Identifying Pollution Prevention & Environmental Improvement Opportunities

NYS Pollution Prevention Institute

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New York State Pollution Prevention Institute (NYSP2I)

Introductions

Anahita Williamson, Ph.D. – Director
  • Oversees 7 Core NYSP2I Programs

Eugene Park, Ph.D. – Assistant Director of Technical Programs
  • Direct Client Assistance Program
  • Research & Development

Patricia Donohue – Senior Pollution Prevention Engineer
  • Sustainable Supply Chain & Technology Program
  • Direct Client Assistance Program
Agenda

• Welcome & Introduction to NYSP2I and Sustainability/P2
  – DEC/NYSP2I

• Tools to Identify Environmental Improvement Opportunities
  – DEC Environmental Audit Incentive Policy
  – Environmental Management Systems
  – Sustainable Supply Chain

• Break & Lunch

• Real Examples of Businesses Improving Their Environmental Performance
  – Direct Client Assistance Program and Lean, Energy & Environment (LE2)
  – Case Studies

• Break out groups
  – Exercises focused on Pollution Prevention
New York State Pollution Prevention Institute (NYSP2I)

Vision & Mission

Vision:
The vision of the NYS P2I is to foster the transformation and development of sustainable businesses and organizations in New York State in a collaborative program committed to making the State a leader in environmental stewardship.

Mission:
The mission of the Institute is to provide a high-impact, comprehensive and integrated program of technology research development and diffusion, outreach, training and education aimed at making New York State more sustainable for workers, the public, the environment and the economy through:

• reductions in toxic chemical use
• reductions in emissions to the environment and waste generation
• the efficient use of raw materials, energy and water
NYSP2I - Core Programs

Research & Development
- Led by Technical Advisory Committee (TAC)
- Four Partner Universities:
  - Clarkson
  - RIT
  - RPI
  - University at Buffalo
- Short & Long-term research

Direct Assistance
- Facilitate the use of P2 for solving environmental problems
  - Assessment & Implementation
  - LE2: Lean/Energy/Environment

Community Grants
- Provide financial & technical support to community organizations
  - Raise awareness & understanding of P2

Professional Training/Outreach
- Workshops & Training
  - Areas of interest for stakeholders
  - Specific Training
  - Environmental Health for New Parents
  - Green Cleaning
  - Life-Cycle Assessment

Sector Projects
- Projects that have the potential to impact NYS on a high level
  - Dry Cleaning
  - Farm to Fork
  - Healthcare
  - Green Buildings

Green Initiatives

New York State Pollution Prevention Institute

Sustainable Supply Chain & Technology Program

Rochester Institute of Technology
Funding Provided by NYS Department of Environmental Conservation

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Sustainability

Brundtland Commission: Convened by United Nations in 1983

• Commission created to address growing concern “about the accelerating deterioration of the human environment & natural resources and the consequences of that deterioration for economic & social development”
• Recognized that environmental problems were global in nature & determined that it was the common interest of all nations to establish policies for sustainable development
  – “..development that meets the needs of the present without compromising the ability of future generations to meet their own needs”

Green engineering:

– The design, commercialization, and use of processes and products, which are feasible and economical while minimizing
  1) generation of pollution at the source
  2) risk to human health and the environment
Sustainability – Defined

Many Phrases for the Same Concept

Many terms for addressing social, environmental and economic initiatives:

- 3Ps—People, Planet, Profit
- Social, Economic, Environmental
- Corporate Social Responsibility
- Corporate Citizenship
- Sustainable Growth

Each company or organization should define how they address sustainability.

Sustainability is actualized
## Sustainability – Defined

**Internal and External Respect and Values**

<table>
<thead>
<tr>
<th>Sustainability – 3Ps</th>
<th>Component</th>
<th>Internal (Company) Aspect</th>
<th>External (Societal) Aspect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>People</strong> (Social)</td>
<td>Respect for People</td>
<td>Respecting the needs of people inside the company</td>
<td>Respecting the needs of people outside the company</td>
</tr>
<tr>
<td><strong>Planet</strong> (Environmental)</td>
<td>Wise use of natural resources</td>
<td>Leaving enough resources to meet current and future needs of company</td>
<td>Leaving enough resources to meet current and future needs of society</td>
</tr>
<tr>
<td></td>
<td>Respect for living things</td>
<td>Treating living things with respect w/in company operations (e.g., respecting animal rights)</td>
<td>Protecting ecosystems so living things can survive in the environment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Preventing and controlling pollution w/in company property</td>
<td>Preventing and controlling pollution of the external environment</td>
</tr>
<tr>
<td><strong>Profit</strong> (Economic)</td>
<td>Wise use of economic resources</td>
<td>Achieving economic success of company</td>
<td>Achieving economic prosperity of society</td>
</tr>
</tbody>
</table>

Figure 2.6, *The Sustainability Handbook*, Wm. R. Blackburn
Sustainability Continuum

Available at: http://scholarworks.rit.edu/jes/vol2/iss2/2
P2 & Environmental Audit Incentives Policy (CP-59)

Identifying P2 & Environmental Improvement Opportunities: Training for NYSDEC
January 21, 2015; DEC - Pulaski

John Vana, Chief, Pollution Prevention Unit
Background


- 11 organizations (covering 17 facilities) have utilized the policy.

- 3 organizations have audit agreements; including one agreement that covers multiple facilities (JP Morgan Chase Bank).

- Facilities range from IBM, Global Foundries, Davis Vision to Brooks’ House of Bar-B-Q

- Executive is interested in looking into additional ways to promote the policy.
Background

- **Basis for Emphasis on P2**
  - ECL Article 28 – Pollution Prevention (2005)
  - ECL 1-0101 – “It is hereby declared to be the policy of the State of New York to … **prevent**, abate and control water, land and air pollution …” (prevent added in 2005)
  - Federal Pollution Prevention Act (1990)
Goals of CP-59

1) Make it easier for the regulated community to return to compliance and stay in compliance.

2) Encourage and reward companies that go beyond compliance.

3) Maintain Robust Enforcement

4) Make Wise Use of Personnel Resources
Encourage and reward companies that go beyond compliance.

- Publicize the benefits of pollution prevention (P2)
- Publicize P2 assistance programs
- Reward implementation of environmental management systems (EMS)
- Reward investment in P2
- Provide incentives for long term commitment to P2 through the New York Environmental Leaders program (NYEL)
Key Elements: Voluntary Disclosure

- **Scope:**
  - Single violation
  - Multiple violations
  - Violations discovered pursuant to a partial or comprehensive Audit Agreement
  - Violations discovered through P2 and compliance assistance

- **Must be disclosed:**
  - Prior to government inspection
  - Prior to filing of report or complaint by third party
  - Within 30 days of discovery (longer for new owners)
Key Elements: Manner of Disclosure

- Contact DEC regional office
  - Complete Return to Compliance Form or
  - Negotiate an Environmental Audit Agreement
    - Define scope of audit
    - Commit to environmental performance tools/P2 (if wanted)
    - Identify entity-specific schedule

- Eligibility determined in 30 days

- What happens if a violation is found ineligible after disclosure?
  - Enforcement Policy discretion, considerations still apply
Key Elements: Eligible Parties & Violations

- **Included:**
  - Any regulated entity, no matter the size

- **Excluded Entity:**
  - History of non-compliance
    - 5-year look back:
      - Notice of violation, etc. AND
      - Lack of cooperation

- **Excluded Violations**
  - Examples – criminal, repeat violations, violations of orders, violations discovered during DEC inspections
Key Elements: Penalty Waiver

- Waives gravity portion of potential civil penalty for those who voluntarily disclose
- Economic benefit portion may be waived
  - Where de minimus (< $5,000)
  - By the amount invested in pollution prevention
Key Elements: Correcting & Preventing Violations

- Correction achieved 60 days after disclosure
- Alternate time frame can be established in Audit Agreement or agreed to by DEC in writing
- Includes implementing and maintaining measures to prevent future violations
- Adoption of environmental management system encouraged
- Adoption of P2 measures encouraged to achieve cost savings and beyond compliance results
Encourage economic revitalization, due diligence

60 days to disclose violations after acquisition
  - Violations required to be reported by law are eligible
  - Violations categorized as a SNC or HPV are eligible

Eligibility not determined by prior owner’s history of non-compliance

New owner must verify lack of connection to prior owner, lack of responsibility for compliance, violations
Key Elements: P2 Incentives
(Additive)

- Audit Agreement with comprehensive scope:
  - Recognition, eligible for NYSERDA Flextech audit, ESD P2 funding, NYEL
  - Priority for assistance from EFC small business program
  - Will not be prioritized for inspection

- All of the above plus comprehensive EMS that integrates compliance audit and IDs P2 opportunities
  - Waiver of economic benefit equal to P2 investment
  - Eligible to enter NYEL leadership tier

- All of the above plus enter NYEL
  - Additional points in scoring for relevant DEC, NYSERDA, ESD, EFC programs
  - Priority for assistance from the NYS Pollution Prevention Institute at RIT
Resources: Website

http://www.dec.ny.gov/regulations/93791.html

- Model Audit Agreement template
- Return to Compliance form
- Response to Comments
- List of compliance and P2 assistance programs
- Regional contacts

In future:
  - Annual report
  - Lists of eligible violations
  - Metrics
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For Legal Matters, Contact OGC:

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mlkreshi@gw.dec.state.ny.us
Tools to Identify Environmental Improvement Opportunities: Environmental Management Systems

Environmental Management System (EMS) defined:

EPA: “a set of processes and practices that enable an organization to reduce its environmental impacts and increase its operating efficiency”

NYSDEC: “a set of management processes, procedures, and auditable performance objectives that allows a facility to continuously analyze, control, and reduce the environmental impact of its activities, products, and services by utilizing pollution prevention measures, performing beyond minimum compliance levels, or integrating sustainable business practices”
An EMS is a framework that helps a company achieve its environmental goals through consistent control of its operations.

The assumption is that this increased control will improve the environmental performance of the company.
How does a company know if it should have an EMS?

• Required to comply with environmental laws and regulations?

• Looking for ways to improve environmental performance?

• Is the state of organization’s environmental affairs a significant liability?

• Does a lack of time or resources prevent the organization from managing environmental obligations effectively?

• Is the relationship between the organization’s environmental goals and other goals unclear?
## Environmental Management Systems Benefits

<table>
<thead>
<tr>
<th>POTENTIAL COSTS</th>
<th>POTENTIAL BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Internal</strong></td>
<td>• Improved environmental performance</td>
</tr>
<tr>
<td>• Staff (manager) time</td>
<td>• Enhanced compliance</td>
</tr>
<tr>
<td>• Other employee time</td>
<td>• Prevention of pollution/resource conservation</td>
</tr>
<tr>
<td><strong>External</strong></td>
<td>• New customers / markets</td>
</tr>
<tr>
<td>• Potential consulting assistance</td>
<td>• Increased efficiency / reduced costs</td>
</tr>
<tr>
<td></td>
<td>• Enhanced employee morale</td>
</tr>
<tr>
<td></td>
<td>• Enhanced image with public, regulators, lenders,</td>
</tr>
<tr>
<td></td>
<td>investors</td>
</tr>
<tr>
<td></td>
<td>• Employee awareness of environmental issues and</td>
</tr>
<tr>
<td></td>
<td>responsibilities</td>
</tr>
</tbody>
</table>

*(Note: Internal labor costs represent the bulk of the EMS resources expended by most organizations)*

[http://www.epa.gov/ems/index.html](http://www.epa.gov/ems/index.html)
Environmental Management Systems: ISO 14001

Environmental Policy
Planning
- Environmental Aspects
- Legal & Other Requirements
- Objectives & Targets

Implementation & Operation
- Competence, Training & Awareness
- Communication
- Documentation
- Control of Documents
- Operational Control
- Emergency Preparedness & Response

Checking
- Monitoring & Measurement
- Evaluation of Compliance
- Nonconformity, Corrective Action & Preventative Action
- Control of Records
- Internal Audits

Management Review
Commitment to Compliance &

Once policy is developed, EMS implementation requires:

• develop and implement a **procedure** to identify, analyze and have access to **environmental laws and regulations**
• set **objectives and targets** in line with its environmental policy, which includes a commitment to compliance
• establish **management programs** to achieve objectives
• **train** employees and **communicate** relevant EMS requirements
• establish and implement **operational control procedures**
• establish and implement a procedure for periodically **evaluating compliance**
• establish and implement a procedure to carry out **corrective and preventive actions**.
EMS Design: Pollution Prevention Hierarchy

In evaluating P2 opportunities, organizations should start at the top of the pyramid (i.e., source reduction) and work their way down as needed to define the most appropriate methods for preventing pollution.
EMS Design: Aspects & Impacts

Environmental Aspect:
Element of an organization’s activities, products, or services that interacts with the environment (e.g., air emissions, wastes, land contamination, wastewater, electricity use)

Environmental Impact:
Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization’s activities, products or services (e.g., increase in ground level ozone, groundwater contamination, degradation in aquatic habitat)
EMS Design: Objectives & Targets

In setting objectives and targets, the following need to be considered:
EMS Design: Objectives & Targets - Examples

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Targets</th>
</tr>
</thead>
</table>
| Reduce energy usage                            | • Reduce electricity use by 10% in 2014  
• Reduce natural gas use by 15% in 2014     |
| Reduce usage of hazardous chemicals            | • Eliminate use of MeCl2 by 2015  
• Reduce use of high-VOC paints by 25%       |
| Improve employee awareness of environmental issues | • Hold monthly awareness training courses  
• Train 100% of employees by end of year     |
| Improve compliance with wastewater discharge permit limits | • Zero permit limit violations in 2014 |
### EMS Design: Linking Operations, Aspects, Controls and Monitoring

<table>
<thead>
<tr>
<th>Source</th>
<th>Significant Aspect(s)</th>
<th>Regulated?</th>
<th>Associated Controls</th>
<th>Associated Monitoring or Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operations</strong>&lt;br&gt;Parts painting</td>
<td>• Air emissions (VOCs)&lt;br&gt;• Solvent waste generation</td>
<td>• Yes&lt;br&gt;• Yes</td>
<td>• Limits on VOC content in paints and operating hours&lt;br&gt;• SOP for HW generation</td>
<td>• Paint use records, log of operating hours&lt;br&gt;• Waste tracking sheet</td>
</tr>
<tr>
<td>Parts plating</td>
<td>• Waste generation&lt;br&gt;• Water discharges</td>
<td>• Yes&lt;br&gt;• Yes</td>
<td>• SOP for HW generation&lt;br&gt;• Notification to site effluent treatment plant</td>
<td>• Waste tracking sheet&lt;br&gt;• Pre-discharge sampling</td>
</tr>
<tr>
<td><strong>Other Activities</strong>&lt;br&gt;Raw material storage</td>
<td>• Potential spills</td>
<td>• Yes</td>
<td>• Stormwater Pollution Prevention Plan</td>
<td>• Weekly inspections of storage area</td>
</tr>
<tr>
<td>Fleet maintenance</td>
<td>• Waste oil generation&lt;br&gt;• Potential spills</td>
<td>• Yes&lt;br&gt;• Yes</td>
<td>• SOP for HW generation&lt;br&gt;• Stormwater Pollution Prevention Plan</td>
<td>• Waste tracking sheet&lt;br&gt;• Weekly inspections of storage area</td>
</tr>
<tr>
<td><strong>Products</strong>&lt;br&gt;Pumps</td>
<td>• Energy Use&lt;br&gt;• Chromium content</td>
<td>• No&lt;br&gt;• No</td>
<td>• None&lt;br&gt;• None</td>
<td>• None&lt;br&gt;• None</td>
</tr>
<tr>
<td><strong>Services</strong>&lt;br&gt;Equipment servicing at customer sites</td>
<td>• Waste generation&lt;br&gt;• Fuel use</td>
<td>• No&lt;br&gt;• No</td>
<td>• SOP for equipment service&lt;br&gt;• None</td>
<td>• Waste tracking sheet&lt;br&gt;• Fuel dispensing records</td>
</tr>
</tbody>
</table>
EMS Design: Audits

Periodic EMS audits will help determine whether all of the requirements of the EMS are being carried out in the specified manner.

For an EMS audit program to be effective:

- develop audit procedures and protocols
- determine an appropriate audit frequency
- select and train your auditors
- maintain audit records

<table>
<thead>
<tr>
<th>EMS Audit</th>
<th>Compliance Audit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus is on systems</td>
<td>Focus is on details of regulations</td>
</tr>
<tr>
<td>Information gathered largely through interviews and document review</td>
<td>Observation of activities is important</td>
</tr>
<tr>
<td>Corrective action involves individuals outside of the environmental staff</td>
<td>Corrective actions involve only environmental staff</td>
</tr>
</tbody>
</table>

Results of any audits should be linked to the corrective and preventive action process.
EMS Design: Nonconformance and Corrective / Preventive Action

To deal with system deficiencies, an organization needs a process to ensure that:

- Problems are identified and investigated
- Root causes are identified
- Corrective and preventive actions are identified and implemented
- Actions are tracked and their effectiveness is verified

EMS nonconformities and other system deficiencies (such as legal noncompliance) should be analyzed to detect patterns or trends. Identifying trends helps to anticipate and prevent future problems.
1. **We already have a compliance program – why do we need an EMS?**
An EMS can help you to comply with regulations more consistently and effectively. It also can help you identify and capitalize on environmental opportunities that go beyond compliance.

2. **Will an EMS help us to prevent pollution?**
A commitment to preventing pollution is a cornerstone of an effective EMS and should be reflected in an organization’s policy, objectives and other EMS elements.

3. **How will an EMS affect my existing compliance obligations?**
An EMS will not result in more or less stringent legal compliance obligations. But an EMS should improve your efforts to comply with legal obligations, and, in some cases, may lead to more flexible compliance requirements.

4. **Do we need to be in 100% compliance in order to have an EMS?**
No. The concept of continual improvement assumes that no organization is perfect. While an EMS should help your organization to improve compliance and other measures of performance, this does not mean that problems will never occur. However, an effective EMS should help you find and fix these problems and prevent their recurrence.
Defining “Supply Chain Sustainability”

• The United Nations Global Compact defines supply chain sustainability as “the management of environmental, social and economic impacts (sustainability), and the encouragement of good governance practices (accountability), throughout the lifecycles of goods and services (supply chain)”

• Supply Chain Sustainability aligns with the UN Global Compact’s ten universally accepted principles

• “The objective of supply chain sustainability is to create, protect and grow long-term environmental, social and economic value for all stakeholders involved in bringing products and services to market.”

Supply Chain Interaction

Inputs
- Transportation
- Packaging
- Energy
- Water

Resource extraction
Suppliers
Food manufacturing
Use & Distribution
- Consumer
- Future Generations

Impact
- Waste water
- Air emissions
- All other wastes

Outputs
Benefits of becoming a “Sustainable Supplier”

• Ensures **compliance** with laws and regulations
• Enables company to meet **customer requirements**
• **Differentiates** company from their competition
• Adheres to and supports international principles for sustainable business **conduct**
• Improves social, economic and environmental **impacts**
• **Acts** in the company’s own interests, the interests of their stakeholders, and the interests of society at large

Components of Sustainable Supply Chain Programs

- **Commit:**
  - Develop a **business case** by understanding the drivers for a sustainable supply chain
  - Establish a sustainable supply chain **vision** and set **objectives**
  - Establish sustainability **expectations** for the company’s supply chain

- **Assess:**
  - Determine the **scope** based on business priorities and impacts (map suppliers; determine key, strategic, high risk suppliers)

- **Define & Implement:**
  - **Communicate** expectations and engage with suppliers to improve performance (**Code of Conduct**)
  - Monitor to establish baseline and assess performance (**Supplier Scorecards** and Audits)
  - Ensure **alignment** and follow-up internally (remediate supplier non-compliance and invest in continuous improvement)
  - Enter into **collaboration** and partnerships (capacity building)

- **Measure & Communicate:**
  - **Track** performance against goals
  - Be **transparent**
  - **Report** on progress to stakeholders

Direct Assistance with NYSP2I: How it works

Phase 1:
- Initial Contact
- Company Screening
- Develop Scope of Work

Phase 2:
- Assessment
- Recommendations
- Feasibility Study (Optional)

Phase 3:
- Implementation
- Case Study
- Follow-up
Direct Assistance, Phase 1

Initial Contact
• Initial meeting to discuss company needs and develop basic understanding.
• Site visit *may* be conducted.

Company Screening
• Company is sent a Data Intake Form (DIF) to gather baseline information on resource utilization, waste generation, payback period, areas of concern, etc.

Develop Scope of Work
• NYSP2I develops project plan that will include deliverables, cost, and schedule.
• Client reviews SOW prior to signing.
# Preliminary Questionnaire

All Information provided will remain CONFIDENTIAL.

**Program Contact:**

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## General Information

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company Name:</td>
<td></td>
</tr>
<tr>
<td>Address 1:</td>
<td></td>
</tr>
<tr>
<td>Address 2:</td>
<td></td>
</tr>
<tr>
<td>City:</td>
<td>County:</td>
</tr>
<tr>
<td>Contact Name:</td>
<td>Title:</td>
</tr>
<tr>
<td>Phone #:</td>
<td>E-Mail:</td>
</tr>
<tr>
<td>Industry Type &amp; SIC or NAICS Code(s):</td>
<td></td>
</tr>
<tr>
<td>Please describe any previous work conducted for your facility by a technical assistance provider:</td>
<td></td>
</tr>
</tbody>
</table>

## Operational Information

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe the types of processes performed:</td>
<td></td>
</tr>
<tr>
<td>Please specify hours of operation/number of shifts:</td>
<td></td>
</tr>
<tr>
<td>What is the number of employees at this plant location?</td>
<td></td>
</tr>
</tbody>
</table>
EMS Design: Pollution Prevention Hierarchy

In evaluating P2 opportunities, organizations should start at the top of the pyramid (i.e., source reduction) and work their way down as needed to define the most appropriate methods for preventing pollution.
Direct Assistance, Phase 2

Assessment
• NYSP2I works with client to establish environmental baseline of manufacturing process or operation.
• Quantify current state inputs, outputs, by-products & waste streams.

Recommendations
• Improvement options identified based on research and testing.

Feasibility Study
• Economic & technical feasibility analyses performed, if needed.
Direct Assistance, Phase 3

Implementation
- NYSP2I provides technical assistance to the client during implementation
- Critical metrics identified & collected to serve as indicators of environmental benefits.

Case Study
- NYSP2I develops a case study of the project work completed and with the approval of the company posts it on the NYSP2I website to showcase the work done and promote adoption of similar practices and technologies.

Follow-up
- NYSP2I follows up with client annually (for 3 years) to monitor the progress made as a result of the implementation.
- Track metrics (reductions in material usage, waste, costs and other parameters).
Direct Assistance Metrics

Companies monitored for 3 years after implementation:

- Hazardous materials/waste reductions
- Solid waste reduction
- Air emissions reduction
- Water use/wastewater reductions
- Energy saved
- Green energy usage
- Economic savings (based on implementation costs and payback)
- Jobs retained/created

- Provided direct client assistance & brief assistance to over 200 companies
- Resulted in the reduction of 5 million pounds of hazardous waste and materials
- Saved over 6.3 million kilowatt-hours of energy and 47 million gal/year water
- Reduced wastewater over 24 million gal/year
NYSP2I’s Lean, Energy, and Environment (LE2) Program

• Focuses on a manufacturing process

• Provides a comprehensive assessment balancing the objectives of all three areas (Lean, Energy, & Environment) to achieve optimum results

• Prioritization of waste streams

• Process is improved as a whole system (taking tradeoffs into account) to result in an enhanced process without sub-optimization (*i.e.* saving pennies on one aspect only to lose dollars on another aspect)
LE2 - Background

• Merging of Two Separate Programs Developed by EPA
  – Lean and Environment Program
  – Lean, Energy & Climate Program

• Individual Program Toolkits can be found on USEPA’s website
  – http://www.epa.gov/lean/
# Lean & Environment

## Table 1: Environmental Impacts of Deadly Wastes

<table>
<thead>
<tr>
<th>Waste Type</th>
<th>Environmental Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overproduction</td>
<td>• More raw materials and energy consumed in making the unnecessary products &lt;br&gt;• Extra products may spoil or become obsolete requiring disposal &lt;br&gt;• Extra hazardous materials used result in extra emissions, waste disposal, worker exposure, etc.</td>
</tr>
<tr>
<td>Inventory</td>
<td>• More packaging to store work-in-process (WIP) &lt;br&gt;• Waste from deterioration or damage to stored WIP &lt;br&gt;• More materials needed to replace damaged WIP &lt;br&gt;• More energy used to heat, cool, and light inventory space</td>
</tr>
<tr>
<td>Transportation and Motion</td>
<td>• More energy use for transport &lt;br&gt;• Emissions from transport &lt;br&gt;• More space required for WIP movement, increasing lighting, heating, and cooling demand and energy consumption &lt;br&gt;• More packaging required to protect components during movement &lt;br&gt;• Damage and spills during transport &lt;br&gt;• Transportation of hazardous materials requires special shipping and packaging to prevent risk during accidents</td>
</tr>
<tr>
<td>Defects</td>
<td>• Raw materials and energy consumed in making defective products &lt;br&gt;• Defective components require recycling or disposal &lt;br&gt;• More space required for rework and repair, increasing energy use for heating, cooling, and lighting</td>
</tr>
<tr>
<td>Over processing</td>
<td>• More parts and raw materials consumed per unit of production &lt;br&gt;• Unnecessary processing increases wastes, energy use, and emissions</td>
</tr>
<tr>
<td>Waiting</td>
<td>• Potential material spoilage or component damage causing waste &lt;br&gt;• Wasted energy from heating, cooling, and lighting during production downtime</td>
</tr>
</tbody>
</table>

Source: [http://www.epa.gov/lean/environment/toolkits/environment/resources/LeanEnviroToolkit.pdf](http://www.epa.gov/lean/environment/toolkits/environment/resources/LeanEnviroToolkit.pdf)
In manufacturing predominant energy sources are natural gas & electricity, typically generated off-site by a utility; Also use other sources, such as fuel oil, co-generation (combust a fuel to produce heat & electricity)

Sources of Energy Used for U.S. Industry and Manufacturing, 2005

Ref: Lean, Energy & Climate Toolkit. USEPA. EPA-100-K-07-003
Lean, Energy & Climate Toolkit

Energy End Uses:

1. Heating, ventilating & air conditioning (HVAC)

2. Lighting

3. Process equipment operation

4. Process heating & cooling

5. Transportation
# Lean, Energy & Climate Toolkit

## Table 1: Energy Use Hidden in Lean Wastes

<table>
<thead>
<tr>
<th>Waste Type</th>
<th>Energy Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overproduction</td>
<td>• More energy consumed in operating equipment to make unnecessary products</td>
</tr>
<tr>
<td>Inventory</td>
<td>• More energy used to heat, cool, and light inventory storage and warehousing space</td>
</tr>
<tr>
<td>Transportation and Motion</td>
<td>• More energy used for transport</td>
</tr>
<tr>
<td></td>
<td>• More space required for work in process (WIP) movement, increasing lighting, heating, and cooling demand and energy consumption</td>
</tr>
<tr>
<td>Defects</td>
<td>• Energy consumed in making defective products</td>
</tr>
<tr>
<td></td>
<td>• More space required for rework and repair, increasing energy use for reprocessing, as well as heating, cooling, and lighting</td>
</tr>
<tr>
<td>Over Processing</td>
<td>• More energy consumed in operating equipment related to unnecessary processing</td>
</tr>
<tr>
<td></td>
<td>• Use of right-sized equipment often results in significant reductions in energy use per unit of production</td>
</tr>
<tr>
<td>Waiting</td>
<td>• Wasted energy from heating, cooling, and lighting during production downtime</td>
</tr>
</tbody>
</table>

Methods Used in DA projects

1. Metering (Ex: ultrasonic flow meters)
2. Estimating (Ex: based on industry standards)
3. Sampling
4. Analytical Testing
5. Observation
6. Time studies
**Case Study: Paper Manufacturing Company**

**Initial Contact**
- Visit to the company in 2012 in coordinated by RTDC
- The company specializes in manufacturing specialty papers including a variety of filtration media and absorbent boards
- Discussion about how NYSP2I works, and what resources are available to support the company
- Project opportunity and funding from USEPA

**Company Screening**
- Data Intake Form completed
- Clarification and discussion on data provided
- The ~100,000 sq. ft. building operates 51 weeks of the year at three shifts per day, five days a week and has 30 employees
- Annual electricity usage is 6 million kWh, annual water usage is 200 million gallons
- Broad areas of opportunity identified:
  - Water use reduction and recovery
  - Energy use reduction
  - Material substitution

**Develop Scope of Work**
**Case Study: Paper Manufacturing Company**

**Assessment**
- Develop a baseline of water usage using existing data and actual measurements using Ultrasonic Flow Meter.
- Identify water and energy reduction/recovery opportunities
- Research alternatives to Nonylphenol Ethoxylate (NPE) based surfactants

**Recommendations**
- Approximately **170,000 GPD (118 GPM)** of water could be recovered for reuse. Over a period of one year, this would equal **43,350,000 gallons**.
- About **75,000 kWh** of electricity could be saved annually by switching to a variable frequency drive and lower HP motor. Cost savings would be ~**$10,000 per year**.
- Drop-in replacement to one NPE based surfactant identified

**Feasibility Study**
- Not Applicable in this case
**Case Study: Paper Manufacturing Company**

**Implementation**
- Implementation of a closed-loop wastewater recovery system leading to 15.6 million gallons water saved annually.
- Involved installation of a self-cleaning filtration system combined with a variable frequency drive (VFD) pump and piping to recover wastewater.
- In the paper manufacturing industry, self-cleaning filtration systems are a proven technology and have been utilized for several years at paper mills.
- They are effective at recovering whitewater for reuse, thus reducing fresh water use, wastewater discharge, energy use (as a result of retained heat in recovered water) and associated costs.

**Case Study**
- In development

**Follow-up**
- In process

Image is of actual installed filter at the company
Case Study: Alternative Chemical Assessment

About the Company:
• Global manufacturer of injection molded plastic parts.
• Parts bonded together with Methyl ethyl ketone ("MEK"), a volatile organic compound regulated by the NYS DEC.
• Currently uses 1,500 gallons of MEK/year and need to reduce to <55 gallons of MEK/year.

Work Performed:
• Researched to identify a replacement chemical to comply with NYS air regulations; meet customer requirements for strength & durability; follow same manufacturing process; evaporate quickly; have high flash point; cost no more than MEK.
• Considered possible alternatives or replacements including ultrasonic welding, adhesives (1), solvents (8), and other chemicals (16).

Results:
• First recommendation based on EPA Design for Environment (DfE) product but did not meet DEC VOC regulations for "lbs VOC per gallon applied".
• Final recommendation a blend of Methyl acetate & Methyl n-Propyl Ketone (MPK); when blended together, the blend has a suitable flashpoint, an acceptable evaporation rate, and VOC content meets the NYS DEC regulations. Company still evaluating.
Case Study: Nitrate Reduction at NYS Paper Mill

About the Company:
- Finch Paper, LLC, in Glens Falls, NY - integrated pulp and paper mill
- Produce ~700 tons/day of high quality offset and digital papers
- Nitrate production is a function of the ammonia loading to WWT
- SPDES permit does not include a limit for Nitrate; TRI reporting is required for Nitrate.
- Finch was #1 in NYS for TRI Off-Site Releases in 2010 = 1.42M lbs of Nitrate compounds discharged to Hudson River.

Work Performed:
- NYSP2I evaluated the potential to reduce total annual nitrate discharged from Finch’s WWT plant
- Recommendations made for improved operation of aerators and revise operating procedures to create a condition that promotes denitrification and thereby reduces the effluent nitrate discharges

Results:
- Ave. daily Nitrate discharge in first 15 weeks of trial resulted in a 69% decrease. On an annual basis, this reduction could place Finch lower in the TRI rankings in NYS.
- Savings in energy costs for the 15 week period exceeded $35,000. This may result in an annual savings of over $100,000.
**Support for “Biodegradable Products Institute” Certification**

**Ecovative**
- Ecovative’s Mushroom Materials start on a farm, with the parts of plants that cannot be used for food or feed.
- A patented process cleans and prepares a blend of agricultural byproducts, and inoculates it with mycelium (mushroom tissue).
- Packaging parts are then “grown” into the required custom shape.

**Ecovative Benefits**
- By using mycelium and agricultural by-products, Ecovative uses materials that are environmentally low-impact, biodegradable and renewable.
- This product replaces synthetic petrochemical based materials such as Styrofoam™.

**SSC&T Project Description**
Provide assistance to Ecovative for obtaining Biodegradable Products Institute (BPI) certification for their packaging products.

**SSC&T Project Objectives**
- Support Ecovative in preparation of samples for testing to satisfy BPI Requirements
- Develop an in-house disintegration test platform to validate new products prior to paying for independent lab testing

**Expected Results**
Ecovative expects a 20% increase in customers as a result of becoming BPI certified.
Case Study: Utica Metal Products

• About the Company:
  – Utica Metal Products produces high end decorative nameplates for equipment manufacturers.
  – Acid bright dip an integral part of surface preparation.
  – Rapid etching of metals resulted in frequent changeover of acid bath due to high metal concentrations.
  – Acid tanks were dumped twice per week and sent out as hazardous waste.

• Work Performed:
  – NYSP2I worked with the company to set up a dosing system which added 1% concentration of PRO-pHx, an additive that helps to control metal concentration in acid solutions and extend the lifetime of the acid bath.
  – Metal concentrations and parts quality were monitored to determine effectiveness.

• Results:
  – Metal concentrations maintained around 3,000 ppm, lower than usual 10,000 ppm.
  – Bath could be used at least 3 months before changeover needed (compared to 2x/week).
  – Payback less than one year with less acid purchased and less hazardous waste disposed.
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