THE MERCURY MARKET IN BRAZIL

Executive Summary

Elementary mercury has silvery colouring, and its abbreviation "Hg" comes to Latin *Hydrargyrum,* that means *liquid silver*.

Mercury is the only metal that is liquid under normal conditions of temperature and pressure in the environment. Mercury occurs not only as elementary mercury but also as inorganic and organic mercury compounds. The different mercury forms are designated as "species".

Among the health effects caused by mercury exposure are weight loss, muscular weakness, anorexia (which increases the serotonin availability, resulting in a neuropsychiatric disorder), and central nervous system effects lead to the ataxia, debility, acrodynia and dormancy of fingers.

BRAZILIAN MERCURY MARKET

According to the Ministry of Environment's National Chemical Safety Commission, from 1998 to 2001 Brazilian mercury imports averaged 58.8 tons. The followings sectors were responsible for these imports: dealerships 83%; odontology 10,4%; chemicals 5,5%; thermometers 0,9%; light bulbs 0,2%.

Other Brazilian government data indicate that from 2002 to 2004 mercury imports were about 252 tons, although the countries that exported to Brazil declared only 122 tons (KEANE & GREER, 2006).

Moreover, official estimations indicate that Brazil imported 43 tons of mercury two years ago (2005). Victor Zveibil, an officer of the Ministry of Environment, estimates that the Amazon Region receives at least 130 tons of pollution by mercury per year, the triple as many as that is legally imported (FIALKA, 2006).

According to ABILUX (Brazilian Industry Lighting Association) data, annual mercury imports to Brazil total 300 tons (2001). This figure contrasts with the official data, which indicates a lower import amount per year, varying between about thirty tons and eighty tons.

IMPORTANT RELEASE AND EXPOSURE SOURCES

Chlor-alkali Industry

According to Brazilian Industry Chlor-alkali Association(ABICLOR), the Brazil's chlorine production is around 325,000 tons/year and some chlor-alkali plants use the mercury cell technology. This production process releases to the environment about 15.25 g of mercury per ton of chlorine produced or releases 4,956 kg/year that needs to be replaced at the cells. On atmospheric emissions, ABICLOR estimates a release of 3.22 g of Hg per ton of chlorine produced, which means they release 1,046 kg/year (ABICLOR, 2002). However, Lacerda et al (2006) confirms that the Brazilian chlor-alkali plants actually contribute 17 tons/year of mercury to atmospheric emissions, seventeen times more than the figures recognized by ABICLOR. Also, in 2006 a company in the chlor-alkali sector transferred 60 thousand kg of mercurial mud to Belford Roxo City, State of Rio de Janeiro, without any type of treatment. This mud, which was a waste from chlor-alkali electrolysis process, contained up to 6% of mercury, or approx. 3, 6 kg of mercury. This type of waste used to be distillated and the mercury recovered, but today it does not receive any treatment, causing more risks not only from the waste itself, but from its transport.

Fluorescent Lamps

According to ABILUX studies, of the 300 tons/year of mercury imported, only 1.1 ton is used in the production of all models of fluorescent and mixed lamps sold in the market. ABILUX asserts that the number of Brazilian lamps produced annually is the same of the burned and broken lamps, i.e., in the 1:1 proportion (ZANICHELLI et al, 2004).

The majority of burned and broken lamps are not collected in the national territory. After they are used at houses and other establishments, they are disposed in landfills together with house waste. Only a small part is recycled.

From 2004 to 2006 the Ministry of Labor (DRT/SP) forced two recycling plants to cease operations: APLIQUIM located in Paulínia city, São Paulo State, and BRASIL RECICLE located in Indaial city, Santa Catarina State. Both companies were charged because they were releasing mercury levels in breach of the law in force applied to workplace environment and atmospheric emissions.

Gold Mining

Estimations indicate that Amazon region utilizes approximately 130 tons/year of mercury for gold mining, with the main gold-mining area in Brazil. However, such figures may be under-estimated, since it is known that part of gold is smuggled, thus the mercury amounts needed for amalgamation are higher.

According Hacon & Azevedo (2006), apud Malm (1998), the Brazilian Amazon gold-mining area received 2,500 tons of mercury in the last 25 years, an average of 100 tons/year.

Burning of mercury-gold amalgam disperses metal by the wind, affecting surrounding communities, and depositing it on structures, as well as on plants and soils, rivers and streams.

Other Sources

Other mercury emissions and exposure sources include used mercury-containing batteries, which some enter the national territory by smuggling; steel and iron production (12,0 tons/year), lead, zinc and cadmium pyrometallurgy (4,5 tons/year); healthcare services how the hospitals and odontological offices (2,8 tons/year); and unsustainable environmental management, such as uncontrolled emissions from urban landfills (5,0 tons/year), incineration, co-incineration and cremation; forest fires (8,7 tons/year); and fossil fuel combustion, such as natural gas and coal energy plants (4,2 tons/year).

LACK OF DATA AND ESTIMATIONS

The worldwide mercury market data is not conclusive enough to give the definite import and export amounts between the different countries. Even though there are laws that restrict the use of mercury, including Brazil, which prohibits the use of mercury use in gold-mining activities, the fact is that significant amounts of mercury are being sold in the Amazon Basin region market.

According to an article published recently in the newspaper "O Estado de São Paulo" (FIALKA, 2006), the owner of a small market located in Creporizão city, Pará State (where the greater gold-mining activity of the country is located), was freely selling mercury to the artisanal miners, asking that his name was not divulged by the journalist.

Fialka (2006) also affirms that there is lack of precision in the import and export data, since "nobody knows exactly how much is exported from the United States of America to the mining countries, because there is not an official global mercury trade register".

The ACPO's report about mercury trade considered the mains sectors that have mercury release and emissions potential during production,

domestic consumption and final disposal. The table I contains these data.

SECTOR	USE	ANNUAL AMOUNT
1. Estimation of the mercury foreign source - import		
Gold-mining	Amalgamation	130.0
Chlor-Alkali Industries	Electrolytic Cells	17.0
Fluorescent Lamps	Component	1.1
Odontology application	Dental Amalgam	2.8
Urban Lanfills	Wastes	5.0
2. Estimation of mercury domestic source – mining		
Steel and Iron production	Contaminant	12.0
Pyrometallurgy (Pb, Zn, Cd)	Contaminant	4.5
Fossil fuel and Natural gas	Contaminant	4.2
Forest Fires	Contaminant	8.7
1. Domestic source (mining) in tons- total estimation		**29.4**
2. Foreign source (imported) in tons - total estimation		**155.9**
GRAND TOTAL		**185.3**

Table 1: Annual Brazilian estimation of mercury use and emission in tons, carried out by Association of Combat Against Pollutants (ACPO) on the basis of information as referenced at the report "The Mercury Market in Brazil", ACPO, 2006. p.32. Available in: http://www.acpo.org.br/mercadohg.htm

NATIONAL MERCURY PROGRAM

Sao Paulo State regional department of the Ministry of Labor conceived an internal national mercury program to survey updated information to allow the Regional Department to implement measures in order to eliminate mercury poisoning, since not only workers but the general population was being poisoned by mercury.

According to the program basic document by Sao Paulo labor regional department of the Ministry of Labor, the goal is to eliminate mercury use in several activity branches, and to register the companies that use or manipulate mercury or mercury-containing products in Brazil. In the first stage the intention is to check mercury (Hg) levels in the environment and people, adopted collective and individual safety measures, procedures adopted by companies on Hg exposed workers, and worksite and environment conditions. They also intend to consider and implement substituting mercury in the production process, and discussing proposals and developing new measures to be adopted.

However, there is not enough attention by the Federal Government to the Ministry of Labor's National Mercury Program, as to its implementation, nor concretes measures taken to eliminate mercury emission and exposure.

CONCLUSIONS

The worldwide mercury market data is still insufficient to let us accurately determine the used, released, disposed, encapsulated, recycled, imported and exported amounts among the different nations. Although there are laws in force restricting mercury use some activities, including Brazil, the fact is that large amounts of this substance continue to be sold in the Amazon region markets.

In Bahia State, southwest region, it is possible to buy mercury in small bottles at drugstores, where the submission of special documents or registration is not required. IBAMA (federal environment agency) only requires documentation indicating the intended use and destination of the mercury that are being purchased, but it's largely known that this is not enough to avoid clandestine deviation, and that there is not efficient government control.

About the mercury use at the chlor-alkali industries in Brazil, the specific Brazilian federal law has confusing provisions. While it prohibits new plants installed with the mercury cells technology, (we recognize that this is small progress), the law allows current industries to operate the obsolete and pollutant mercury and asbestos cells technology, legalizing the continuity of the official import of mercury to support this sector. Although such federal law was not totally regulated, this is the only legal framework in force. (BRASIL, 2000).

While the use of mercury cells in existing chlor-alkali plants is a legal reality in Brazil, the worldwide contemporary society demands the mercury ban in all its uses. Furthermore, there are alternative technologies to mercury and asbestos cells at the chlor-alkali industries, namely the membrane technology. Many companies that had used mercury cells have phased out the process, proving that it is fully feasible.

About the Amazon region, ACTO – Amazon Cooperation Treaty Organization and MMA – Brazilian Ministry of Environment drafted a regional action plan on the mercury contamination and control in Amazon Basin ecosystems. The North-American NGO Natural Resources Defense Council (NRDC) and the Brazilian NGO Association of Combat against Pollutants (ACPO) have submitted some concerns about such draft.

NGOs accept that the action plan has as its purpose the control and prevention of mercury use in the Amazon region and the establishment of a mercury ban mechanism that includes a rigorous smuggling control. Some alternatives can make it possible, such as incentives for sustainable investments and the regional political commitment of all local and regional actors towards the elimination of this huge threat. In addition however, the development of mercury-free technologies in the small-scale gold-mining sector must be promoted and supported.

ACPO made suggestions to the regional action plan regarding mercury contamination prevention and control in Amazon ecosystems, which is being prepared by ACTO. The original document, NRDC's and ACPO's suggestions, can be accessed at the ACPO internet homepage: http://acpo.org.br/campanhas/mercurio/biblioteca_merc.htm.

The challenge to eliminate the mercury use and reduce the non-intentional mercury emissions is also very important under the public health view. Some national and regional measures could have been taken already, and others could be accelerated aiming to reduce dramatically the mercury level in the global atmosphere.

Several healthcare devices as thermometers, control switches, water level floats and others can be replaced by similar non-mercury devices. Public administration procedures about waste management can be immediately implemented to prevent mercury-containing materials from being disposed at urban landfills or incinerators. It is similarly urgent to make decisions on the following items:

1) Adequate the existing laws to definitively convert the current use of electrolytic mercury cells at chlor-alkali manufacture process to membrane cells;

2) Establish a legal framework to provide rules on the responsibility of the industry with its production chain and life cycle of fluorescent lamps, in order to recover all material, not only mercury (total recycling cycle);

3) Intensive and extensive mercury movement control in the Amazon region, punishing the illegal users and traders.

4) Support and promote mercury-free technologies in the artisanal and small scale gold mining sector.

Zero Mercury Campaign: http://www.zeromercury.org/

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