

# Implementation of Lean, Energy & Environment (LE2) Projects within NYS Manufacturing Sector



**Rochester Institute of Technology (RIT)**

**June 29, 2011**

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**Funding provided by NYSDEC**

# NYSP2I

## 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 conducted for clients
  - Areas of interest for stakeholders
  - Specific Training
    - Design for the Environment & Life-Cycle Assessment

## Sector Projects

- Projects that have the potential to impact NYS on a high level
  - Dry Cleaning
  - Hospitality
  - E-waste
  - Auto body shops



Tangible results towards...

...a sustainable New York!



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# Sustainability

## Brundtland Commission: Convened by United Nations in 1983

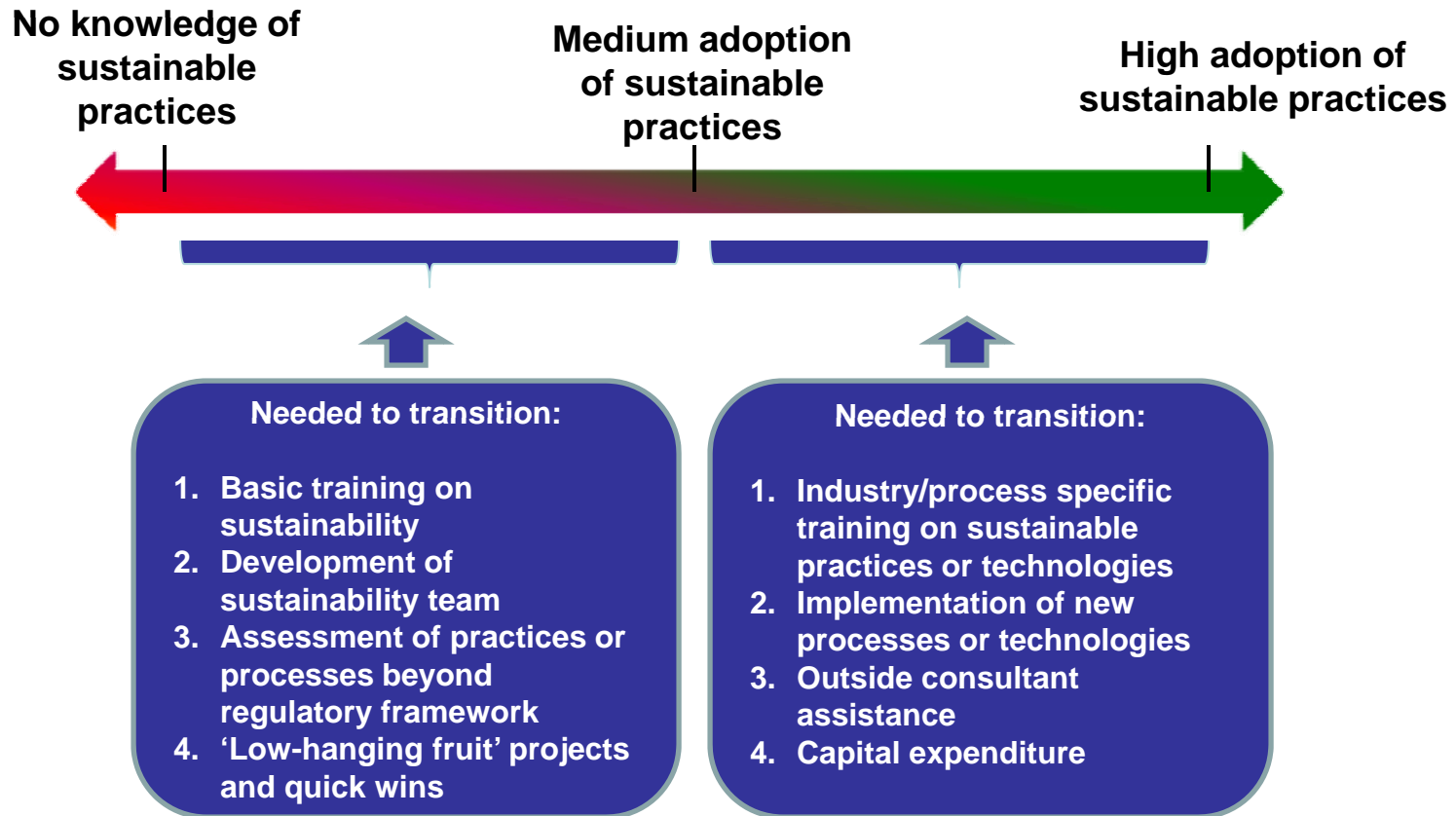
- Commission created to address growing concern ‘about the ***accelerating deterioration*** of the human environment & natural resources and the ***consequences of that deterioration*** for economic & social development’
- Recognized that environmental problems were global in nature & determined that 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.



# Where is Industry on the Sustainability Continuum?



# Why LE2? The Business Case...



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# Tecmotiv (USA), Inc.

- Upstate New York Remanufacturing business
- In business more than 50 years
- Rebuild & fabricate engine parts for military tanks and armored personnel vehicles
- Focus: Cylinder process



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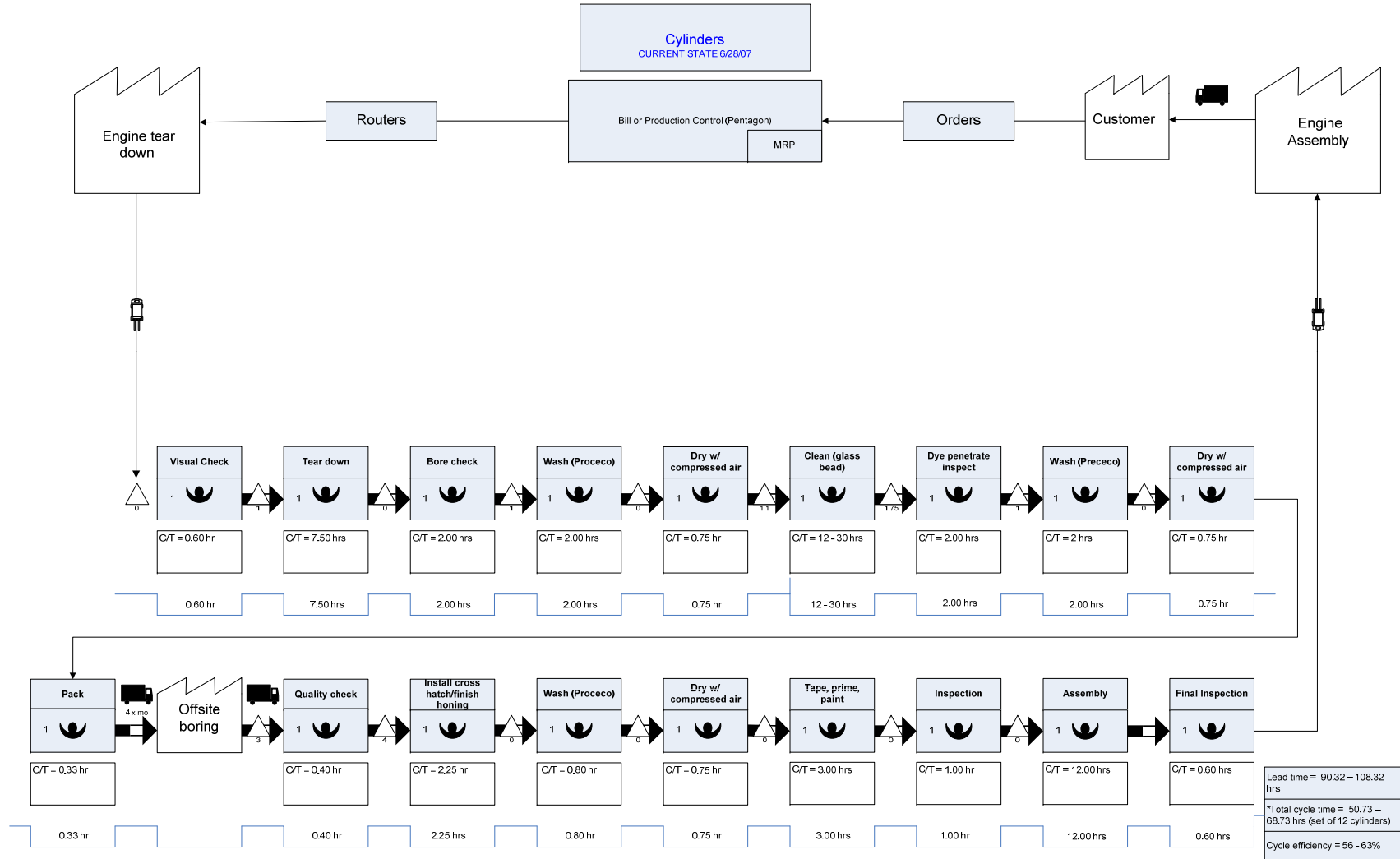
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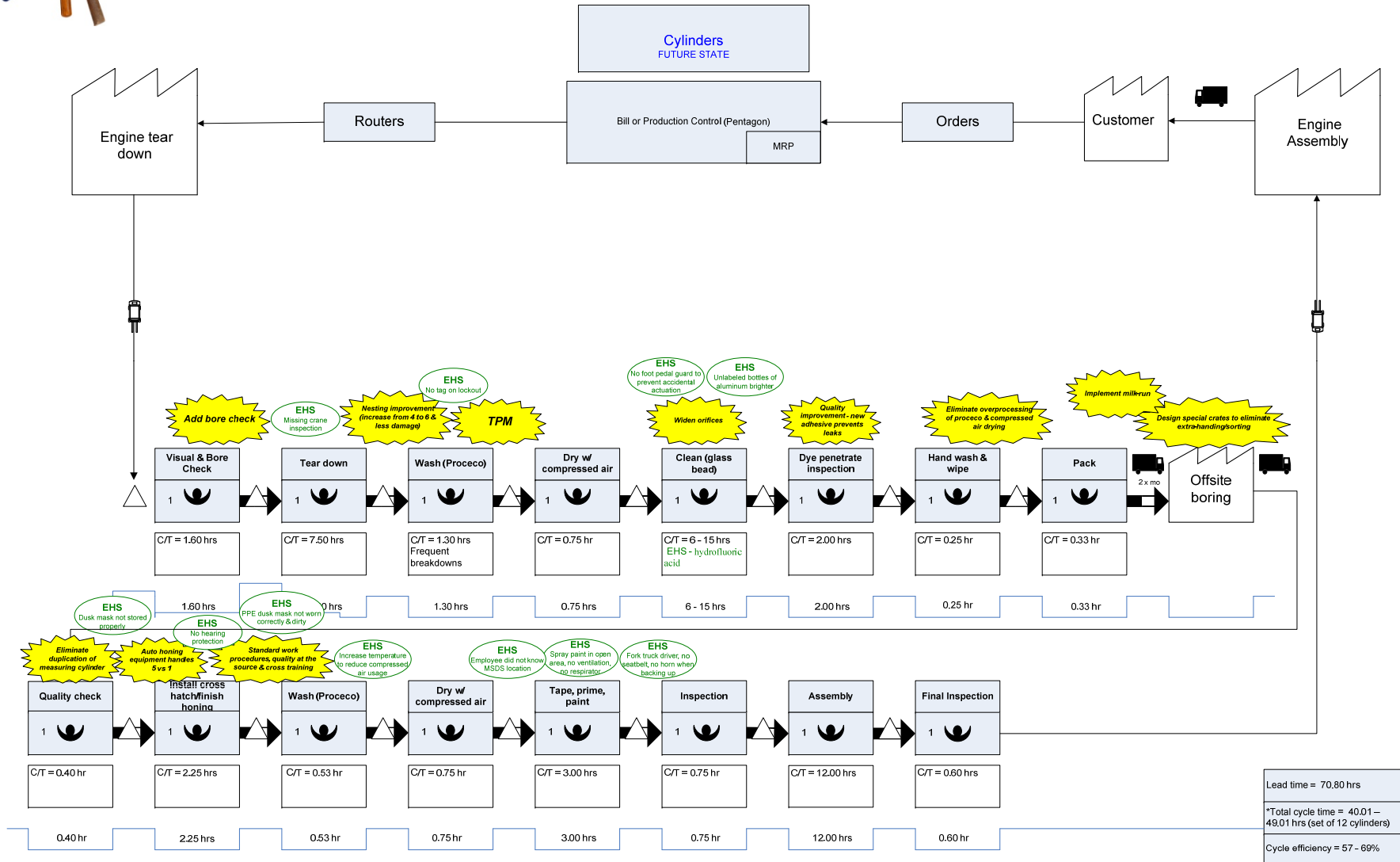


# Current State Value Stream Map – Lean Only





# Future State Value Stream Map – LE2





# Specific Improvements – Operating Costs (1 of 2)

- Inspection process moved from back of process to front of process, thereby identifying bad parts at the start of the process instead of at the end of the process
- *6 cylinders are now loaded into the high-pressure spray washer instead of 4; as a result, 50% more cylinders can be washed at once*
- *Temperature increased in spray washers so that increased number of cylinders can be washed in the same amount of time as before*



# Specific Improvements – Operating Costs (2 of 2)

- *Widened orifices in glass bead blast cabinets, thereby resulting in more rapid cleaning and overall energy and material reduction*
- *Eliminated one process cleaning step*
- Cross-training instituted
- Responsibility for Product Quality transferred from Inspectors to Assemblers



# Specific Improvements – Labor Hours

- *Largest reduction occurred as a result of widening orifices in glass bead blast cabinets, reducing cleaning time per cylinder from 90 minutes to 45 minutes*
- Eliminated one process cleaning step
- *Increased batch size in spray washer, thereby reducing total load and unload time*
- *Cross-training instituted*
- Parts repackaged in special crates to minimize handling
- Boring, honing, and cross-hatching now done on an automatic honing machine instead of doing one cylinder at a time manually



# Annual Savings from LE2 Implementation (cylinder remanufacturing operation only)

- Operating cost: \$64,300/year
- Energy: 32,709 KWH
- Detergent: 41 gallons
- Water: 1,480 gallons
- Glass bead: 3,631 pounds
- Non-hazardous wastewater: 259 gallons
- Non-hazardous solid waste: 5,791 pounds



# Lean, Energy & Environment

## (LE2) Program Overview

*NYSERDA-NYSDEC Support*



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# Lean, Energy, and Environment (LE2)

- Merging of Two Separate Programs Developed by EPA
  - Lean and Environment Program
  - Lean and Energy Program
- See EPA's website for Program Toolkits
  - <http://www.epa.gov/lean/>





# Objectives of Pilot

- (1) Introduce Lean Energy & Environment (LE2) Program in manufacturing companies throughout NY State
- (2) Leverage experience, skills, and marketing channels of MEP network
- (3) Train MEP staff and company personnel in conducting LE2 assessments and implementations and empower them to perpetuate this knowledge
- (4) Implement **innovative** LE2 strategies in various company locations throughout NY State to:
  - **Reduce electricity use**
  - **Reduce environmental impact**
  - **Increase productivity and profitability**
- (5) Measure and communicate program benefits and encourage others companies to implement the LE2 process



# Project Plan – Screening

- NYSP2I:
  - Develop *LE2 Data Intake Form*
- MEPs:
  1. Review list of target companies prepared by NYSP2I as well as their own current client rosters
  2. Contact companies, collect information per *LE2 Data Intake Form*, and evaluate suitability of company processes for LE2 program
  3. Conduct site visits at companies to observe company processes, preferably with energy subcontractor (**Challenge**)
- MEPs submit lists of 3 best company processes to NSYP2I
  - NYSP2I reviews lists submitted by all RTDCs on an on-going basis and selects 15+ processes for assessments based on consistent criteria



# Project Plan – Assessment

- NYSP2I narrows scope of project to identify one area of major opportunity or importance to industry
- NYSP2I, MEP and/or energy consultant initiate assessment
  - Estimates baseline (energy, environment or efficiency)\_for process and estimates potential savings resulting from installation of best innovative strategy
  - Due to NYSERDA grant, many projects had heavy energy focus **(Challenge)**
    - **NYSP2I & Energy consultant performed analysis**
    - **Full Value stream mapping too costly**
    - **Currently working on modified LE2 with MEP network**
- At completion of assessment, innovative or under utilized technology described in report and presented to industry (LE2 team)



# Project Plan – Implementation

1. Implement Technology
2. Monitor performance of new process & obtain metrics (after installation)
  - Operating cost savings
  - Reductions in electricity and gas usage
  - Reductions in environmental wastes
  - Productivity improvements, etc.
3. If a public demonstration is to be held at the implementing company's site, the MEP to conduct the following additional activities:
  - Plan and promote public demonstration
  - Recruit participants for public demonstration
  - Coordinate logistics and set up public demonstration
  - Conduct public demonstration with company
  - Document metrics from public demonstration and submit to NYSP2I
4. NYSP2I-MEP develop case study and submit to trade or peer-reviewed

# Case Studies from LE2 Pilot Program



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# Hoosier Magnetics, Inc.

## LE2 Assessment



**Client:** Manufacturer of hard ferrite powders for commercial, industrial, and military applications

**Problem:** Ferrite powder is formed by combining materials in a rotary kiln operated at very high temperatures (2,400F) then cool the clinker to 350F before further processing. This is an energy intensive & high water use process.

**Objective:** Identify energy and environmental impact reduction opportunities at Ogdensburg, NY plant.

**Work Performed:** Evaluated alternative processes for cooling the clinker while reducing energy consumption. Propose replacing the existing water-cooled clinker cooling system with an air-cooled fluidized bed system.

### **Potential Results based on Calculations:**

- **Energy savings of 372,000 kWh with an electricity cost savings of \$50,410/year**
- **Natural gas savings of 200,350 therms/year with a cost savings of \$118,562/year**
- **Water savings of 63 million gallons/year**
- **Payback period of 10 months or less based on estimated equipment costs of \$267K**

Photo and client info from <http://www.hoosiermagneticsinc.com/>



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# Gleason- Project Overview

## About the Company:

- Gleason Works is a gear and gear making equipment manufacturer in Rochester, NY

## Innovative Project:

- Conversion of its plating lines (copper and hard chrome) from an electrolytic precipitation method (ANDCO equipment) to a combination reverse osmosis and ion exchange system (RO/DI) to clean and reuse rinse water

## Results:

- The RO/DI change will eliminate hazardous waste sludge, provide very clean water to the rinse system, reduce scrubber maintenance from twice a year to potentially less than once a year, significantly reduce electricity use, and totally eliminate compressed air use in the plating area
- **Electricity savings of 141,596 KWH/year; → Equates to annual savings of \$11,000 per year with payback of 3.3 years**
  - **Additional upgrade of exhaust scrubber motor leads to energy savings of 267,483 KWH/year (\$21,000 per year), resulting in a simple payback of 2.9 years**



# Kraft Walton



Our Sustainability Goals: To be achieved by 2011, with 2005 as the base year



Use 15% less  
H2O in  
our plants



Eliminate  
150mm lbs. of  
packaging material



Reduce  
plant waste  
by 15%



Reduce plant  
energy-related CO2  
emissions by 25%



Use 25% less  
energy in  
our plants

Identified the following opportunities for energy use reduction for Kraft Walton:

- Free cooling for fan coolers -- Save 420,244 kWh/year or \$37,612 with a 3.42 year payback period
- Vat room HVAC system -- Save 82,750 therms per year or \$88,600 with a 2.25 year payback period

The LE2 also identified the following environmental opportunities:

- Save 70-100 million gallons of water per year by modifying piping to eliminate the whey water valve
- Ferment the acid cheese whey generated from washing cheese curds to make ethanol to run a CHP facility to supply heat and electricity to the Kraft facility.

## Results:

- **Kraft is developing a work plan to modify the piping around the whey water valve**
- **Laboratory testing has shown that the acid cheese whey can be fermented into the required amount of ethanol to be able to supply a CHP facility to meet Kraft's energy needs**
  - **Enable Kraft to save additional energy by not running the evaporator to concentrate the whey**



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# HP Hood

## About the Company:

- Located in LaFargeville, New York
- Manufacturers cottage cheese and cream cheese

## NYSP2Is Role:

- Partner with Citec) and Larsen Engineers
- Assess opportunities for reduction in energy use and waste-to-energy conversion

## Baseline:

- **Annual plant electric cost is \$750,000.** Much of this cost results from large process equipment (up to 125 HP) that operates 24/7 with no feedback control.
- No POTW discharge, but existing **UF sludge and aerobic digester sludge is land spread at a cost of ~\$200K/year**

## Conclusions:

- **Short-term:** Install dissolved oxygen (DO) sensors with variable frequency drives on the air compressors currently used to supply oxygen to the aeration basins. This will enable operation of compressors only when DO drops below the setpoint.
- **Long-term:** Cover the aeration basins with a flexible membrane to preclude oxygen transport and capture biogas (aerobic-to-anaerobic conversion)
- **\$750K - \$900K investment for \$450K annual economic benefit.** Electricity cost savings can help fund this capital investment.



# Questions?



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