



# Lean and Environment Training Modules

**Version 1.0 – January 2006**



# Lean and Environment Training Module 2

## Identifying Environmental Wastes



## Purpose of This Module

- » To provide an understanding of what environmental wastes are and how they are related to Lean's seven deadly wastes
- » To begin identifying environmental wastes in your company
- » To provide strategies for identifying and eliminating environmental wastes as part of Lean efforts



# What is Environmental Waste?

- » **Environmental waste** is:
  - an unnecessary use of resources, or
  - a substance released to the air, water, or land that could harm human health or the environment
  
- » Environmental wastes can occur when:
  - companies use resources to provide products or services to customers and/or
  - when customers use and dispose of products



## The Link to Lean's Seven Deadly Wastes

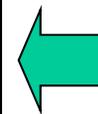
- » Many environmental wastes are, embedded in, or related to, the seven deadly wastes

### Lean's "Deadly Wastes"

1. Overproduction
2. Inventory
3. Transportation
4. Motion
5. Defects
6. Over Processing
7. Waiting

### ***Where are environmental wastes?***

- Excess materials use
- Pollution/emissions
- Scrap & non-product output
- Hazardous wastes





## Lean Production's Environmental "Coattails"

- » Less scrap, fewer defects, less spoilage = **reduced environmental waste**
- » Fewer defects, less overproduction, simpler products, right-sized equipment = **reduced use of raw materials**
- » Less storage, inventory space needed = **reduced materials, land and energy consumed**
- » Less overproduction, lighting/heating/cooling unneeded space, oversized equipment = **less energy use**
- » Less overprocessing, more efficient transport and movement = **lower emissions**



## Lean's “Blind Spots”

- » Lean can be leveraged to produce even more environmental improvement, by addressing environmental “blind spots” in lean.
  - **Hidden environmental waste** is often buried in overhead and facility support costs
  - **Environmental and human health risks** are often not explicitly considered in lean initiatives
  - **Environmental impacts** throughout the **product lifecycle** can affect customers and stakeholders



## TO CONSIDER

- What types of environmental performance gains has your company seen from implementing Lean methods? For example have you :
  - › reduced chemical use in a leaned process?
  - › generated smaller quantities of waste?
  - › reduced vehicle miles traveled thereby reducing exhaust emissions and fuel use?
- What are three examples of environmental wastes you could reduce at your company? What steps could you take to eliminate these wastes?





# Learn to “See” Environmental Wastes

## *Overview of Organizational Strategies*

1. Add environmental metrics to Lean metrics
2. Show management commitment and support
3. Include environmental wastes in Lean training efforts
4. Make environmental wastes visible and simple to eliminate
5. Recognize and reward success



# 1. Add Environmental Metrics to Lean Metrics

- » Using environmental metrics in Lean efforts will allow your company to document the environmental benefits that are part of Lean implementation

<b>Examples of Environmental Metrics</b>	
Energy Used	Air Emissions
Materials Use	Hazardous Waste Generation
Chemical Use	Solid Waste Generation
Water Use	Wastewater Discharges



## 2. Show Management Commitment and Support

- » Invest in Lean and environment training
- » Provide resources, tools, and incentives to employees
- » Make time for and encourage Lean managers and EHS managers to collaborate
- » Set performance goals and objectives related to Lean and the environment
- » Track Lean and environment progress and hold individuals accountable for meeting those objectives



### 3. Include Environmental Wastes in Lean Training Efforts

- » Include slides on how to identify and eliminate environmental waste in introductory Lean training presentations
- » Add an eighth waste—environmental waste—to Lean’s Seven deadly waste list in training presentations and materials
- » Conduct a “waste walk” during Lean trainings – workers walk the shop floor and write down the environmental wastes they observe
- » Develop [checklists](#) or a pocket guide with common environmental wastes to use during events and waste walks
- » Provide Lean and/or advance environmental training for EHS personnel and other selected employees



## 4. Make Environmental Wastes Visible and Simple to Eliminate

- » Take advantage of Lean's focus on rapid feedback and visual controls by:
  - Displaying how individual production areas or departments are doing relative to environmental targets
  - Incorporating environmental wastes into activity and production control boards, one-point lessons, and other signs about wastes on the shop floor
  - Using colors, signs, and other visual controls to reinforce proper chemical handling, waste management and environmental procedures



## 5. Recognize and Reward Success

- » Highlight the environmental gains your company has already accomplished
- » Encourage Lean and environment coordination efforts through recognition and awards
- » Recognize Lean and environment accomplishments in simple ways (i.e., in a company newsletter)





## TO CONSIDER

- What are three things you could do to explicitly include environmental wastes in your company's Lean implementation efforts?
- What ideas do you have for involving employees at all levels of your company in efforts to identify and eliminate environmental wastes?
- What environmental goals and targets does your organization have?





## Reflections on Identifying and Eliminating Environmental Waste

- » Remember, Environmental Wastes are embedded in or related to the wastes targeted by Lean methods
- » Using environmental performance metrics in Lean efforts enables managers to understand key areas for improvement
- » Consider using the organizational strategies in this module to help integrate Lean and environmental waste reduction efforts.



## Reflections on Identifying and Eliminating Environmental Waste, Continued

- » What did you learn from this training module that was particularly useful?
- » Do you need any more information to understand organizational strategies for eliminating environmental waste?
- » Would any other tools be helpful?



## EPA Lean and Environment Training Modules

- » For more information about EPA's Lean and Environment Training Modules, visit:  
[www.epa.gov/lean](http://www.epa.gov/lean)
- » EPA is interested in learning from organizations' experiences with Lean and environment, and welcomes your comments on this training module
- » Please contact EPA by using the form found at  
<http://www.epa.gov/lean/auxfiles/contact.htm>



# Environmental Impacts of Deadly Wastes (1 of 2)

Waste Type	Environmental Impacts
Overproduction	<ul style="list-style-type: none"><li>• More raw materials consumed in making the unneeded products</li><li>• Extra products may spoil or become obsolete requiring disposal</li><li>• Extra hazardous materials used result in extra emissions, waste disposal, worker exposure, etc.</li></ul>
Inventory	<ul style="list-style-type: none"><li>• More packaging to store work-in-process</li><li>• Waste from deterioration or damage to stored WIP</li><li>• More materials needed to replace damaged WIP</li><li>• More energy used to heat, cool, and light inventory space</li></ul>
Transportation and Motion	<ul style="list-style-type: none"><li>• More energy use for transport</li><li>• Emissions from transport</li><li>• More space required for WIP movement, increasing lighting, heating, and cooling demand and energy consumption</li><li>• More packaging required to protect components during movement</li><li>• Damage and spills during transport</li><li>• Transportation of hazardous materials requires special shipping and packaging to prevent risk during accidents</li></ul>



# Environmental Impacts of Deadly Wastes (2 of 2)

Waste Type	Environmental Impacts
Defects	<ul style="list-style-type: none"><li>• Raw materials consumed in making defective products</li><li>• Defective components require recycling or disposal</li><li>• More space required for rework and repair, increasing energy use for heating, cooling, and lighting</li></ul>
Over Processing	<ul style="list-style-type: none"><li>• More parts and raw materials consumed per unit of production</li><li>• Unnecessary processing increases wastes, energy use, and emissions</li></ul>
Waiting	<ul style="list-style-type: none"><li>• Potential material spoilage or component damage causing waste</li><li>• Wasted energy from heating, cooling, and lighting during production downtime</li></ul>



## EPA's Lean and Environment Basic Environmental Measures (1 of 5)

- » EPA has assembled a list of environmental metrics that may be of use to organizations implementing Lean
- » The metrics are derived from EPA's Green Suppliers Network and Performance Track Programs
- » The measures include chemicals that are of particular concern because of their toxicity, persistence in the environment, and/or their potential to occur in higher concentrations at upper levels of the food chain



# Environmental Performance Metrics (2 of 5)

DETAILS

Basic Environmental Measures			
Category	Definition	Metric	Unit of Measure
<b>Input Measures</b>			
Energy Use	Any source providing usable power Transportation and non-transportation sources	Energy Used	Specific to energy source such as BTUs or kilowatt hours, % reduction, energy use/unit of product
Land Use	Land covered by buildings, parking lots, and other impervious surfaces Land/habitat conservation	Land Converted, Land Restored or Protected, Area of Impervious Surfaces	Square feet, acres
Materials Use	Materials used (total or specific), including: - Ozone depleting substances (e.g., CFC-11) - Packaging materials Proportion of input materials that were recycled or recovered (vs. virgin materials)	Materials Used, Percent Utilization of Materials, Post-Consumer Recycled Content	Tons/year, pounds/unit of product, % materials utilization
Toxic/Hazardous Chemicals Use	Use of hazardous and toxic chemicals that are regulated or otherwise of concern	Toxic/Hazardous Chemicals Used	Pounds/year, pounds/unit of product, % reduction
Water Use	Incoming raw water, from outside sources, e.g., from municipal water supply or wells, for operations, facility use, and grounds maintenance. NPDES	Volume of Water Used, P2 to reduce Priority Chemicals/Quality Standards/Pretreat Standards	Gallons/year, % reduction, % recycled Pounds Priority Chemicals/year, % reduced, % recycled



# Environmental Performance Metrics (3 of 5)

DETAILS

Basic Environmental Measures			
Category	Definition	Metric	Unit of Measure
<b>Non-Product Output Measures</b>			
Air Emissions	The release of any of the following: Air toxics - CAA 112b HAPs (see attachment A) Carbon Monoxide Lead Ozone and its precursors, including: VOCs (volatile organic compounds) NOx (nitrogen oxides) Ozone-depleting substances PM10 (particulate matter) PM2.5 (fine particulate matter) Sulfur Dioxide Greenhouse gases, including Carbon Dioxide	Air Emissions Generated	Pounds/year, Tons/year % reduction
Water Pollution	Quantity of pollutant in wastewater that is discharged to water source. Should include any substances regulated in NPDES permit. May include: Heavy Metals - Cu, Pb, Hexavalent Chromium, Cadmium, Zn, Ni, Hg, Organic Pollutants and Pesticides, Conventional pollutants, e.g., oil and grease, BOD and suspended solids, and Nutrients - N, P Pathogens Sediment from runoff	Mass or Concentration of Regulated Pollutants Discharged	Pounds/year, mg/L or % reduction
Solid Waste	Wastes (liquid or solid) other than RCRA hazardous wastes.	Solid (Non-Hazardous) Waste Generated	Gallons or pounds/year, % reduction, % recycled



# Environmental Performance Metrics (4 of 5)

DETAILS

Basic Environmental Measures			
Category	Definition	Metric	Unit of Measure
<b>Downstream/Product Measures</b>			
Product Impacts	Expected lifetime energy and water use Wastes (to air, water, & land) from product use and disposal or recovery	Energy and water used (over product's lifecycle) Waste generated (after the product is used)	Energy - Btu, kWh, MWh Water use - gallons Wastes - pounds, tons
<b>Other Measures</b>			
Money Saved	Money saved in the reduction of materials or other changes in processes	Dollars saved	Dollars saved
Qualitative Measures	Other environmental improvements that cannot be directly or accurately quantified. For example: implementing an EMS or CMS	Savings/environmental benefits from leaning out of permits/DfE/Clean Production/EMS implementation/ Extended Product Responsibility	Not Applicable



## Environmental Performance Metrics Resources (5 of 5)

- » Companies and other non-governmental organizations have also developed guidance on environmental metrics
  - The [Global Reporting Initiative](http://www.globalreporting.org) provides guidance for company-wide environmental and sustainability metrics – see [www.globalreporting.org](http://www.globalreporting.org)
  - The [Facility Reporting Initiative](http://www.facilityreporting.org) provides guidance for facility-wide environmental and sustainability metrics – see [www.facilityreporting.org](http://www.facilityreporting.org)
  
- » While these resources do not focus explicitly on process level environmental metrics, most of the metrics in these frameworks can be considered and applied at process or sub-process levels