EUROPEAN COMMISSION
DIRECTORATE GENERAL FOR ENVIRONMENT
RUE DE LA LOI, 200
B-1049 BRUSSELS

MERCURY FLOWS AND SAFE STORAGE OF SURPLUS MERCURY

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Sprl concorde

Av. René Gobert, 10 B-1180 Brussels ☎+32(2) 374.36.47 concorde@skynet.be

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Mercury flows and safe storage of surplus mercury

Background

The Community Mercury Strategy (Mercury Strategy, 2005) was adopted January 2005. The Commission is now working on the implementation of the Strategy. Currently the Commission is drafting a proposal for a Regulation on the banning of mercury exports and the related safe storage of surplus mercury, i.e., Actions 5 and 9 of the Strategy. For this Regulation an impact assessment is required.

Objectives

The extended impact assessment (Mercury Strategy ExIA, 2005) already prepared in support of the Mercury Strategy contains much information that is still valid, but further information is needed to assess in greater detail the impacts of the introduction of an export ban and the storage obligation. In this report the information available in the extended impact assessment is updated and complementary information is also provided, in particular with regard to the newer member states of the EU-25.

1 International overview

The following tasks are included in Section 1:

1. Update of global mercury supply (mining, by-product, chlor-alkali, recycling, government or private stockpiles) specifically indicating contribution from the EU-25
2. Update of global mercury demand by use category and by region, specifically indicating EU-25 demand
3. Brief review of global mercury trade, and the role of the EU in that trade
4. Explanation of the recent evolution of mercury market prices
5. Estimates of supply, demand and relevant mercury trade 10 years into the future under a business-as-usual scenario, assuming there is no mercury export ban in place.

1.1 Mercury sources and supply

There are five common sources of mercury supply:

1. Recovery of mercury from mercury cell chlor-alkali plants (MCCAPs) converted to a mercury-free process, or occasionally closed.
2. Stocks of mercury accumulated from previous years (typically the source would have originally been mercury mine or by-product, chlor-alkali decommissioning, or mercury recovered from wastes).
3. Mining and processing of primary mercury ores.

4. By-product mercury from some ferrous and most non-ferrous metals mining or natural gas cleaning.
5. Recycled mercury.

1.1.1 MCCAP capacities and closures

There are a number of key issues related to the phase-out of mercury cell chlorine production capacity in the EU-25.

1.1.1.1 EU-25 chlorine production capacity

In 2005, there remained very close to 6 million tonnes of mercury cell chlorine capacity operating in the EU-25, as summarised in Annex 1 (valid as of January 2005). After several years of relatively limited mercury cell closures or conversions, during 2005-2007 the discontinuation of some one million tonnes of EU mercury cell chlorine capacity have been announced by industry, including two plants in Italy (ENS, 2005), one plant in Poland, etc. In addition, two of the UK plants and one in Sweden listed in Annex 1 closed during the course of 2005.

1.1.1.2 EU-25 phase-out of the mercury process

According to two studies carried out for Euro Chlor (SRIC, 1998 and Prochemics, 2002), subsequent closures are expected to reflect a fairly straight-line phase-out of remaining mercury cell capacity to 2020, the voluntary phase-out date agreed by Euro Chlor member companies as being consistent with the end of the economic lifetimes of most of the European mercury cell facilities. Even in 2020, however, as Euro Chlor has already informed the European Commission,[1] a few mercury cell plants (in particular, Euro Chlor mentioned Degussa and BASF in Germany – about 300 tonnes chlorine capacity) will remain open, as "cases where mercury cells are indispensable for the production of some speciality chemicals."[2] The Commission should also be aware that other EU-25 plants producing potassium hydroxide may argue they also need to stay open for technical reasons.[3] These EU plants that produce KOH comprise nearly 1300 tonnes chlorine capacity, in addition to the German plants previously mentioned.

1.1.1.3 Mercury cost relative to other operating costs

It has occasionally been argued that the cost of mercury for the chlor-alkali industry may be relevant to the EU industry's competitive position in the world chlorine and caustic markets.

At the beginning of 2005, the EU mercury-cell production capacity was very close to 50% of the total EU-25 capacity. In 2011 it will be 35-40%, according to information now available on announced closures, as well as SRIC (1998), Prochemics (2002), Euro Chlor (2005) and industry activity projections (SRIC, 2005).

One might ask whether the proposed export ban might in any way favour EU MCCA producers by ensuring them a supply of very cheap mercury. In response, it should be noted that the export ban will oblige EU MCCAP operators, after 2010-11, to sell mercury to each other or to store/dispose of it. At that time the EU-25 will have 30-35 MCCAPs with about 4 million tonnes of Cl_2 capacity, which will consume mercury at the rate of 20-25g/t

[1] As confirmed by Dr. Seys during a meeting including Maxson, Andersson and Debelle, 24 May 2006.
[2] As quoted from Euro Chlor voluntary agreement concerning phase-out by 2020.
[3] The Chlor-Alkali BREF (2001) mentions some plants in Japan, which has a strong aversion to the industrial use of mercury, that continue to use mercury for such a process.

Cl_2 capacity, or 80-100 tonnes mercury per year, or 3 tonnes average per plant. In 2011, the typical EU MCCAP of 120 thousand tonnes Cl_2 capacity will produce 110 thousand tonnes of Cl_2 and 120 thousand tonnes of NaOH. Although European producers continue to take measures to limit transportation of chlorine for safety reasons, and now some 80% of chlorine produced in Europe is consumed "on site," one can still give a value to chlorine and caustic products based on market prices. 110 thousand tonnes of Cl_2 at a present value of €400-500/tonne, and 120 thousand tonnes of NaOH at a present value of €250-350/tonne, give a total basic product value of €49.5 million + 36 million = €86 million.

In comparison, if an MCCAP is obliged to pay market price for 3 tonnes of mercury, the present (relatively high) cost of the mercury would not be greater than €50 thousand. It is therefore impossible to argue that the cost of mercury (whatever it may cost, in the range of 0 - 0.1% of the chlorine and caustic product value) for the chlor-alkali industry has any significant bearing on the EU industry's competitive position in the world chlorine and caustic markets.

1.1.1.4 Residual mercury

Nevertheless, the discontinuation of nearly 6 million tonnes of mercury cell chlorine capacity in the EU will free up large amounts of process mercury. Besides the 12 thousand tonnes of mercury in the electrolytic cells, there is a great deal more to be recovered or disposed of during plant decommissioning and decontamination. This issue has been discussed at length in Maxson (2000). The mercury content of contaminated buildings and structures, soils, equipment, etc., may vary from tens of tonnes to hundreds of tonnes for one plant,[4] depending on the plant age and design, but especially on the plant operating, maintenance and waste disposal practices over the plant lifetime. An average mercury content of 25-75 tonnes per plant in the EU would likely find general agreement among experts. However, it should be noted that there is no legal or other obligation that this mercury should be recovered rather than disposed of.

If recovered, the cost of recovering this mercury varies greatly, from the ease of scooping up a pool of mercury accumulated in the soil under the cellroom, to the difficulty of cleaning mercury from masonry and other construction materials, or from soils typically contaminated at the level of many hundreds of ppm or more.

1.1.1.5 Chlorine capacity in the rest of the world

Outside the EU-25, there exists approximately 4 million tonnes of mercury cell chlorine capacity. In those regions MCCAPS occasionally close, and mercury-free plants are constructed, implying a slow transition away from the mercury cell process as well. For example, two plants in the US have announced they will close or convert during the next two years, which will also free up their process mercury. These are typically decisions taken by industry with little pressure from regulators. Apart from the recent Euro Chlor commitments in the EU (and the earlier OSPAR Decision 90/3), and some rumours of eventual phase-outs in India, no national or regional phase-outs of the mercury cell process have been agreed.

One point of occasional confusion in dealing with mercury data related to MCCAPs is that mercury recovered from decommissioned MCCAPs may be sold or transferred within the industry, or it may be sold outside the industry on the international market (presently via MAYASA, in the case of companies that are members of Euro Chlor). Information about

[4] Two sites in the Czech Republic, for example, hold an estimated 472 tonnes of mercury in contaminated buildings and soils, in addition to the quantities in the cells, according to Czech Republic (2005).

the intra-industry transfers of mercury is not readily available, which makes it difficult to have a complete picture of how much mercury is recovered within the industry, and where it goes. It would seem, also in the interest of most of the stakeholders, that this level of transparency needs to improve as all aspects of the mercury life-cycle are more closely examined and regulated.

1.1.2 Stocks of mercury at Almadén and elsewhere

Following a site tour and on-site discussions with Almadén officials in 2005, the author estimated mercury stocks there at 1000-2000 tonnes. These have been accumulated over a number of years from previous mining activities (both from mines at Almadén and from mines elsewhere, such as the Kyrgyz Republic), as well as deliveries of mercury from chlor-alkali plants that have closed or converted to the membrane technology. For example, between 1997 and 2000, 8 German plants converted to mercury-free technology. Of the 2030 tonnes of mercury recovered from the German plants during this period, 1380 tonnes were sold to MAYASA in Spain, 190 tonnes were sold to other chlor-alkali plants, etc.[5]

According to Euro Chlor, its member companies sold 227 tonnes of mercury to MAYASA in 2003, 108 tonnes in 2004 (MAYASA said it received 164 tonnes of mercury from MCCAPs during the same year), and 294 tonnes in 2005. Since, in a typical year, MAYASA sells mercury to the industry and also purchases mercury from the industry, it is not clear from these numbers whether they are net purchases by MAYASA, or merely the mercury purchases separate from any sales.[6]

It is likely there are other stocks in Europe as well, especially in light of recent price rises and increased speculation by traders. One of the two major European mercury brokers, Lambert Metals, has storage facilities at the ports of Antwerp and Rotterdam (Fialka, 2006), where it maintains stocks of mercury, and the company has reportedly purchased mercury from the Kyrgyz Republic in recent years. The major Indian mercury broker has also been very actively searching to purchase mercury during the last two years.

Likewise, there appear to be some other stocks of mercury remaining. Despite claims some years ago by mercury brokers that the former Soviet stockpiles had been depleted, as mercury prices reached 40-year highs in 2005, suddenly 500 tonnes of mercury from “former FSU stocks” became available to the market – whether privately owned or government owned was not clear, although the origin was the Kyrgyz Republic, according to one of the Russian dealers, who provided the photo below. Lambert Metals (UK headquarters) has purchased about half of the 500 tonnes in 2006, and hopes to receive the rest later in 2006 or early in 2007. It is not clear how much more than this 500 tonnes may be available.

Now that MAYASA sells mercury only from its own inventory, one persistent question with regard to MAYASA mercury sales and “stocks” is how much of the mercury is actually originally from the Spanish mine (therefore a source of “new” mercury, although it should have been included in the mercury “supply” at the time it was mined), and how much may have been previously purchased from other sources such as the Kyrgyz Republic, in which case it should have been likewise accounted for as Kyrgyz production. In any case, this text does not consider mercury put on the market by MAYASA after 2004 as a “stockpile” source of previously uncounted mercury.

[5] Germany (2005).
[6] In principle, such a clarification could easily be sought from MAYASA.

Photo of Kyrgyz-origin "Russian" stocks that came to the market in 2005.

1.1.3 Mining and processing of primary mercury ores

At the last operational EU mercury mining site, Almadén, the mining and processing of primary mercury ores in the EU stopped in 2003, and is not expected to restart. There remains a stockpile of cinnabar (mercury ore) that was excavated prior to the shutting down of process equipment. This unprocessed ore is now in a surface deposit, covered by a layer of soil and possibly a geo-textile sheet or similar barrier. The parent mining and trading company, MAYASA, continues actively trading in the mercury market, although from about 2004 it appears to be taking more care about which customers it sells mercury