

# MERCURY

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**M**ercury, chemical symbol Hg and also known as quicksilver, is one of the few metals that is liquid at room temperature. It is silvery white with a faint bluish tinge. Mercury is produced by mining the ores then processing and calcining to vaporise the mercury which is then condensed to produce the liquid metal.

The three categories of mercury supply are primary, being prime virgin mercury produced from mercury-mining operations, by-product production from copper, gold and zinc mining operations and secondary or recycled mercury that is recovered from previous uses.

Mercury is packed in cast, wrought iron, or spun steel bottles known commonly as flasks, and is sold and priced on the basis of a flask containing 34.50 kg nett and market quotations cover prime virgin mercury only.

After years of considerable fluctuation, the mercury market appears to have stabilised in recent years, albeit at relatively low levels of production, consumption and price. Mercury has remained critical to the production of many manufactured products due to its unusual combination of properties, such as high specific gravity, fluidity at normal temperatures and electrical conductivity. Mercury compounds were still used in a variety of pharmaceuticals and other products. Commonly used compounds include mercuric oxide as cathode material in batteries, mercuric chloride in pharmaceuticals, phenylmercuric acetate in paints and pharmaceuticals, mercuric sulphide in red pigment and pharmaceuticals and thimerosal as a preservative used in medicines and contact lens solution. Mercury remains a pollutant but declining world demand throughout the 1970s and 1980s has now levelled out at around 100,000 flasks/y, and primary production has been cut back to leave

the market in balance despite unpredictable arisings from secondary sources and stockpiles, particularly in the former Soviet Union (FSU).

Consumption of mercury has trended downward since the early 1970s owing to regulations regarding mercury discharges and emissions, and to concern regarding the ultimate fate of mercury-bearing products. The largest use of mercury continued to be for the electrolytic production of chlorine and caustic soda. However, the quantity of mercury thus consumed is expected to continue declining as manufacturers replace existing plants with mercury-free operations.

In the electrical industry, mercury consumption is also declining. In many applications, mercury switches are being replaced with either electronic or other special switches. In fluorescent lighting, mercury content has been reduced to less than 50% of that used in lights manufactured in the mid-1980s.

Regulations have virtually eliminated the use of mercury in electrical batteries except in countries such as China and India. The only mercury oxide batteries still produced outside these countries are for military and medical equipment. Only in dental applications, where it is the most cost-effective and longest-lasting dental cavity filler, has mercury use remained steady. It is still important in gold mining, mostly in China and Brazil, but much of this amalgamation practice is illegal, and attempts to stop such uncontrolled use of mercury continued in both countries.

Ever stricter environmental regulations and the development of new technology continued to be the primary factors affecting the supply and demand for mercury. Regulations and technology development are likely to work in tandem to reduce further the demand for

mercury in commercial products. However, even as the unit mercury content of products declines, regulations on the disposal of mercury are still forcing more recycling of mercury-bearing material to take place. As a result, secondary or recycled mercury remained an important component of supply.

Mercury was recovered from discarded products and industrial wastes such as chlor-alkali wastes, dental amalgams, fluorescent light tubes, electronic devices, batteries and other instruments such as thermometers. There are two basic categories of secondary production: recovery of liquid mercury from dismantled equipment and mercury recovery from scrap products using extractive processes. Liquid extraction involves draining the liquid mercury from dismantled equipment. Recyclers use thermal or chemical processes to extract mercury from scrap. Most commonly, the mercury is vaporised in a retort and collected by condensation. Condensed mercury is then distilled to remove impurities.

Further distilling of either prime or reclaimed mercury yields higher purity mercury, usually known as triple-distilled, mostly for dental and high purity instrument use.

Other potential sources include mercury contained in the US and FSU stockpiles. In the US, the Defense Logistics Agency (DLA) continued to hold 112,000 flasks of prime virgin and 50,000 flasks of secondary mercury, although this material remains unavailable to the market due to an ongoing investigation by the Environmental Protection Agency, and the availabilities from Russian/CIS stockpiles appear now to be exhausted. This leaves the remaining few producers of primary mercury, particularly the Spanish and Algerians, in a strong position and although demand did not

increase due to the environmentally unfriendly nature of mercury, restricted supplies during 2000 pushed prices higher. The price started the year at US\$133-140/flask (as published by *Metal Bulletin*) and increased at the end of June to US\$145-150/flask and again in early August to US\$145-155/flask where it remained to the end of the year. Whereas the Russian stockpile material had been freely available at around US\$125/flask it was difficult to find good-quality mercury below US\$140/flask. Producers, in particular the Spanish, by managing their production, were careful not to push prices too high so as not to encourage substantial quantities of secondary mercury appearing again, particularly from Eastern Europe.

Primary world mercury resources are estimated at nearly 600,000 t (approximately 17 million flasks) principally in China, Italy,

<b>World Mercury Reserves &amp; Reserve Base ('000 t)</b>		
	<b>Reserves</b>	<b>Reserve Base</b>
Spain	89.6	93.1
Italy	-	69.0
Slovenia	12.0	17.2
Turkey	-	6.9
Finland and other Europe	0.7	1.0
US	4.8	9.0
Canada	-	5.5
Mexico	4.8	8.6
Zimbabwe	0.7	1.0
Algeria	2.8	3.4
Philippines	-	0.9
China	10.3	17.2
FSU. Countries inc		
Russia, Ukraine, Kyrgystan, Tajikistan & Slovakia,	10.3	17.2
<i>Total</i>	<i>125.7</i>	<i>250</i>
<i>Flasks (million)</i>	<i>Approx. 4</i>	<i>Approx. 7.3</i>

Source: US Bureau of Mines (USBM) Mineral Facts & Problems (1985)

Kyrgyzstan, Russia, Slovenia, Spain and Ukraine. Of the total resources it is estimated that less than 136,000 t (4 million flasks) could economically be mined (reserves) and 250,000 t (7.3 million flasks) recovered if costs were not considered (reserve base) (Table 1). These reserves at present production rates would provide sufficient resources for between 50 and 100 years respectively.

World mine production between 1977 and 1987 was around 200,000 flasks/y reaching a ten year peak in 1987 of 210,300 flasks. This has since declined to an estimated level of 57,971 flasks during 2000. During the same period world consumption has steadily decreased leaving the shortfall to be made up from stockpiles and by the ever increasing availability of secondary mercury. The only mines left operating and contributing significantly to this reduced mine production are Minas de Almaden in Spain, the Khaidarkan Mercury state joint stock company in Kyrgyzstan and L'Entreprise Nationale des Produits Miniers Non-Ferreaux et des Substances Utiles (ENOF) in Algeria.

The Almaden mines are based in the heart of Spain's La Mancha region and the plant's annual capacity, which over the years has produced 7.5 million flasks, is some 100,000 flasks. New production was halted in August 1999 and only restarted during the fourth quarter of 2000 with plans to produce 50,000 flasks up to July 2001 when production would be halted again as Almaden continued to use its strategy, as the world's largest mercury producer, of seasonal output in an effort to avoid a large market oversupply.

The Khaidarkan mercury mine enterprise is located in Khaidarkan town, Kadamjay region, Osh Oblast, in the Kyrgyz Republic and has a capacity of up to 20,000 flasks/y. Production was restarted in 1995 with help from the World Bank and in

recent years most production has been sold to China. However, although no confirmation was available, the mine was said to have stopped or at least reduced production significantly in late 2000, which would explain partly why the Chinese were consistent importers of mercury from the free market throughout the year. A Canadian organisation CESO undertook a study during the first half of the year with regard to the feasibility of re-opening the JSC Ulu-Too mine which had previously been part of the Khaidarkan Mercury industrial complex but which had ceased operating in 1995 due to the collapse of the former Soviet Union. In 1998, this open-pit mine was privatised and in August 1999 the metallurgical works were restored and around 300 flasks of mercury were produced. Forecasted deposits of ore are sufficient for 40 years processing but the study came to the conclusion that due to the world situation for mercury an investment in re-opening the mine would not be the most effective use of Canadian taxpayers' funds.

Shipments from the Algerian producer ENOF were seriously delayed throughout the year due mainly to marketing difficulties caused by

<b>World Primary And By Product Mine Production by Country ('000 t)</b>					
	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000<sup>e</sup></b>
Algeria	368	447 <sup>r</sup>	224 <sup>r</sup>	348	350
China	510	830	230 <sup>r</sup>	196	200
Finland	88	90 <sup>e</sup>	80 <sup>e</sup>	80 <sup>e</sup>	80
Kyrgyzstan	584	610 <sup>e</sup>	620	620 <sup>e</sup>	300
Mexico	15	15	15	15 <sup>e</sup>	15
Russia	50	50	50	50	50
Slovakia	- <sup>r</sup>	- <sup>r</sup>	20 <sup>e</sup>	-	-
Slovenia	5 <sup>r</sup>	5 <sup>e</sup>	5 <sup>e</sup>	-	-
Spain	862	863 <sup>r</sup>	675 <sup>r</sup>	1105	1000
Tajikistan	45	40	35	25 <sup>e</sup>	-
Ukraine	30	25	20	-	-
US	3	2	5	5	5
<b>TOTAL</b>	<b>2,560<sup>r</sup></b>	<b>2,977<sup>r</sup></b>	<b>1,979<sup>r</sup></b>	<b>2,444</b>	<b>2,000</b>
<b>Flasks</b>	<b>74,202</b>	<b>86,289</b>	<b>57,362</b>	<b>70,840</b>	<b>57,971</b>

<sup>r</sup> = Revised; <sup>e</sup> = Estimated

Source:- US Department of The Interior Geological Survey on mercury 1999 Annual Review much of which contains estimated figures. Accordingly adjustments have been made where more accurate information has been obtained.

political and administrative problems. Production was only running at approximately 50% of the 25,000 flasks/y capacity, and what sales were made were mainly through third country barter deals, mostly through central European countries relating to Algeria's national debt.

China continued as one of the world's largest importers despite a production capacity in the past of some 35,000 flasks/y. As well as purchasing the majority of Kyrgyzstan production, it purchased regular supplies from Almaden and other market sources. With the Chinese economy nowadays based more on a free-market system, it would appear that the low market prices of recent years are below the production costs of many of the Chinese mines which have reduced or stopped production altogether.

The Rudnik Zivega Srevbra mine in Slovenia, Placer in the US, and the Turkish and Ukrainian mines remained closed.

By-product mercury occurs in some gold and silver deposits, particularly in the US, in zinc ores in Finland and Italy, and in copper ore in Slovakia. Only 5,000-10,000 flasks of by-product mercury were estimated to have been produced in 2000.

Although demand for mercury in Europe and the US has decreased considerably, its consumption in other parts of the world seems relatively stable. Despite the industrialised nations banning the use of mercury in a range of products from batteries to pesticides, global demand appears to have stabilised. Industrial countries continue to use mercury in low-level applications, such as dental amalgams, lighting and measuring equipment. The less-industrialised countries are even increasing their consumption of cheap, mercury-based products such as paints. In the long term, however, the prospects for mercury still look poor.

Demand for such an environmentally unfriendly metal is unlikely to grow, the US stockpile will eventually be made available to the market and there may be further FSU stockpile releases. In addition, the closure of chlor-alkali plants throughout the world will continue and the most likely scenario for the early part of the this century is that after a further period of stability, or even price increases, the market will again go into decline, regardless of whether or not other markets improve. The remaining world producers, including Spain (which is already diversifying into other areas), could cease primary production altogether, as there is likely to be more than sufficient secondary mercury available to satisfy world demand.