Metal Recycling Project

Co-leaders
Adam Wheeler (IBM)
Carol Handwerker (Purdue)
Agenda

- Problem Statement
- Is/Is Not Analysis
- Project Team
- Key Objectives
- Project Plan
- Project Progress
- Anticipated Outcome
• Problem Statement
  • Metals recovery from electronic product recycling is focused on high-volume and most valuable metals that are easily recoverable. Current and future electronics will contain small amounts of resources that are available for recovery but are not currently recovered in today’s recycling infrastructure.

• Purpose and Scope
  • Conduct an analysis of the needs and readiness of current and future materials recovery, focusing on metal recovery, as it applies to consumer electronics, enterprise electronics and future ICT. The trend toward miniaturization to increase functionality and the introduction of new heterogeneous materials systems and technologies create new challenges with respect to materials supply, materials recovery, and electronics recycling. Understanding how these interact, and their impact on metals recycling will assist us in making materials and technology choices both now and in the foreseeable future.
<table>
<thead>
<tr>
<th>This Project <strong>IS:</strong></th>
<th>This Project <strong>IS NOT:</strong></th>
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<tbody>
<tr>
<td>Focusing on Metals Recycling – some plastic contaminant optimization/handling for metal recovery</td>
<td>Developing smelter processes, or other end-processes, or pre-processing (sorting and separation processes)</td>
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<td>Developing a list of existing applicable literature, pilot studies and build upon this work. ID what activities are going on. Recommendation of applicability to electronics industry</td>
<td>Assessing recycling of any other materials (plastics, paper, etc.), except for some plastic contaminant optimization/handling for metal recovery</td>
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<td>Developing a map of the recycling system. Recommendation of what elements to follow in the mapping activity (metal types, chemistry, etc.)</td>
<td>Attempting to identify or prioritize specific “critical” metals for recovery</td>
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<td>High-level assessment of roles of different stakeholders in the life-cycle chain through the lens of future needs</td>
<td>Repeating existing work</td>
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<td>Metals recycling from consumer electronics, enterprise electronics, and future ICT</td>
<td>Developing Standards or Certifications</td>
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<td>Analysis of current state of the art of the recycling systems and technologies in use (Efficiency, Economics, etc.). Recommendations/Gap Analysis of how this relates to readiness for future materials recovery</td>
<td>Creating new implementation activities</td>
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<td>Guidance, Best Practices, Recommendations for manufacturers, electronic recyclers and other economic actors in the supply chain</td>
<td>Being proscriptive</td>
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<td>End outputs: Public report; INEMI member-only recommendations for next steps (Phase 2+ or other)</td>
<td>Creating new tools or assessment methods</td>
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<td>High level assessment - User-friendly guide on ability for recovery</td>
<td>Judging effectiveness</td>
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<td>The project will assess how the widest range of metal recovery options can be realized through the EoL supply chain in order to permit market forces, future policy initiatives to determine what options are realized.</td>
<td>Developing product design criteria</td>
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<tr>
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<td>Keith Howell</td>
<td>Nihon Superior</td>
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<td>Tetsuro Nishimura</td>
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<td>Jeffrey Lee</td>
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<td>Derek Hellar</td>
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<td>Callie Babbitt</td>
<td>RIT</td>
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<td>Wayne Rifer</td>
<td>EPEAT/GEC</td>
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Key Objectives (1 of 3)

• Identify materials and future product technology trends that the recycling/recovery industry will be handling in the near future. This will permit an assessment of the readiness of the recycling industry for coming changes in materials and products.
Key Objective (2 of 3)

• Assess the current state of the recycling systems and technologies in use
  – Develop map of the existing recycling systems.
  – Develop a high-level assessment of the roles of the economic actors in the life-cycle chain, including product designers, EoL collectors, processors, and treatment facilities, with an eye to future needs.
  – Develop a decision tree for use along the supply chain on potential choices for systems to increase efficiency of material recovery.
Identify Gaps and provide recommendations of how to increase the readiness for future materials recovery.

– Develop projections regarding future demands for recovery of an increasing diversity of metals (metal species, processing and smelting technologies, metallurgy, etc.).

– Project future opportunities for and expectations of the recycling industry.

– Identify system needs to meet these opportunities and expectations.
**Task 1:** Review existing work and Develop baseline “vocabulary”
- Need to define terms like “efficiency”
- Identifying the product(s) in each sector (consumer electronics, enterprise electronics and future ICT) to model

**Task 2:** Develop map of existing recycling systems
- Routes through which equipment goes
  - Inputs
  - Outputs
  - Qualitative evaluation

**Task 3:** Assess current state of recycling systems and technologies

**Task 4:** Develop high-level assessment of roles of the economic actors in the life-cycle chain

**Task 5:** Develop a decision tree for use along the supply chain on potential choices for systems to recover materials

**Task 6:** Identify Gaps and provide recommendations for future metals recovery

**Task 7:** Write and issue public report

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<tr>
<th>PHASE 1</th>
<th>Q1</th>
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<th>Q3</th>
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<td>Task 1</td>
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Project Progress

- Task 1: Review existing work and baseline vocabulary
  - Level setting some industry practices and their impact (Ex. shredding PCB v dismantle)
  - Identify what materials we are recovering today
  - Material breakdown for the various products of interest for this project
  - Investigate material cost to determine if it drives recovery practices in the industry
Task 2: Develop map of existing recycling system

- Review the recycling system maps utilized by all of the project member’s companies
- Identify gaps between metals being used and not being recovered
- Trends in the amount and types of materials recovered
Task 2: IBM Reverse Logistics Supply Chain

Automated track and trace at each stage of the process
Task 2: IBM Demanufacturing Technical Workflows

**Products**
- Hard drives, Laptops, Tablets, Mobile Devices
- Routers, Servers, Desktops
- Monitors, Displays, CRT’s
- Accessories, Parts
- Printers, Multi-Function Devices
- Media, Software

**Inspection/Testing**
- Hardware testing
- Electrical testing

**Refurbishing**
- Data Wiping
- Replace
- Packaging

**Dismantling**
- Dismantling Technical Parts
- Removing Hazardous Waste (Batteries …)
- Segregate Commodities
- Scanning
- Module Pulling

**Scraping**
- Wafer Recovery
- HDD Destruction
- Shredding

**Sorting**
- Cabling
- Plastic
- Consumables
- Hazardous Waste
- Precious Metal
- Metal
- Magnesium
- Copper
- Paper

**Saving/Distribution Center**
- Re-usable ESD Box
- Automated Storage
- Shelves
- Racks

**Sales**
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**Images and Logos**
- APEX EXPO
- INEMI
- GEODIS

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**Additional Text**
- NEW IDEAS ... FOR NEW HORIZONS
- MARCH 25-27, 2014
- MANDALAY BAY RESORT AND CONVENTION CENTER
- LAS VEGAS, NEVADA
Challenges

- Participation by a recycler
  - The team has been actively reaching out to engage a company to join the team. The success of this actively will largely impact how far the project will be able go.
This iNEMI sponsored project proposes to understand the current and future readiness of the recycling infrastructure and provide recommendations throughout the entire life-cycle to better enable more efficient metals recovery.

- The output of the project will be, at a minimum, a public report
- Future phases of the project may be identified depending upon the findings of Phase 1.
Questions