Measuring Sustainability with Life-Cycle Assessment (LCA)

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- Leads NYSP2I’s LCA program
- Life cycle assessment certified professional (LCACP) for 8+ years
- Performs ISO compliant LCAs and peer reviews
NYS Pollution Prevention Institute

- HQ at RIT.
- Established in 2008.
- $3.9M in annual NYS funding administered through the NYS Department of Environmental Conservation.

**Focus areas include:**

- Sustainable-Manufacturing Assessments
- Supply-Chain Sustainability
- Technology Commercialization
- Food-Waste Diversion
- Outreach and Education
- Research and Development
- Emerging Contaminants
Outline

- What is Life-Cycle Assessment (LCA)?
- Using LCA to meet sustainability goals
- How to get started
Life Cycle Assessment (LCA)

LCA is a technique used to quantify the environmental impact of a product or process from raw material acquisition through to end-of-life disposition.
Life Cycle Assessment (LCA)

Natural Resource Inputs
energy, material, water

Emissions & Waste Outputs
air and water pollution, municipal and hazardous waste

Environmental Impacts
human health, ecosystem, resources
Types of LCA

Comprehensive
- all life-cycle stages
- thorough set of impacts

Streamlined
- few life cycle stages
- few impacts

Targeted
- 1 life cycle stage
- 1 impact

Life cycle stages and impacts vs. time and resources
Benefits of LCA

Green-Product Marketing

Environmental Footprints

Decision-Making Guidance

Hot-Spot Analysis

Meeting Customer Demands

Third-Party Validation
LCA Case Studies
Support Product Design & Marketing

- **Challenge**: Quantify the environmental benefits of a redesigned blood-pressure cuff
- **Solution**: comprehensive, comparative-assertion LCA
Understand process contribution to impact

Understand specific environmental impacts

**Cumulative Energy Demand**

- Materials
- Assembly
- Packaging
- Transport
- Landfill

**Environmental Impact Category Results**

- Carcinogen
- Resp. organics
- Resp. inorganics
- Climate change
- Radiation
- Ozone layer
- Ecotoxicity
- Acid/Eutroph.
- Land use
- Minerals
- Fossil fuels
Impact of results

1. Credible marketing claims led to increased customers and sales

2. Put focus on manufacturing and supply-chain of highest impact parts and processes

3. Design team better understood the impact of their decisions

4. Instilled life-cycle thinking
Validate Remanufacturing

- **Challenge**: Compare the impact of a new and remanufactured toner cartridge
- **Solution**: comprehensive, comparative-assertion LCA
- **Impact of results**:
  1. Remanufacturing was shown to provide significant life-cycle environmental benefits when compared to new manufacture
  2. Major benefit realized through part-material and process recovery
  3. Highlighted the importance of “functional equivalence”
Make a difference.
Staples recycles your ink and toner cartridges.

Staples is committed to recycling or reusing 100% of a cartridge’s components, ultimately limiting the number of cartridges sent to landfills. The remanufactured toner process emits 60% fewer carbon equivalents than manufacturing a new cartridge. And each remanufactured toner helps save 2 quarts of oil.¹

Cartridges that cannot be reused are recycled to create new products. The process is as follows:
Comparing Disposable and Durable Floor Mats

- **Challenge**: Understand the environmental impact of a disposable floor mat to that of a reusable mat
- **Solution**: comprehensive, comparative-assertion LCA
- **Impact of results**:
  1. Expanded client’s customer base and market share by validating and supporting environmental claims
  2. Educates and assists customers in making more informed purchasing decisions
Using Waste Glass to Offset Cement in Concrete

- **Challenge**: Quantify and qualify the environmental impact of replacing cement with post-consumer glass
- **Solution**: comprehensive LCA
- **Impact of results**:
  1. Potential expanded customer base
  2. Informs state and national glass recycling policies
  3. Reduced landfill volume
  4. More efficient building materials

![Normalized Average Life-Cycle Impact]

- **Global Warming Potential**
  - Municipal Recycling-Facility Glass: 21%
  - Ordinary Portland Cement: 0%

- **Acidification**
  - Municipal Recycling-Facility Glass: 20%
  - Ordinary Portland Cement: 7%

- **Ozone depletion**
  - Municipal Recycling-Facility Glass: 0%
  - Ordinary Portland Cement: 0%

- **Eutrophication**
  - Municipal Recycling-Facility Glass: 6%
  - Ordinary Portland Cement: 0%

- **Smog**
  - Municipal Recycling-Facility Glass: 7%
  - Ordinary Portland Cement: 50%
Validating a Product Designed to Increase Energy Efficiency

- **Challenge**: Quantify the impact of an air-conditioning-coil coating designed to increase energy efficiency

- **Solution**:
  1. sustainable materials assessment of the coating
  2. streamlined LCAs of an absorption chiller and electricity for 20 years of operation
  3. development of a life-cycle energy-use and cost tool to model effects over time

- **Impact of results**:
  1. Improved data collection methods
  2. Tool can be used to focus research and development efforts
Cost and Environmental Impact of Alternative Process

- **Challenge:** Quantify cost and environmental impact of a snow- and ice-management removal process at 7 Syracuse-area grocers
- **Solution:** streamlined LCA, focused on mass of salt and global-warming potential
- **Impact of results:**
  1. Increased client base
  2. Focused company’s data collection
  3. Hot spot analysis identified opportunities and tightened up process
Optimizing End-of-Life Management

- **Challenge**: Quantify environmental and economic life-cycle impact of distribution and material-reclamation scenarios for a fibre drum.
- **Solution**: targeted LCA with scenario analysis (e.g., landfill, reuse, recycled into drums, and recycled externally).
- **Impact of results**:
  1. Supported internal decision making.
  2. Hot spot analysis helped company to focus on high-impact areas.
How to Get Started
NYSP2I Can Help You

- Focus the goal and scope of an LCA.
- Design a study that meets your needs.
- Support product development, manufacturing, and supply chain by identifying areas for environmental improvement.
- Identify opportunities for LCA results to help increase market share and meet customer demands.
Thank you

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