Mercury Use in Products and Industrial Processes

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The Most Notorious Source of Mercury Pollution
Eat fish low in MERCURY

Fish you catch...
Landlocked Salmon  Higher
Brook Trout       Lower
Rainbow Trout     Higher
Brown Trout       Lower
Pumpkinseed       Higher
Rainbow Smelt     Lower
Brown Bullhead    Higher
Lake Trout        Lower
Yellow Perch      Higher
Largemouth Bass   Lower
Smallmouth Bass   Higher
Northern Pike     Lower
Chain Pickerel    Higher
Walleye           Lower

Fish you buy...
Atlantic Salmon   Higher
Shellfish         Lower
Flattfish & Flounder Higher
Hake, Haddock, Pollock & Cod Lower
Canned "Light" Tuna Higher
Canned "White" Tuna Lower
Tuna              Higher
Halibut           Lower
Swordfish         Higher
Shark             Lower

Fish is good for you... eat fish low in mercury!

Mercury in fish can harm your family. Pregnant and nursing women and children age 6 and younger should not eat fish containing high levels of mercury. Even small amounts can damage a developing brain. Want more information? Call us toll-free at 800-439-8850 or visit our Web site at www.mercvt.org.
Characteristics of Mercury Market

- Global in nature
- Small in economic terms (less than $25 million) and tonnage (~3500 tonnes)
- Private primary mines closed, government mines subsidized
- Secondary supplies expected to rise
- Demand concentrated in only a few sectors
# Geography of Mercury Demand

**Table 23 - Global manufacturing demand for mercury, by region, 2000**

<table>
<thead>
<tr>
<th>Region</th>
<th>Mercury consumption (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Union (15)</td>
<td>302</td>
</tr>
<tr>
<td>North America</td>
<td>314</td>
</tr>
<tr>
<td>Other OECD</td>
<td>100</td>
</tr>
<tr>
<td>Central &amp; Eastern Europe/CIS</td>
<td>530</td>
</tr>
<tr>
<td>Arab States</td>
<td>100</td>
</tr>
<tr>
<td>East Asia and Pacific</td>
<td>1100</td>
</tr>
<tr>
<td>Latin America &amp; Caribbean</td>
<td>450</td>
</tr>
<tr>
<td>South Asia</td>
<td>400</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>90</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>3386</strong></td>
</tr>
</tbody>
</table>
Global Mercury Consumption- 2004 (tonnes)

- Batteries, 200
- Switches, 154
- Lighting, 91
- Measuring, 166
- Dental, 272
- Vinyl chloride, 610
- Small-scale gold mining, 650
- Chlor-alkali, 797
- Other, 175
- Small-scale gold mining, 650
Mercury process for making chlorine
Spolatia Chlor Alkali plant
Neratovice, Czech Republic
Mercury Pollution from Chlor alkali Production

- Mercury cell process accounts for large fraction of overall mercury use worldwide (~25%)
- Process used in many developing countries
- Mercury emissions estimates from 0.6 g to 3 g/tonne chlorine, depending on estimate (OIT, 2000)
- In India, losses are much higher: 146 g/tonne caustic (CSE, 2002)
- Reliability of electricity is a critical factor - power interruption can decrease efficiency and increase mercury releases in return brine to 200 mg/l vs 7 mg/l (CSE 2002)
Phase out of Mercury Technology in Chlor Alkali Sector

- Environmental preference is for conversion from mercury cell to membrane cell plants
  - EuroChlor has committed to voluntary phase out of mercury plants by 2020
  - Indian chlor-alkali sector has agreed to voluntary phase out by 2012
  - United States has six remaining plants, no requirements for conversion
Vinyl Chloride Manufacture
Growth estimates for PVC sector

From 2002-2004, PVC output in China rose from 1.96 million tons to 3.1 million tons, an annual increase of over 25%.

Mercury catalyst usage grew by an annual rate of 31.4% during this period.

***This is probably the largest single use of mercury within any sector of any country***
Mercury Pollution from Vinyl Chloride Sector (China)

- Mercury escapes from activated carbon matrix and is entrained in reaction gases
- Travels with by-products/heavy ends resulting from reaction
- Ultimate fate is poorly understood
  - Half may be escaping into environment or traveling with hydrochloric acid subsequently sold and used as a product in other industries
  - The other half remains on “spent” catalyst
- NRDC estimates that over 300 tons a year of mercury is escaping from this industry from China alone
Energy Usage in Vinyl Chloride Sector

- Highly energy intensive process used upstream for feedstock to the process: manufacture of calcium carbide
- 3450 kwh/tonne calcium carbide reportedly used for production in China
- Currently extreme excess production of calcium carbide; government working to decrease production by 50%
Options for Reducing Mercury Usage in VCM manufacture

- Alternative non-mercury catalysts
- Coal to ethylene via naptha
- Better management of mercury catalyst during production
- Improvements in recycling??