Energy Savings within Flexible Packaging Facilities

Conservation and Reduction
Why is Energy Conservation a Hot Topic?

- The continuing fluctuations & rising natural gas costs.

- Natural gas prices hit a high of $13.90+/MM BTU and a low of $4.50/MM BTU! Currently at approximately $9.30/MM BTU!

- Worldwide environmental pressure to reduce greenhouse gases.

- Bottom line savings on energy and production costs.

- Increased capacity and production capabilities.

- 33% of energy is consumed by the industrial sector.
Energy in Perspective
Projected Worldwide Consumption

Energy costs

- Natural gas prices have started to lower in recent months
  - This reduction may continue for a short period of time.
- Gas costs will not remain at lower levels for a significant period of time.
  - Added pressure on GHG will drive coal fired power generation to natural gas, adding pressure to pricing

- Electrical costs will continue to increase long-term.
  - Again GHG pressures will make coal fired power generation more costly
  - Nuclear energy ideal, but still faces perception issues in the US.
  - Natural gas power generation will continue to increase.
  - Wind and similar power will increase, but in the process will impact cost of electrical energy.
Energy Usage in Flexible Packaging

- There are three major areas of energy consumption
  - Electrical energy
  - Natural gas or other fuel sources
  - Compressed air
- All of these need to be looked at in depth to find real savings for your facility
Electrical Energy

• Major sources are;
  – Lighting
  – Make-up Air Systems
  – Power for process lines
    • Press, laminator, and coating line drives
    • Exhaust fans
  – Emission control system fans
Natural Gas

- Building and hot water heating
- Process line drying equipment
- Emission Control burners
Compressed Air

- Various components within pressroom
- Added processes
  - Dampers
  - Poppet valves on some RTO units
- Typical facility uses 18% of energy for compressed air
Where and how can energy be reduced?

- Building MUA systems can be improved
- Reduction in air flows can result in lower energy cost
  - Process dryers flow reduction
    - Lower flows to control device
    - Less building makeup air loading
  - Emission control
    - Replacement
    - Optimization
    - Secondary heat recovery
Building Energy Reduction

- Look at potential for optimization of existing building heating, cooling, and other energy reductions.
- Many states offer assistance in reducing energy along with rebates or similar incentives to replace energy wasting equipment.
  - Lighting
  - HVAC
  - Motors
  - Chillers
  - Compressed air audits and upgrades
Process Dryers

• Routine and planned maintenance of existing dryers can provide instant reduction in both electrical and gas usage.
• If looking at new process lines, ask about availability of exhaust reduction capabilities
  – LFL based
  – Speed based
  – Data to allow operator reduction of exhaust
• Each cubic foot of exhaust reduced can have a larger impact on energy usage on the associated emission control system
Dryer / Oven / Process Maintenance

- Changing operating parameters to compensate for equipment deficiencies
- Process tune-up for energy savings
  - Initiate a Preventive Maintenance plan
  - Clean supply & exhaust nozzles & plenums
  - Clean air filters & screens
  - Replace gasketing on doors
  - Adjust air supply & exhaust balancing dampers
  - Have burners maintained and tuned
  - Use only as much air/heat as needed
  - Fan balancing and belts
- Establish a baseline
  - Document operating parameters
  - Measure and record flows and energy usage
Emission Control Systems

• For existing systems look at optimization
  – If existing RTO look at potential for media replacement to increase thermal efficiency and reduce electrical energy
  – Look at potential for secondary heat recovery
  – For recuperative oxidizers look at methods of conserving energy usage.

• If multiple oxidizers installed on various lines and are aging, look at new higher efficiency unit to greatly reduce overall energy costs
Regenerative Thermal Oxidizer
Energy Upgrades

- Improved ceramic heat recovery media available
- Structured ceramic media
  - Provides higher heat recovery
  - Reduce system pressure drop (horse power)
  - Can increase system capacity by 10+%
- Improved temperature control systems
  - Air/fuel ratio control
- Better process interface systems
  - Isolate process when not in use
Secondary Heat Recovery Systems

- Thermal Oil Systems
- Air to Air Heat Exchanger Systems
- Air to Glycol Systems
- Air to Steam Boiler Systems
- Adsorption Chiller Units
  - (Requires 550°F+ exhaust temperature)
  - Chilled Water
  - Plant Cooling
Air to Air Heat Recovery
Secondary Heat Recovery Unit
Secondary Heat Recovery Unit
Hot Water Loop Heater
Hot Water (Glycol) Recovery
Glycol Economizer System

- Ideal energy recovery for existing catalytic units
- Increase equipment efficiency
- “add-on” technology
- Minimal downtime to install
- Favorable ROI
- Fully automatic operation
Glycol Economizer System

To Atmosphere
Pressure Relief to Safe Area
Pressure Relief Valve

Fluid Outlet Temp 300°F
Fluid Inlet Temp 150°F
BTU Exchange 1 - 1.90 M
2 - 2.87 M
3 - 4.10 M

Oxidizer Inlet Temp 250°F

Exhaust Stack
Exhaust Temp 350°F

Flow
1 - 14,000 SCFM
2 - 21,000 SCFM
3 - 30,000 SCFM

Process Inlet Temp 100°F

Primary Recirculating Pump
Expansion Tank

To Drain

Oxidizer
RTO with Air-to-Air Heat Recovery

40,000 SCFM - Massachusetts
Oil Loop Heater (Paratherm)
RTO with Thermal Oil heat recovery for Gravure Press
Secondary & Tertiary Heat Recovery
Payback Analysis

Information Needed:

A. Cost of the project including equipment, installation and technical services

B. Total hours of estimated operation per year

C. Estimated energy saved or recovered/operating hour

D. Cost of energy

Simple ROI Formula:

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\text{ROI} = \frac{\text{Cost Of Project}}{\text{Total Hours} \times \text{Energy} \times \text{Cost of energy}}
\]
Financial Assistance

- Many states have programs for partial funding, tax incentives or low-cost loans

- Visit [www.think-energy.net/rebates](http://www.think-energy.net/rebates) to see what may be available in your area

- DOE (Department Of Energy) offers funding for energy reduction feasibility studies

- Vendor may offer terms aligned with payback period
Finding areas where energy can be reduced provides real savings that continues to have a positive impact on your organization for years to come.

Also allows your organization to be much greener (i.e., smaller carbon footprint)