Lead Use and Alternatives

from Winter 2002 TURP Talk - MA TURI

Where do governments and companies stand on the use of lead?

The European Commission is restricting the use of lead in vehicles, and considering a proposal to restrict its use in electronics and electrical equipment:

> *"It is important that preventive measures be applied from the conception phase of the vehicle onwards...in order to prevent [lead's] release into the environment, to facilitate recycling and to avoid the disposal of hazardous waste. In particular the use of lead...should be prohibited."*[1]

> *"Member States shall ensure that new electrical and electronic equipment put on the market after 1 January 2006 do not contain lead...."*[2]

Major corporations, particularly those in Japan, are setting phase out dates for lead:

> Sony has already implemented the use of lead-free solder in most printed wiring board soldering processes, and has set a target of 2005 year-end to be using lead-free solder in all products.[3]

> As part of it's Green Plan 2010, Matsushita Electric Group (parent company of Panasonic) has set a target of FY2005 to discontinue use of lead.[4]

In these and other cases, goals are being set for phasing out lead, beginning with the least critical and most easily substituted uses.

How are lead and lead compounds used in Massachusetts?

Total 1999 Massachusetts Lead and Lead Compounds Use (Pounds)
(1999 TURA Data)

Electricity Generation	17,000
Electronic Components	68,746
Metal Products	561,241
Paints and Coatings	103,350
Plastic or Rubber Additives and Compounding	5,639,071
Wire and Cable - Plastics and Rubber Coating	2,519,117
Waste management and remediation	767,829
Ceramic Glazes and Coatings	75,110
Total 1999 Reported Lead Use	**9,751,464**

The largest use of lead and lead compounds, more than 8 million pounds, is in the plastics and rubber industries. Almost one third of that amount is used for insulation and coatings on wire and cable. While lead is widely used in the electronics industry for soldering, a comparatively small amount of solder actually remains on the board. Other significant reported uses include metal castings and processing of lead-bearing wastes.

What are the alternatives for lead-based solder?

While electronics may not be the largest use of lead in Massachusetts, there is concern world-wide about how to safely manage and close the materials loop on the growing quantity of waste electronics. This has led to a global push to identify safer and easily recyclable materials for use in electronics.

From the many different alloys originally proposed as alternatives to tin-lead solder, alloys of tin, copper and silver are emerging as the preferred US industry standard. Companies throughout the electronics supply chain are trying to grapple with the many issues presented by switching to alternative solders, such as increased processing temperatures and materials compatibility.

To address these issues, UMass Lowell is leading the Massachusetts Lead-Free Electronics Consortium, an industry consortium of seven companies from throughout the electronics supply chain, in a research and testing program designed to help Massachusetts companies make the transition to lead-free electronics. Research papers and results are on the web at *www.turi.org*.

NEMI, the National Electronics Manufacturing Initiative, is a US industry consortium of large firms which has conducted research and testing of alternative solder materials. They have recommended the following alloys: Sn3.9Ag0.6Cu for surface mount applications and Sn0.7Cu (first priority) or Sn3.5Ag (second priority) for wave soldering applications. NEMI research teams are continuing to gather data and develop reliability models.

The TURI Lead-Free Electronics Workgroup, which meets periodically to discuss the latest research results and other issues, will be meeting at the end of March. The agenda will include the latest UML Consortium and NEMI testing results, as well as other recent developments in lead-free electronics. [For more info contact Liz Harriman - harriman@turi.org, 978-934-3275]

What are the alternatives for the use of lead in plastics?

Lead compounds are used in plastics as heat stabilizers in PVC (polyvinyl chloride) and some elastomers. They are also used in colorants in plastics, inks and other products. Because many plastic and elastomeric materials are used in automotive, electrical and electronics products, the global pressure to phase out lead will affect this industry as well. The TURA Program has initiated research, technical assistance and networking efforts to assist the plastics and coated wire and cable industries.

OTA has undertaken several efforts to identify alternatives to lead stabilizers for the plastics and rubber industries, in particular the wire and cable industry. (see Green Chemistry article, pg 3) In concert with those efforts, TURI is bringing together companies from the wire and cable supply chain to hear about and discuss environmental issues and global pressures on their industry. A background report on the environmental health and safety issues in this industry is currently being published and will be available on TURI's web site. To help the industry develop products which will keep them globally competitive, plastics engineering researchers at UMass Lowell are investigating innovative, more environmentally friendly polymer coatings for wire and cable applications. There will be an opportunity to see these innovative materials extruded during a Cleaner Technology Demonstration Site visit at UMass Lowell in the spring.

[1] *Directive of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles*

[2]*Amended proposal for a Directive of the European Parliament and of the Council on the restriction on the use of certain hazardous substances in electrical and electronic equipment - 6 June 2001*

[3]*Sony Mid-Term Environmental Action Program "Green Management 2005."*

[4]*Matsushita Electric Industrial Co., "Green Plan 2010."*