

INTERNATIONAL MERCURY CONFERENCE

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1. INTRODUCTION

In 2005, the World Health Organisation (WHO, 2005) reported that: "...Hg may have no threshold below which some adverse effects occur". As this represents a global problem, the purpose of meeting was to promote global action, and a possibly legally binding international agreement to reduce human and environmental exposure to mercury (Hg).

Coal combustion is the major source of Hg to the world, primarily because of the world's hunger for energy. Even though Hg emissions in North America and Europe are declining, the global pool of Hg is growing larger. This is primarily because use in other countries is increasing, mainly due to small-scale power plants, while in many developing countries, the artisanal gold mining (ASM) industry is the major source of Hg to the environment. It has been estimated that approximately 80% of Hg used currently, is in the developing world. If Hg is available cheaply, then Hg uses for gold (Au) production increases. There is an increase in Hg usage for Au when poverty increases. Thus, Hg usage is increasing at an unprecedented rate, with financial incentives being the core motivational force for using Hg to get Au. The price of Hg:Au ratio is 1:1000 (1g Hg: \$0.02; 1 g Au: \$20). Thus, the ASM industry is largely linked to:

- Poverty
- Price of gold / Hg
- Economy of country / community
- Illegal trade

The EU Strategy calls for a 50% reduction in Hg usage by 2010, and a 70% reduction in Hg usage by 2017. There are 20 specific Hg actions in the EU Strategy, with the key to reducing Hg export and exposure to humans, and reducing Hg emissions, as coal causes about 50% Hg emissions in the EU. This reduction depends on:

- Chlor-alkali plants using / switching to alternative membrane technologies which are cheaper.
- PVC production using alternatives to Hg.
- Reducing Hg usage in ASM.
- Reducing Hg supply.

The United Nations Environmental Programme (UNEP) urges countries to take global action on reducing Hg usage and emissions, both medium and long term. The UNEP Governing Council concluded that there is a lot research that indicates the global action is needed.

Mercury's hazardous properties are of global relevance, and human populations and ecosystems are at risk. Mercury is becoming a global issue, and the number of Hg research has increased. This can be seen from conference attendance, where for example, at the first *Hg as a Global Pollutant Conference* held in Sweden, about 100 people attended, while this number increased to more than 1000 people in Madison during August 2006. In addition, Government is now focusing on Hg as a Global Problem. Studies have also shown that MeHg production continues after 100 years from historical tailings and workings.

2. INTERNATIONAL PROGRAMMES ON MERCURY RESEARCH

USEPA has 3 Global Hg Partnerships to focus on:

- Hg reduction in products
- Hg reduction in chlor-alkali production plants
- Hg reduction in ASM
- UNEP Global Hg Programme: Reduce Hg emissions in coal combustion

UNEP's Global Mercury Programme aims to:

- Build inventories of uses and releases
- Identify populations at risk
- Develop communications and outreach programmes for communities at risk

UNEP is focussing on:

- Hg Small Grants Programme (up to \$50k)
- Developing a series of guideline documents that can have quick results
- Inventory toolkit on web
- Continued awareness raising of Hg risks

UNEP Projects focus on:

- Hg from coal-fired power plants: What is coming from here?
- Health care sector
- Waste management
- Air Transport and Fate research: Focus on emissions

3. HISTORY OF MERCURY POLLUTION AND IMPACTS

Mercury pollution can be tracked through time, with the following relevant dates linked to pollution, impacts, research undertaken and Government action:

- 1866: first case of / record of fatal occupational Hg poisoning
- 1952: first reported case on developmental toxicity to 2 infants in Sweden
- 1963: Minamata disease
- 1967: Methylation in sediment demonstrated.
- 1972: Experimental demonstration of delayed developmental neurotoxicity.
- 1982: Research on Great Lakes, Acidification of lakes
- 1990-2000:
 - USEPA Report to Congress (Global Hg cycle, Hg in Tropics/Arctic. Risk / Health issues, Waste Management, Remediation, Policy Tools, Legislation)
 - UNEP Global Action
 - EU Hg Strategy

Minamata disease can be detected 3 months after birth, and can be observed in humans as follows:

- Adult: localised focal / brain damage
- Non-fetal exposure: widespread brain damage
- Fetal exposure: diffused brain damage

Evidence from a Faroes Island Study, where population fish intake is high shows:

- Mercury is 2x more toxic if arising from maternal fish intakes (nutrients), and MeHg is accounted for in this.
- Loss of IQ results in children:
 - A doubling of MeHg exposure corresponds to 1.5 IQ points
 - Economic value: 1 IQ point = \$5.350 (USEPA 98)
 - Linked to Autism
 - Linked to Cardio-vascular disease
 - Linked to Neurological disease

The impacts of Hg on human health may have been underestimated because:

- It is associated with seafood's beneficial nutrients;
- Of other residual confounding factors (e.g. toxicants in non-seafood), and
- Of failure to include multiple joint effects in human health risk studies.

The history of Hg and its impacts on humans and the environment shows that global action is needed now.

4. MERCURY SOURCES

Planetary belts show natural Hg Planetary belts. The AMAP website shows the extent of Hg emissions globally, and shows that land, water and resource activity will affect Hg globally.

Sources of Hg (UNEP COMTRADE):

- Mercury mining: 1500 – 1700 T
- By product Hg: 300 – 500 T
- Recycled Hg: 600 – 800 T
- Decommissioned chlor-alkali: 500 – 700 T
- Stocks / Inventories Hg: 0 – 200 T

Mercury usage in VCM increasing in China, however, strict control of alternative products is being encouraged. China is developing alternative / improving technology to reduce Hg usage and pollution. The country is committed to increasing research to reduce Hg emissions.

Mercury loss in ASM:

- 1 – 3 g Hg is lost to the environment for every 1g Au produced.
- When Hg is expensive, then less Hg will be used and it will be used more efficiently.
- Hg loss in:
 - Whole Ore: ~ 3g
 - Retort: ~ 1g
 - No retort: > 1g

5. MERCURY USAGE

Global uses of Hg (Total Hg: 3000 – 3500 T)

- ASM: 800 – 1000 T
- Chlor-alkali: 500 – 700 T
- Vinyl Chloride Monomer (VCM): 600 – 800 T (PVC production)
- Batteries: 300 – 600 T

- Hg is also now being used to recover Au from old computers

Vaccine use of Hg:

- EthylHg is used and is slightly less toxic than MeHg.
- It is phased out in child vaccines.
- Still used in flu vaccines in USA and EU.
- Thimerosal is still used especially in many developing countries. Thimerosal uses Hg for a preservative.

Hg can occur in different forms:

- Fulminate (i.e. blasting caps of explosives)
- Sublimate (i.e. disinfectant for wounds)

Silver is replacing Hg as a disinfectant in hospitals and households, and represents a future problem.

Hg used in creams and skin lighteners used by African women:

- 35% in South Africa
- 25% in Mali
- 37% in Nigeria

6. CONCLUSIONS

Mercury is one of the most hazardous substances globally, and poses a threat to current and future generations. More awareness-raising is needed on the risks associated with Hg in humans and ecosystems. This can be done through working with leaders in the community, creating awareness effectively to miners, or using appropriate resources / alternative methodologies. Waste management processes are high on the list to reduce Hg emissions.

Mercury is a solvable problem and it is really only surfacing on the radar screen. It is very different from other metals, and thus should not be classified with other metals, and thus should be called what it is. In the big picture of Hg usage, we need to ask:

- What is the cost of slow / late action?
- What is the loss of average IQ / Loss of super intelligent individuals?
- What is the loss of reputation, for businesses and Government alike?

There is some regional action, but this is insufficient and more action is needed. Action is needed to reduce the Hg risk to humans. This action can be taken as follows:

1. We need to establish how we can replace Hg use - cyanide is also a problem.
2. It is not enough to monitor Hg only nationally, one has to look at local/regional/international Hg levels.
3. Researchers have to ask for more Research, while Policy Makers must make decisions.
4. A reduction in MeHg in fish is a priority action that is required to solve the Hg pollution problem.
5. Determine the qualitative and quantitative relationships between Hg emission to atmosphere, deposition and Hg in the aquatic environment.
6. Establish a deposition limit for Hg in order to regulate Hg emissions to the atmosphere.
7. Determine the relationship between Hg flux in sea water and fish.
8. Test flu vaccines for Hg in South Africa.

9. Develop regional centres of excellence in developing countries – that will act as assistance to the miners
10. Further commitment is needed to reduce Hg by 50% as stated in the EU strategy.

The barriers to change include:

- Cost of non-Hg devices are 10 times more expensive
- There are calibration / Accuracy issues
- Low awareness of Hg occupational hazards
 - Prepare flyers on Hg hazards, and clean – up campaigns.
 - Make fridge magnets / brochures – place into mailboxes of public.

Postponement of addressing these challenges and obstacles relating to Hg only means more expensive mitigation processes in the future. Reaction only 20 years later (like we did with lead - Pb) is irresponsible and will cause further serious global problems.

7. SUMMARY OF CONFERENCE

There is no doubt that Hg affects human health and environment, and calls for immediate action. Action is needed at local, regional and international level to reduce the risk associated with Hg.

Mercury is a global international problem, as it is a transboundary issue because of i) trade (actions are needed on the demand and supply side), and ii) its long-range transport.

Mercury is used mostly in the ASM industry, and there are many social issues associated with this. Thus, awareness-raising of Hg risks are needed. Possibilities of phase-out of Hg are needed and can be done, and interventions at local, regional and international levels are needed.

The EU's Mercury Strategy, UNEP Global Hg Programme and other are important initiatives focus on Hg as a Global Pollutant. There is a possibility of having a meeting in Cape Town, South Africa in 2007, on awareness-raising of Hg and other issues.

There is a need for an import/export ban, with import seeming to be easier to ban, than export. The role of partnerships has and should play an important role in continuing to focus on reducing Hg usage and sources internationally.

POSSIBLE IDEAS FOR SAMA PROGRAMME RESEARCH

POSSIBLE STUDY METHODS

100 interviews done

Design strategy and Hg Awareness-Raising:

- Primary Target: Miners, Suppliers, Processors, etc.
- Involve local government directly
- Media is important by means of banners, flyers, etc.
- Launch: Entertainment and speeches
- Use a Lumex Spectrophotometer to measure Hg in people's breath / clothes
- Film shows in the communities on Hg pollution and risks
- Encourage retort use / fumehood usage: takes longer and thus miners are reluctant to use retorts.

DECLARATION FROM SOUTH AFRICA

- The SAMA Programme represents a great opportunity to work together as Government, Industry, Science and Civil Society, towards:
 - Creating awareness of Hg as a local, regional and global pollutant,
 - Strategise to create awareness in government and civil society with regards to Hg risks to humans and ecosystems,
 - Strategise for assessing Hg usage and sources in South Africa, and
 - Strategise for action on banning Hg usage in South Africa.

SOUTH AFRICA NEEDS

1. Regulations on Hg use in Pesticides, etc.
2. A licensing process for Hg use
3. Procedures on control of Hg activities, trade and use
4. To establish Hg maximum levels in fish
5. Need a national system of epidemiological environmental health survey
6. To ban the use of Hg compounds in medicine, hygiene products, cosmetics, perfume, energy-efficient lamps
7. To establish Hg maximum levels in surface water, groundwater, etc.
8. To establish who / where the fish eating population are (i.e. fish population and much Hg is in fish that is eaten)
9. To determine what epidemiological Hg contamination data is needed to establish a correlation between cause and effect.
10. Raise Hg awareness to public
11. Substitute Hg-containing health devices (e.g. thermometers, manometers).
12. We need to develop a Hg policy for hospitals

POSSIBLE PROPOSAL TO UNEP

- Environmental Consciousness → Political Consciousness → Legislation
- Proposal on Awareness raising in Schools / Mine areas (ASM) / inventories / look at Hg in cosmetics in South Africa
- Proposal on Hg from coal-fired power plants in Mpumalanga