Closing the Loop in Supply Chains

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“The Smell of Money”

Istanbul

The other face of Istanbul
A Success Story

1891 – Michelin introduces the “removable” bike tire

Charles Terront, Winner of PBP, 1891 on Michelin tires

Disposal of Tires
A Success Story

King Camp Gillette

Municipal Waste

In 1999, 14 states had no landfill capacity left
8 additional states have less than 10 years capacity

U.S. EPA 2002
Municipal Solid Waste

E-Waste

E-waste is consumer and business electronic equipment that is near or at the end of its useful life.
One of the fastest growing waste streams.
Contain toxic ingredients such as lead, mercury and cadmium that pose environmental and health threats
220 million tons of old computers and other tech hardware are trashed in the U.S. every year.
Fifty percent of computers being discarded are in good working order.
About 70 percent of heavy metals found in U.S. landfills comes from discarded electronics such as circuit boards, wires, steel casings and other parts.
It is estimated that 80% of “recycled” computers are exported from the US to 3rd world and developing countries.
The Value Chain Perspective

What We Waste

• Every American consumes 136 lbs of resources/week
• 2000 lbs of waste discarded to support it
  – Paper, CO2, agricultural waste, effluent, packaging material, nitrous oxides
• Consider life-cycle impact
• Back to China

Source: Hawken, *Ecology of Commerce*
Solutions: Environmental Regulation

- Basel convention
  - Bans exporting hazardous waste. US one of 3 countries that did not ratify. Enforcement spotty worldwide.
- EU packaging ordinance
  - Makes the cost of landfilling packaging the responsibility of manufacturers using the packaging. 50% drop in packaging waste since enacted.
- EU WEEE Directive
  - Makes the recovery and recycling of electronic waste the responsibility of the manufacturer. Came into effect in 2006.
  - In the US, Washington Senate Bill 6428 was signed by Governor Gregoire on Friday, March 24, 2006. The bill requires electronics manufacturers to finance and implement an electronics product collection and recycling program in Washington State.
- EU RoHS Directive
  - Bans certain toxic substances such as lead from being used in products manufactured in the EU or imported into the EU. Came into effect in 2006

Solutions: The Waste Reduction Pyramid

from least to most preferred environmentally
The Value Chain Perspective

Recycling

Recycling means processing used materials and remaking them into the same material.

Recycling Rates of Selected Materials 2003

<table>
<thead>
<tr>
<th>Material</th>
<th>Recycling Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batteries</td>
<td>93.0</td>
</tr>
<tr>
<td>Steel Trimmings</td>
<td>60.0</td>
</tr>
<tr>
<td>Yard</td>
<td>53.0</td>
</tr>
<tr>
<td>Paperboard</td>
<td>48.1</td>
</tr>
<tr>
<td>Plastics &amp; Soft Drink Containers</td>
<td>45.9</td>
</tr>
<tr>
<td>Tires</td>
<td>36.6</td>
</tr>
<tr>
<td>Metal Bottles</td>
<td>28.9</td>
</tr>
<tr>
<td>Plastic Bottles</td>
<td>29.2</td>
</tr>
<tr>
<td>Glass Containers</td>
<td>22.6</td>
</tr>
</tbody>
</table>
Remanufacturing

Remanufacturing means using a mix of used and new parts to make products.

Remanufacturing is a $53 B industry.
   e.g. engines, tires, copiers, cell phones, PCs, toner cartridges, single-use cameras

Both OEMs and third parties remanufacture.

Kodak

Plus Digital   MAX Water & Sport   MAX HQ
ADVANTIX Switchable  MAX Flash  Black & White
FUN SAVER 35 Flash  MAX Outdoor
Business Challenges

- Cost
- Technology feasibility
- Competition
- Customer preferences/education
- Organizational culture
Interface

Located in Lagrange, GA

Worldwide leader in design, production and sales of modular carpet

1994 – CEO Ray Anderson develops a new vision

“Our current system of industrialism developed in a different world from the one we live in today: fewer people, less material well-being, plentiful natural resources.” (Interface Sustainability Report, 1997)

“No one is accusing me, I stand convicted by me, myself, alone, and not by anyone else, as a plunderer of the earth”

Interface

• Sustainability strategy
  – Eliminate Waste
  – Benign Emissions
  – Renewable Energy
  – Closing the Loop
  – Resource Efficient Transportation
  – Sensitivity Hookup
  – Redesign Commerce
What Can IE/OR Do?

• TQM → TQEM

• Cost efficient/profitable reverse logistics, recycling and remanufacturing operations
  – Design collection infrastructure
  – Procurement planning
  – Production planning
  – Inventory management
  – Warehousing
  – Supply chain management
  – Pricing