Illinois Conservation of Resources and Energy (ICORE)

The Beginning

October 1, 2008 to September 30, 2010

By

Dan Marsch and Mike Springman

Abstract

The Illinois Conservation of Resources and Energy (ICORE) project strives to achieve energy and water conservation improvements in Illinois businesses and communities. Through the project, the Illinois Sustainable Technology Center (ISTC) provides technical assistance to water and wastewater treatment facilities and businesses to improve efficiency in: 1) water consumption; 2) wastewater generation; 3) energy consumption; and 4) carbon emissions.
Funded by Grants from

U.S. Environmental Protection Agency

Region 5

- IL
- OH
- MI
- MN
- WI
- IN

P2 Priorities

- Reduce haz. materials
- Reduce energy, GHG emissions, water use and costs
- Assist businesses to lean and green operations
ICORE

Providing technical assistance in sustainability to central Illinois communities and businesses
ICORE
Objectives

• Reduce energy use, water use and wastewater generation.
• Promote water conservation, energy efficiency (E2) and pollution prevention (P2).
• Relieve demand on local resources and strain upon local system capacities.
• Allow communities to thrive without tapping into additional resources or expanding infrastructures and capital investment.
Methodology

• **Identify and recruit partners, stakeholders, and participants (municipalities, businesses, associations).**
• Perform on-site assessments.
• Multi-media focus: source reduction, reuse, conservation, green chemistry, chemical management, substitution, process efficiency, in-line recycling, and Best Management Practices.
• Evaluate and prioritize opportunities.
• Develop strategies to implement P2/E2 improvements.
• Conduct and evaluate pilots (when needed).
• Develop case studies.
Project Marketing and Forming of Working Relationships

- By phone…cold-calls.
- In-person…one-on-one meetings.
- Networking- associations, conferences, shows, etc.
- ISTC’s client database.
- Personal contacts and relationships.
- Marketing materials: handouts, flyers, PowerPoint, etc.

1st Year Results

<table>
<thead>
<tr>
<th>Total Attendees</th>
<th>Associations or Organizations</th>
<th>Number of Water/POTW Facilities</th>
<th>Number of Municipalities</th>
<th>Number of Businesses</th>
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</thead>
<tbody>
<tr>
<td>292</td>
<td>8</td>
<td>57</td>
<td>3</td>
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</tbody>
</table>

- Stakeholders
Stakeholders

- Municipalities.
- Water Associations.
- Wastewater Associations.
- Vendors, contractors, consultants, etc.
- Other- IEPA Office of Pollution Prevention.
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WASTE MANAGEMENT HIERARCHY

SOURCE REDUCTION & POLLUTION PREVENTION
   Eliminate Waste, Focus on In-Process Recycling & Reuse

REUSE & RECYCLE
   Focus On-Site

REUSE & RECYCLE
   Focus Off-Site

TREATMENT
   Including Incineration

DISPOSAL

HIGH PREFERENCE

LOW PREFERENCE
Electricity E2 - Compressed Air Systems

100HP @ 100 PSI running 24/7 = $40-50K energy.

Use a blower instead?

Efficient Guns

Clean Filters?

Pipe Size

Storage
Electricity E2- Motors, Pumps and Blowers

• Install variable speed drive motors, where applicable.

• Dampers- Do you control your speed by using your brake?

• Cut motor speed by 20%, use 50% less energy.

<table>
<thead>
<tr>
<th>Speed</th>
<th>Flow</th>
<th>Required Power</th>
</tr>
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</table>
Natural Gas E2- Boilers and Ovens
(system efficiency, design & waste energy recovery)
Water Conservation - Conductivity Control

50-90% Savings
Resource Conservation - In Line Recycling

Ultrafiltration
Green Chemistry
Green Chemistry

solvents
Recycling
Diverting Waste Streams from Landfills
ICORE Participants

**Municipalities**
- Bushnell
- Greenville
- Highland

**Businesses- 29**
- Manufacturing
- Commercial/Retail
- Public
Methodology

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ISTC Fact Sheets

[http://www.istc.illinois.edu](http://www.istc.illinois.edu)

- Recovery of Steam Condensate Utilizing Membrane Technology at Carlisle SynTec, Greenville, Illinois, TN10-096.
- Reducing Water Consumption: Conductivity Control at Harris Broadcast Communication Division, TN11-099.

Additional Related Fact Sheets

- Vendor Synergy: Efficient Water and Wastewater Treatment in Effingham, Illinois, TN12-100.
- Shedding Light on Water, TN07-088.
- The Visible Cost of Air, TN07-087.
ICORE Project Challenges & Obstacles

Outside Our Control

• 2008 RECESSION!
• Businesses’ response: reduction in goods/services, reduction in workforce and freezing of capital funds…trying to stay open.
• High rainfall in Illinois in 2008/09, resulting in less attention, perceived relevance or urgency to water conservation.
• Lack of state/federal financial incentives for water conservation, vs. state/federal electricity incentives via utilities.
A Company’s Response: “Make Work Jobs” vs. Employee Lay Offs
A Silver Lining...

• Businesses Reaction to the on-going recession…Tightening the Belt.

Yielding New Opportunities:
• Resource conservation measures.
• Improvements in process efficiency.
• Changes in technology and management practices.
• Leaner and Greener.
What Did ISTC Do to Address Obstacles that were within ISTC’s Control?

- **Qualify** participants…understanding their immediate needs, organizational structure and culture, financial standing and resources.
- Enlisted **decision-makers**… those at the “top of the food-chain,” examples: CEO, CFO, GM, VP.
- Developed a relationship…**TRUST**!
- **PERSISTANCE**, timing is everything.
- **A persistent, trusting relationship with the decision-maker is critical to the process.**
Finally…The Results

First 2 Years

Project Outputs
Municipalities: 3
Participant Facilities: 29
Case Studies: 3
Recommendations- 480
Implemented- 164 (34%)
$1.5 M

14.1 M kWh

46,000 Therms

20.1 M Gallons

$1.5 M

$10,245 MTCO2e

2.4 M lbs.

3,500 lbs. VOCs
The End

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Questions?
Lighting and Motor Efficiency In ICORE

Mike Springman
July 19, 2012
Types of Lighting Encountered in ICORE
Metal Halide

460 Watts
HPS – High Pressure Sodium

460 Watts
Fluorescent

196 Watts
LED Entryway Light

30 Watts
Cobra Hood Area Light

150 Watts
High Pressure Sodium Area Lights

150 Watts
Normal Operations
When Businesses Become Concerned About Lighting
Lighting Improvement Facts
Most Companies Don’t Know:

• How much lighting costs
• Availability of efficient alternatives
• How much electricity and money they could save
Why Don’t They Know?

• It’s not my job

• Their focus is on production

• They don’t have the time to do the research

• They don’t realize the significance of potential savings
How Does ISTC Help Them?

- Perform an Assessment
- Establish a baseline that
  - Identifies current lighting costs
  - Provides a basis for savings comparison
- Identify efficient alternatives
  - Provide different lighting options
  - Provide materials estimate
How Does ISTC Help Them?

• Identify savings potential

• Identify simple payback

• Identify funding alternatives
Why All The Talk About Fluorescent?

• 2 to 3 times more efficient than alt. lighting.
• More cost-effective vs. HID lighting.
• Attractive, simple payback.
• High % of energy reduction.
• Good quality light.
• Balanced, full-spectrum lighting available.
• Instant On. Sensor Compatible
Cooper B-line Facility

- Highland, Illinois
- 300,000 Square Feet
- 250 Employees
- Operates 24/6
- Ceiling Height 30 Feet
- Lamp Height 25 Feet
- Primary Lighting – High Pressure Sodium
High Pressure Sodium and Fluorescent Comparison
Where B-Line Electricity $ Go

Electricity Usage

- Lighting
- Compressed Air
- Production
Fixtures Replaced

• 527 High Pressure Sodium Fixtures
• 76 T12 2-Lamp 8 Foot VHO Fixtures
• 308 T12 4-Lamp “Work Light” Fixtures
Bottom Line

- Current Annual Cost for Lighting $123,927
- Lighting Improvement Savings $58,692
- Percent Reduction 47%
- Lighting Improvement Costs $130,540
- Simple Payback 2.2 Years
Variable Frequency Drives

Making Your Existing Pumps, Fans and Blowers More Efficient
Methods for Controlling Flow

- Control by restriction
  - Control air flow with vanes or dampers.
  - Control fluid flow with valves.
  - Recirculating a portion of the flow.
- Control by mechanical variable speed
  - Eddy Current clutch
  - Reeves Vari-drives
  - DC motor with controller
  - Fluid couplings
Methods for Controlling Flow

Control By Restriction

Valve

Damper
Variable Frequency Drives

- VFDs offer economic benefits to end users.
  - Enhanced production process control.
  - Energy savings by matching motor speed with load requirements.
- The installed base of VFDs in industry is fairly low, only 9% of motor systems use VFDs.
- Fan, Pumps & Blowers applications are excellent candidates for VFD retrofit.
The Facts

• VFDs can match the speed of a motor to the requirements of a fluctuating load

• Fan, Pump, & Blower (We will refer to as a pump) power consumption is equal to the cube of the speed - (Affinity laws)

• Matching the speed to the system requirements is the most economical way to operate your
# Affinity Laws

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Variable Frequency Drive

**Advantages:**
- Use a standard NEMA frame motor
- High starting torque
- Easy to retrofit
- High reliability
- Increase Efficiency
Energy, Fixed Speed Vs Variable Speed

- 100 HP motor running 24/7 at 100% speed and 75% Flow, with mechanical flow control

  - Fixed speed - $50,000 per year

- 100 HP motor running 24/7 at 75% speed, and 75% Flow

  - VFD at 75% speed 24/7 - $21,094 per year
The advantages

- Energy Savings
- Quiet
- Easy installation, use existing motors & pumps
- Equipment runs continuous, no starting & stopping
- Eliminate the mechanical shock on your system
- Eliminate the control valve, no maintenance
- Reduced heating in your equipment room
- Pump the proper mass
Industrial Applications

- Industrial Plants
  - HVAC Fans and Pumps
  - Cooling Tower Pumps
  - Cooling Tower Fans
  - Process Pumps
  - Transfer pumps
  - Mixers
  - Booster Pumps
Water Treatment Applications

• Water Treatment Plants
  – Well Pumps
  – Intake Pumps
  – Primary or High Service Pumps
  – Inline Booster Pumps
Waste Water Treatment Applications

- Lift Station Pumps
- Main Influent Station Pumps
- Aeration Blowers
- Aeration Rotors
- Sludge Return Pumps
- Effluent Pumps
Small Town VFD Applications

• Installed VFD on water plant's lake recirculation pump. Annual Savings 131,325 kWh and $10,605
• Installed VFDs on High Service Pumps. Annual Savings 706,250 kWh and $56,500
• Installed VFDs on Waste Water Plant Aeration Rotors. Annual Savings 354,687 kWh and $28,375

• Total Annual Electricity Savings: 1,192,262 kWh
• Total Annual Monetary Savings: $ 95,480
Lighting and VFD Implemented Recommendation Comparison

• ICORE I
  - Lighting 4,528,132 kWh (92%), $ 329,471 (71%)
  - VFD 131,325 kWh (2.7%), $ 10,605 (2.3%)

• ICORE II
  - Lighting 1,773,587 kWh (41%), $ 141,887 (25%)
  - VFD 2,162,607 kWh (50%), $ 152,069 (27%)
Questions?
Acknowledgements

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