
1958	1,820	161	1,820	NA	6,870	80	396	3,420	8,820	4,360	24,600	12,600	NA
1959	1,060	118	1,050	NA	9,640	30	636	4,490	10,500	3,930	22,000	14,800	NA
1960	W	109	W	NA	5,520	80	842	4,050	5,340	3,390	18,600	14,200	NA
1961	W	81	W	NA	4,760	90	820	4,350	4,770	3,280	17,900	14,400	NA
1962	W	94	NA	NA	5,640	90	671	5,110	5,790	3,210	17,400	17,100	NA
1963	W	112	NA	NA	4,770	90	498	4,780	4,970	3,180	16,900	14,500	NA
1964	492	67	NA	332	5,640	49	644	4,830	6,340	3,190	16,800	17,800	NA
1965	538	39	NA	1	6,990	53	1,630	6,170	6,520	3,480	18,000	19,000	NA
1966	551	22	NA	346	8,540	45	2,900	6,440	8,140	3,420	17,200	21,800	NA
1967	530	54	NA	2,810	3,730	91	2,970	6,340	6,960	4,370	21,300	20,500	NA
1968	533	65	NA	2,250	4,110	644	2,670	5,900	6,620	4,500	21,100	19,600	17,100
1969	455	149	NA	2,720	5,860	679	2,330	7,080	8,850	4,070	18,100	20,200	18,000
1970	316	31	NA	2,340	5,630	670	2,600	6,060	7,380	4,880	20,500	24,200	21,300
1971	313	57	NA	763	4,950	166	2,370	5,670	6,140	4,810	19,400	25,100	22,400
1972	0	89	NA	2,700	6,310	586	2,060	6,410	8,830	5,230	20,400	24,800	20,300
1973	0	120	0	3,890	8,730	634	4,170	8,500	9,990	6,480	23,800	29,400	23,100
1974	0	122	0	4,050	7,310	611	4,290	8,560	10,700	7,520	24,900	30,900	24,800
1975	0	155	0	2,880	3,000	802	3,150	5,800	6,380	9,280	28,100	30,800	20,800
1976	0	149	0	3,040	7,480	794	4,020	7,480	9,000	9,410	27,000	21,400	18,800
1977	0	230	0	67	7,960	404	3,570	7,520	8,310	11,900	32,100	21,500	20,800
1978	0	470	0	0	8,630	702	2,730	9,070	9,240	22,000	54,900	26,800	24,700
1979	0	531	0	0	9,070	329	3,470	7,890	8,530	53,300	120,000	29,900	28,500
1980	0	537	0	0	7,390	264	3,400	6,950	7,740	51,600	102,000	31,300	30,200
1981	0	441	0	-1,060	7,070	378	3,800	5,300	5,680	36,900	66,100	30,700	25,800

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1982	0	395	0	-1,300	5,840	270	3,390	4,290	5,070	25,300	42,700	24,600	19,300
1983	0	328	0	-120	7,810	374	4,050	5,130	6,980	14,900	24,300	37,900	18,100
1984	0	399	0	-2,450	11,500	304	5,110	5,870	8,060	19,000	29,800	40,900	23,700
1985	0	408	0	-721	8,030	292	5,480	5,620	7,060	23,800	36,100	47,400	27,500
1986	0	1,200	0	0	5,570	454	4,060	6,480	7,740	16,200	24,100	50,200	31,400
1987	0	1,030	0	0	8,830	366	5,560	6,670	7,990	14,700	21,100	41,200	28,000
1988	0	1,020	0	0	7,050	543	5,260	7,230	7,830	16,200	22,300	43,800	26,400
1989	0	1,180	0	0	5,790	889	4,550	7,030	6,800	17,300	22,700	42,900	26,400
1990	0	1,230	0	-108	6,530	1,340	3,220	7,560	7,640	18,200	22,700	42,300	27,300
1991	0	1,580	0	0	6,920	1,540	2,400	7,220	7,790	25,100	30,100	33,300	25,200
1992	0	1,620	0	0	5,760	1,420	1,760	6,400	6,590	47,400	55,100	28,000	21,500
1993	0	1,610	0	289	5,940	795	1,460	6,480	7,350	31,300	35,300	21,900	16,600
1994	0	1,840	0	1,500	6,780	1,360	1,490	7,500	8,730	42,200	46,400	18,000	20,000
1995	0	1,870	0	1,550	6,440	1,300	1,080	7,590	8,970	58,300	62,400	24,500	23,300
1996	0	2,280	0	2,050	6,710	1,660	1,070	7,990	9,380	56,400	58,600	26,200	25,600
1997	0	2,750	0	1,620	8,430	1,570	1,090	9,160	11,200	46,300	47,000	27,400	27,100
1998	0	3,080	0	2,310	7,670	1,680	1,000	9,380	11,500	44,200	44,200	36,300	31,400
1999	0	2,700	0	1,530	8,150	1,550	1,160	8,660	10,700	33,700	33,000	33,900	33,100
2000	0	2,590	0	2,960	8,770	2,630	1,120	8,980	11,700	29,700	28,100	39,300	36,000
2001	0	2,810	0	3,050	9,410	3,210	1,330	9,540	11,800	23,300	21,500	46,300	38,700
2002	0	2,750	0	524	8,450	2,080	1,140	8,270	9,830	17,100	15,500	53,700	40,800
2003	0	2,130	0	2,380	8,080	2,710	1,010	8,030	10,000	20,600	18,200	54,600	43,200
2004	0	2,300	0	1,630	8,720	2,500	1,210	8,990	9,950	43,400	37,400	60,300	48,500
2005	0	2,030	0	1,110	11,100	2,440	1,190	9,150	11,800	33,600	28,100	65,200	54,100
2006	0	2,010	0	260	11,600	2,850	1,180	9,280	11,000	30,700	24,800	70,000	53,800
2007	0	1,930	0	617	10,300	3,100	1,310	9,320	9,630	54,600	42,900	73,700	53,500
2008	0	1,930	0	203	10,700	2,850	1,160	8,820	10,100	68,400	51,800	79,100	57,500
2009	0	1,790	0	180	7,680	2,440	780	7,470	7,580	34,200	26,000	78,800	62,100
2010	0	2,000	0	-8	11,100	2,640	903	8,030	10,300	39,700	29,700	106,000	79,400
2011	0	2,210	0	0	10,600	3,390	1,080	9,100	9,230	36,100	26,200	109,000	82,200

NA Not available. W Withheld to avoid disclosing company proprietary data.

[1]Compiled by D.A. Buckingham (retired) and K.B. Shedd.

Data are calculated, estimated, or reported. See notes for more information.

Cobalt Worksheet Notes

Data Sources
The sources of data for the cobalt worksheet are the mineral statistics publications of the U.S. Bureau of Mines (USBM) and the U.S. Geological Survey(USGS)—Minerals Yearbooks (MYB) and its predecessor, Mineral Resources of the United States (MR); Mineral Commodity Summaries (MCS) and its predecessor, Commodity Data Summaries (CDS); and Mineral Facts and Problems (MFP). In addition, some data came from U.S. Bureau of Mines Information Circular 8103 (IC 8103), Cobalt—A Materials Survey, (U.S. Bureau of Mines, 1962). The years of publication and corresponding years of data coverage are listed in the References section below.

Primary Production
The data are U.S. mine production. Prior to 1940, U.S. cobalt mine production was intermittent and, with some exceptions, generally very low in volume; a consistent data series is not available. Data are not available for 1900–09, 1918–22, 1931, and 1933–39. Data for 1940–46 represent estimated recoverable cobalt content derived by using an estimated average recovery rate of 63.5 percent for cobalt. This average was calculated from recoverable cobalt and cobalt content for 1947–50. Data for 1947–59 are published recoverable cobalt content from the MYB. Production data are withheld for 1960–63 in order to avoid disclosing proprietary data. Data for 1964–71 are mine production from the 1975 MFP. After 1971, there was no mine production.

Secondary Production
U.S. scrap consumption was used to estimate secondary cobalt production. Prior to 1943, data are not available. Data for 1943–45 are from IC 8103. Data for 1946 to the most recent year are from the MYB, but include unpublished revisions for 1988, 1992–96, and 1999–2002.

Shipments
Shipments data are not available prior to 1940. Data for 1940–59 are mine shipments. Data for 1940–46 represent estimated recoverable cobalt content derived by using an estimated average recovery rate of 64.6 percent for cobalt. This average was calculated from the cobalt content and recoverable cobalt content of mine shipments for 1947–50. Data for 1947–59 are recoverable cobalt content. All mine shipments data are from the MYB. Data for 1960–61 are withheld in order to avoid disclosing proprietary data. For 1962–72 mine shipments data are not available. The U.S. Government began stockpiling cobalt in the early 1940s. Data for 1964 to the most recent year are net U.S. Government stockpile shipments. Negative numbers for data for 1981–85 and 1990 indicate net U.S. Government acquisitions. The negative number for 2010 is the result of an inventory adjustment. Data for 1964–77 are from the 1975 and 1980 MFP. Data for 1978–89 and 1991 to the most recent year are from the MCS. Datum for 1990 is from the MYB.

Imports
Data are cobalt imports for consumption. Imports data include various types of cobalt materials, such as alloys, matte, oxides, ores and concentrates, salts and compounds, unwrought metal, waste and scrap, and other. These data are reported in gross weight for 1900–22 and cobalt content for 1923 to the most recent year. By using gross weights and cobalt contents reported for 1923–30, an estimated weighted average cobalt content of 73.1 percent was calculated and used to estimate the cobalt content of imports for 1900–22. Data for 1964 to the most recent year exclude cobalt alloys, ores, and concentrates. Import data for 1989 to the most recent year exclude matte, waste, and scrap. Data for 1984–85 and 1990 include cobalt destined for the National Defense Stockpile. Data are from the MR and the MYB.

Exports
Data are not available prior to 1941. Cobalt exports data include alloys, oxides, ores and concentrates, salts and compounds, waste and scrap, and unwrought metal, and exclude semifabricated, wrought cobalt, and cobalt articles. Cobalt content data for 1942–48 and 1951–52 are estimated based on the estimated cobalt content of each material, alloys, metal, and scrap (estimated to be mostly metal), 90 percent; ores and concentrates, 2 percent; oxides, 70 percent; and salts and compounds, 30 percent. Exports for 1949–50 and 1953–63 are estimated to be mostly scrap with a cobalt content of about 10 percent. Gross weight data for 1941–63 came from the MYB. Exports for 1964–79 are estimated cobalt content from the 1975 and 1980 MFP. Exports for 1980 to the most recent year are estimated cobalt content from the MYB.

Stocks
Stocks data are not available prior to 1948 and for 1950. All stocks data are for the end of the calendar year, so beginning stocks are defined as the previous year stocks, and ending stocks are defined as the current year stocks. Stocks data for 1948–49 and 1951–64 are consumer stocks; data for 1965 to the most recent year are industry stocks; data for 2010 to the most recent year include London Metal Exchange stocks in U.S. warehouse. Data are from the following sources: 1948–53, CDS; 1954–64, MYB; 1965–72, MFP (1975); 1973–82, MCS; 1983–85, and 2000, previously unpublished revisions; and 1986–99 and 2001 to the most recent year, MCS.

Reported Consumption
Data represent reported cobalt consumption in the United States to make products such as alloys, cemented carbides, and a variety of chemical applications. Data are based on company reports to the USBM and the USGS and may include estimates for nonrespondents. Reported consumption data are not available prior to 1943. Cobalt materials included during various time periods are as follows:

1943–45, metal, chemical compounds (oxide and cobalt-nickel compound only), purchased scrap, and ore used directly in magnets and other industrial applications; 1946–53, metal, chemical compounds (organic and inorganic), purchased scrap, and ore and alloy; 1954 to the most recent year, metal, chemical compounds (organic and inorganic), and purchased scrap. Data for 1943–87 and 1992 to the most recent year are from the MYB. Data for 1988–91 are previously unpublished revisions.

Apparent Consumption

Cobalt apparent consumption data prior to 1940 are cobalt imports data only. Prior to 1940, U.S. cobalt mine production was intermittent and, with some exceptions, generally very low in volume; secondary production, exports, and U.S. government shipments were assumed to be negligible or zero; and there is no information available to assess changes in stocks levels. Apparent consumption for 1940–63 was estimated using the following equation:

APPARENT CONSUMPTION = MINE SHIPMENTS + SECONDARY PRODUCTION + IMPORTS – EXPORTS ± STOCK CHANGES + GOVERNMENT SHIPMENTS.

Because primary cobalt production and mine shipments data for 1960–61 were withheld and were not available for 1962–63, an estimate of 500 metric tons (t) was used for calculating apparent consumption and rounded to three significant figures. This estimate reflects a contraction of the domestic cobalt industry during this time period. Apparent consumption for 1964 to the most recent year was estimated using the following equation:

APPARENT CONSUMPTION = PRIMARY (MINE) PRODUCTION + SECONDARY PRODUCTION + IMPORTS – EXPORTS ± STOCK CHANGES + GOVERNMENT SHIPMENTS.

Unit Value ($/t)

Unit value is defined as the value of 1 t of cobalt apparent consumption. For 1900 to the most recent year, estimation of the cobalt unit value is calculated on an annual basis from the U.S. dollar (expressed as current dollars) value of imports divided by cobalt content of those imports. Estimation of unit value is based on import data because the greatest part of apparent consumption is imported. U.S. cobalt import quantity and value data are from the MR and the MYB.

Unit Value (98$/t)

The Consumer Price Index conversion factor, with 1998 as the base year, is used to adjust unit value in current U.S. dollars to the unit value in constant 1998 U.S. dollars.

World Mine Production

Data represent the cobalt content of refined products or the cobalt content, recoverable cobalt content, or recovered cobalt content of mined ores, concentrates, or intermediate products depending on the producing country and year. Datum for 1900 was not available. Production estimates for the former Soviet Union are not included prior to 1961. Data for 1901–36 are from IC 8103. Data for 1937–97 are from the MYB. Data for 1998–2003 are previously unpublished revisions. Data for 2004 to the most recent year are from the MYB.

World Refinery Production

Data were not available for 1900–67. Data for 1968 to the most recent year are from the MYB and represent the cobalt content of refined cobalt products. U.S. production data are included in the total for 1969–71, and 1975–83. No U.S. production data are reported for 1968, 1972–74 and after 1983.

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For more information, please contact:

USGS Cobalt Commodity Specialist