

VANADIUM STATISTICS¹
U.S. GEOLOGICAL SURVEY
[All values in metric tons (t) vanadium unless otherwise noted]
Last modification: December 13, 2007

| Year | Production | Imports | Exports | Stocks | Apparent consumption | Unit value (\$/t) | Unit value (98\$/t) | World production |
|------|------------|---------|---------|--------|----------------------|-------------------|---------------------|------------------|
| 1900 | | | | | | | | |
| 1901 | 6.80 | | | | 6.8 | | | |
| 1902 | 69.1 | | 68.0 | | 1.1 | | | |
| 1903 | | | 7.84 | | 4.7 | | | |
| 1904 | | | | | 8.3 | | | |
| 1905 | | | | | 12 | | | |
| 1906 | | | | | 15 | | | |
| 1907 | 18.9 | | | | 19 | | | |
| 1908 | | 272 | | | 270 | | | |
| 1909 | | | | | 200 | | | |
| 1910 | | | | | 130 | 2,640 | 46,000 | |
| 1911 | 61.2 | | | | 61 | 984 | 17,000 | |
| 1912 | 272 | | 43.0 | | 230 | 1,100 | 19,000 | 1,040 |
| 1913 | 392 | | 129 | | 260 | 1,750 | 28,800 | 392 |
| 1914 | 410 | | 165 | | 250 | 1,800 | 29,400 | 414 |
| 1915 | 569 | | 180 | | 390 | 1,850 | 29,800 | 1,360 |
| 1916 | 417 | | 435 | | 310 | 1,690 | 25,300 | 1,190 |
| 1917 | 439 | | 200 | | 240 | 2,400 | 30,600 | 1,260 |
| 1918 | 250 | 16.1 | 324 | | 270 | 2,440 | 26,300 | 484 |
| 1919 | 258 | 54.7 | 14.2 | | 300 | 2,480 | 23,400 | 578 |
| 1920 | 478 | 188 | 92.6 | | 570 | 2,680 | 21,800 | 1,640 |
| 1921 | 182 | 93.5 | 12.4 | | 260 | 2,880 | 26,200 | 94.4 |
| 1922 | 23.5 | 277 | 11.1 | | 290 | 3,080 | 29,900 | 70.8 |
| 1923 | 57.4 | 27.9 | 21.1 | | 64 | 3,280 | 31,200 | |
| 1924 | | 128 | 10.3 | | 120 | 3,060 | 29,100 | |
| 1925 | 118 | 233 | 23.3 | | 330 | 2,830 | 26,400 | 1,170 |
| 1926 | 300 | 880 | | | 1,200 | 4,050 | 37,200 | 1,700 |
| 1927 | | 740 | | | 740 | 3,650 | 34,100 | 2,200 |
| 1928 | | 59.0 | | | 59 | 3,820 | 36,400 | 2,810 |
| 1929 | | 1,040 | | | 1,000 | 4,000 | 38,100 | 2,810 |
| 1930 | | 105 | | | 110 | 4,050 | 39,700 | 2,190 |
| 1931 | | | | | 180 | 4,490 | 48,100 | 661 |
| 1932 | 245 | | | | 250 | 4,920 | 58,600 | 480 |
| 1933 | 1.10 | | | | 1.1 | 4,920 | 61,700 | 300 |
| 1934 | 5.90 | 104 | | | 110 | 4,780 | 58,200 | 118 |
| 1935 | 23.1 | 42.6 | | | 66 | 4,770 | 56,800 | 416 |
| 1936 | 63.5 | 156 | | | 220 | 4,750 | 55,700 | 975 |
| 1937 | 493 | 571 | | | 1,100 | 4,740 | 53,700 | 1,950 |
| 1938 | 732 | 991 | | | 1,700 | 4,720 | 54,600 | 2,590 |
| 1939 | 900 | 968 | | | 1,900 | 4,710 | 55,200 | 2,910 |
| 1940 | 981 | 1,170 | | | 2,200 | 4,690 | 54,600 | 3,020 |
| 1941 | 1,140 | 970 | 11.6 | | 2,100 | 4,330 | 48,000 | 2,770 |
| 1942 | 2,010 | 1,170 | 10 | | 3,200 | 4,330 | 43,300 | 3,870 |
| 1943 | 2,530 | 960 | 17.3 | | 3,500 | 4,920 | 46,400 | 4,380 |
| 1944 | 1,600 | 601 | 2.9 | | 2,200 | 4,720 | 43,700 | 3,500 |
| 1945 | 1,340 | 1,580 | 51.7 | | 2,900 | 4,720 | 42,900 | 2,670 |
| 1946 | 577 | 368 | 2.8 | | 940 | 4,530 | 37,800 | 1,390 |
| 1947 | 1,280 | 479 | 60.4 | | 1,700 | 4,530 | 33,100 | 1,740 |
| 1948 | 811 | 477 | 8.81 | | 1,300 | 4,720 | 31,900 | |
| 1949 | 3,190 | 250 | 52.3 | | 3,400 | 4,530 | 31,000 | |
| 1950 | 2,090 | 689 | 18.1 | | 2,800 | 4,050 | 27,400 | |
| 1951 | 2,800 | 473 | 27.4 | | 3,300 | 4,600 | 28,800 | |

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|------|------------|---------|---------|--------|----------------------|-------------------|---------------------|------------------|
| 1952 | 3,270 | 479 | 101 | | 3,600 | 4,920 | 30,200 | |
| 1953 | 4,210 | 326 | 30.2 | | 4,500 | 4,900 | 29,900 | |
| 1954 | 2,860 | 462 | 98.0 | | 3,200 | 4,950 | 30,000 | |
| 1955 | 2,980 | 83.9 | 784 | 256 | 1,540 | 4,920 | 30,000 | |
| 1956 | 3,510 | | 842 | 256 | 1,800 | 4,920 | 29,500 | |
| 1957 | 3,350 | | 454 | 256 | 1,620 | 5,230 | 30,400 | |
| 1958 | 2,750 | | 572 | 250 | 1,140 | 4,920 | 27,800 | |
| 1959 | 3,710 | 2.72 | 1,130 | 316 | 1,720 | 5,430 | 30,300 | |
| 1960 | 4,510 | 2.72 | 1,130 | 750 | 1,830 | 5,430 | 29,800 | 5,040 |
| 1961 | 4,850 | | 4,160 | 333 | 1,830 | 5,430 | 29,700 | 7,850 |
| 1962 | 4,730 | | 926 | 346 | 2,100 | 5,040 | 27,200 | 6,080 |
| 1963 | 3,500 | | 486 | 409 | 2,640 | 5,040 | 26,800 | 6,500 |
| 1964 | 3,960 | 10.9 | 1,120 | 674 | 3,220 | 4,530 | 23,800 | 7,170 |
| 1965 | 4,740 | | 842 | 751 | 1,550 | 4,530 | 23,500 | 8,300 |
| 1966 | 4,690 | 65.3 | 804 | 1,790 | 4,970 | 4,920 | 24,700 | 8,440 |
| 1967 | 4,500 | 38.1 | 715 | 1,080 | 4,760 | 4,920 | 24,000 | 9,610 |
| 1968 | 5,880 | 28.1 | 420 | 886 | 4,990 | 4,530 | 21,300 | 11,400 |
| 1969 | 5,060 | 2,040 | 261 | 1,370 | 5,580 | 5,940 | 26,400 | 10,300 |
| 1970 | 4,830 | 1,810 | 883 | 929 | 5,200 | 4,920 | 20,700 | 14,900 |
| 1971 | 4,770 | 2,130 | 236 | 585 | 4,360 | 11,200 | 45,100 | 15,800 |
| 1972 | 4,430 | 1,270 | 160 | 715 | 4,740 | 7,280 | 28,400 | 15,500 |
| 1973 | 4,410 | 2,570 | 852 | 3,730 | 5,800 | 7,280 | 26,700 | 16,000 |
| 1974 | 4,870 | 2,870 | 1,010 | 3,540 | 6,530 | 8,190 | 27,100 | 20,400 |
| 1975 | 4,410 | 3,840 | 0 | 4,100 | 4,990 | 8,420 | 25,500 | 21,600 |
| 1976 | 5,620 | 3,510 | 0 | 3,720 | 4,280 | 13,300 | 38,100 | 29,200 |
| 1977 | 4,730 | 3,260 | 472 | 3,960 | 4,770 | 13,700 | 36,800 | 29,000 |
| 1978 | 5,720 | 3,050 | 1,560 | 2,770 | 6,020 | 13,700 | 34,300 | 29,400 |
| 1979 | 6,690 | 3,510 | 1,810 | 3,110 | 6,100 | 14,000 | 31,400 | 37,700 |
| 1980 | 6,370 | 2,630 | 1,020 | 3,870 | 5,570 | 12,100 | 23,900 | 35,900 |
| 1981 | 7,500 | 3,410 | 259 | 4,280 | 6,230 | 12,400 | 22,200 | 35,300 |
| 1982 | 5,790 | 1,720 | 1,550 | 4,390 | 3,170 | 10,800 | 18,200 | 27,200 |
| 1983 | 3,020 | 669 | 1,940 | 4,390 | 2,970 | 13,800 | 22,600 | 27,200 |
| 1984 | 3,920 | 1,770 | 2,360 | 3,420 | 4,320 | 13,800 | 21,700 | 31,100 |
| 1985 | 2,450 | 990 | 1,240 | 2,910 | 4,430 | 13,800 | 20,900 | 31,000 |
| 1986 | 2,110 | 2,740 | 1,390 | 2,480 | 3,920 | 13,800 | 20,500 | 32,000 |
| 1987 | 2,280 | 2,570 | 1,310 | 2,060 | 4,220 | 13,800 | 19,800 | 32,000 |
| 1988 | 2,950 | 2,350 | 1,580 | 1,270 | 4,830 | 13,400 | 18,500 | 33,000 |
| 1989 | 2,390 | 4,160 | 3,040 | 1,740 | 4,650 | 24,300 | 31,900 | 33,000 |
| 1990 | 2,310 | 4,690 | 3,920 | 1,080 | 4,080 | 16,600 | 20,700 | 33,200 |
| 1991 | 2,250 | 1,620 | 2,860 | 935 | 3,290 | 11,200 | 13,400 | 26,400 |
| 1992 | 1,350 | 1,790 | 3,430 | 1,080 | 3,980 | 8,970 | 10,400 | 26,700 |
| 1993 | 2,870 | 3,190 | 3,100 | 900 | 3,930 | 5,710 | 6,440 | 2,500 |
| 1994 | 2,830 | 4,150 | 2,790 | 1,110 | 4,460 | 11,600 | 12,800 | 3,200 |
| 1995 | 1,990 | 5,100 | 2,240 | 310 | 4,650 | 11,000 | 11,800 | 3,600 |
| 1996 | 3,730 | 4,650 | 3,700 | 305 | 4,630 | 12,600 | 13,100 | 35,100 |
| 1997 | 0 | 5,640 | 2,420 | 323 | 4,710 | 15,300 | 15,500 | 37,100 |
| 1998 | 0 | 5,200 | 2,350 | 336 | 4,380 | 21,500 | 21,500 | 42,700 |
| 1999 | 0 | 5,000 | 1,540 | 348 | 3,840 | 7,830 | 7,660 | 36,300 |
| 2000 | 0 | 7,830 | 1,710 | 282 | 6,160 | 7,160 | 6,780 | 41,000 |
| 2001 | 0 | 6,140 | 600 | 251 | 5,600 | 5,390 | 4,960 | 41,800 |
| 2002 | 0 | 5,060 | 1,010 | 233 | 4,060 | 5,270 | 4,780 | 51,000 |
| 2003 | 0 | 5,460 | 1,740 | 252 | 3,700 | 8,700 | 7,710 | 47,900 |

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|-------------|-------------------|----------------|----------------|---------------|-----------------------------|--------------------------|----------------------------|-------------------------|
| 2004 | 0 | 6,650 | 2,520 | 336 | 4,050 | 23,600 | 20,300 | 51,900 |
| 2005 | 0 | 15,310 | 3,360 | 371 | 11,900 | 64,100 | 53,500 | 56,400 |
| 2006 | 0 | 5,480 | 3,980 | 330 | 1,540 | 30,900 | 25,000 | 56,300 |

¹Compiled by C.A. DiFrancesco (retired) and M.J. Magyar.

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

Vanadium Worksheet Notes

Data Sources

The sources of data for the vanadium worksheet are the mineral statistics publications of the U.S. Bureau of Mines and the U.S. Geological Survey—Minerals Yearbook (MYB) and its predecessor, Mineral Resources of the United States (MR), and Mineral Commodity Summaries (MCS), and its predecessor, Commodity Data Summaries (CDS). The years of publication and corresponding years of data coverage are listed in the References section below. Blank cells in the worksheet indicate that data either were not available or were being withheld because they are proprietary.

Production

Production data represents vanadium contained in mine or mill production and petroleum byproducts in the United States. Data were reported in the MR and MYB for the years 1901–02, 1907, 1911–23, 1925–26, and 1932–54, the CDS for the years 1955–77, and the MCS for the years 1978–96. When possible, the contained vanadium in mill recovery was used to account for vanadium from vanadium and uranium ores, as well as vanadium recovered from ferrophosphorous slag derived from domestic phosphate rock. Blank cells in the worksheet, for the years 1900, 1903–06, 1908–10, 1924, 1927–31, and 2000–06 indicate that data were not available. From 1955–68, data was reported as vanadium in ores and concentrates. Cells for the years 1997–99 are blank in order to avoid disclosing proprietary data.

Imports

Depending on the year, import data include the amount of vanadium content in ash, ore, concentrate, residue, slag; vanadium pentoxide anhydride; other oxides and hydroxides; aluminum-vanadium master alloys, and ferrovanadium imported into the United States. From year to year or for a range of years, materials included in reported imports changed, as did the types of materials. Data were reported in some MR for the years 1908–31, MYB for the years 1932–54, the CDS for the years 1955–77, and the MCS for the years 1978–99. Blank cells in the worksheet indicate that data were not available for the years 1900–07, 1909–17, 1931–33, 1956–58, 1961–63, and 1965. Prior to 1942, data was reported as vanadium contained in ores and concentrates. Although, not specifically stated, vanadium in flue dust may have been included. From 1942–54 data was reported in the MYB as vanadium in ores, concentrates, and flues dust. From 1955–68, the MYB and CDS reported imports as vanadium in ore and concentrates, in 1969–70 as vanadium in ores, slags, and residues. The significant increase in imports from 1968–69 was a result of increasing domestic demand for application of vanadium in the domestic aerospace and steel industries. From 1971–72, imports included vanadium pentoxide (anhydride). In 1973–87, imports included ferrovanadium to the existing categories. From 1988–92, vanadium in ores, slags, residues, vanadium pentoxide (anhydride), oxides and hydroxides, aluminum vanadium master alloys (by gross weight), and ferrovanadium made up the category. In 1993, vanadium in ash was added as a replacement for ore in the ores, slags, and residues category, (1998 MCS), ore imports were added back to this category in 1994 (1999 MCS). Data for the years 2000–06 are unpublished revisions provided by the commodity specialist.

Exports

Export data report (when available) the total amount of vanadium contained in vanadium pentoxide anhydride, other oxides and hydroxides, aluminum-vanadium master alloys, and ferrovanadium exported from the United States. Data were from the MR for the years 1908–31, MYB for the years 1932–54, the CDS for the years 1955–77, and the MCS for the years 1978–99. Blank cells in the worksheet indicate that data were not available for the years 1900–02, 1904–11, and 1926–40. The several-fold increase in exports from 1954 to 1955 resulted from an increase in demand from Europe, coupled with the inability for African producers to expand production. The significant decrease in exports from 1968 to 1969 was a result of increasing domestic demand for application of vanadium in the domestic aerospace and steel industries. Data for the years 2000–06 are unpublished revisions provided by the commodity specialist.

Stocks

Stocks data report the amount of contained vanadium held in consumer stocks. Blank cells in the worksheet indicate that data were not available for the years 1900–54. Data were from the CDS for the years 1955–77 and the MCS for the years 1978–2006.

Apparent Consumption

Apparent consumption was estimated for the years 1901–02, 1907–08, 1911–15, 1917, 1919–30, and 1932–54 by using the formula:

$$\text{APPARENT CONSUMPTION} = \text{PRODUCTION} + \text{IMPORTS} - \text{EXPORTS} \pm \text{CHANGES IN STOCKS.}$$

Blank cells in the worksheet indicate that datum was not available for the year 1900. No imports, exports, or stocks data were available for the years 1901, 1907, 1911, and 1932–33 and were assumed zero to calculate apparent consumption to two significant figures. No imports or stocks data were available for the years 1902, 1912–15, and 1917. The values were assumed zero to calculate apparent consumption to two figures. Apparent consumption was estimated by interpolation for the years 1903–06, 1909–10, 1916, 1918, and 1931. No production, exports, or stocks data were available for the years 1908, and 1927–30 and were assumed equal to zero to calculate apparent consumption to two significant figures. No stocks data were available for the years 1919–23, 1925, and 1941–54 and were assumed equal to zero to calculate apparent consumption to two significant figures. No production or stocks data

were available for the years 1926 and 1934–40 and were assumed zero to calculate apparent consumption to two significant figures. No exports or stocks data were available for the year 1924 and were assumed zero to calculate apparent consumption to two significant figures. Reported consumption was used as an estimate for apparent consumption from the MYB for the years 1955–85, 1987–91, and 1995–98. Estimates for the years 1986, 1992–94, and 1999–2006 were generated from data maintained by the commodity specialist.

Unit Value (\$/t)

Unit value is the value, in dollars, of 1 metric ton (t) of vanadium apparent consumption. Data were from the MR and MYB for the years 1910–12, 1915–17, 1923, 1925–26, 1930, 1932–33, 1941–52, the CDS for the years 1955–61, and 1964–77, and the MCS for the years 1978–2006. Unit value was estimated for the United States in actual dollars by using the price derived from dividing the vanadium pentoxide price by 0.5602. Unit value was interpolated for the years 1913–14, 1918, 1920–22, 1924, 1927–29, 1931, 1934–40, 1953–54, and 1962–63. Blank cells in the worksheet indicate that data were not available for the years 1900–09.

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. Blank cells in the worksheet indicate that data were not available for the years 1900–09.

World Production

World production data were for mine production of vanadium. Data were from the MR and MYB for the years 1912–22, 1925, 1927–31, 1934–43, 1945–47, and 1998–2006, the CDS for the years 1960–77, and the MCS for the years 1978–84 and 1990–97. Blank cells in the worksheet indicate that data were not available for the years 1900–11, 1923–24, and 1948–59. World production was interpolated to two significant figures for the years 1926, 1932–33, 1944, and 1985–89. World production data for the years 1927–31 and 1997–99 do not contain U.S. production.

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