

Industrial Heat Efficiency and Heat Recovery

Michelle Miilu

MA Office of Technical Assistance
Fundamentals of Energy Efficiency and
Renewable Energy – Holyoke, MA
April 15, 2008

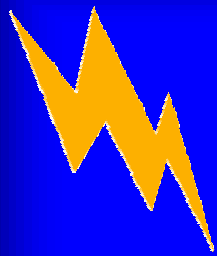




Sequential Strategies for Heat

- 1) Reduce demand for heat
- 2) Where heat is needed, conserve
- 3) Recycle waste heat





Reduced Heat Options

- Alternatives to heat curing
- Eliminate need for thermal oxidizer
- Ambient temperature processes





Heat Efficient Equipment Ideas

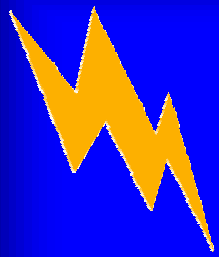
- Energy Star products

www.energystar.gov/index.cfm?fuseaction=find_a_product.
(note period at end of link address!)

- Ovens and other process equipment
- Boilers and hot water heaters
- Controls
- Cafeteria equipment

www.fypower.org/pdf/BPG_RestaurantEnergyEfficiency.pdf

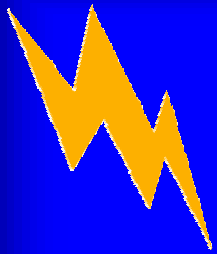




Operation & Maintenance

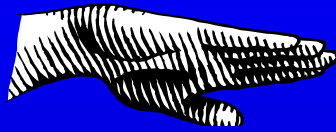
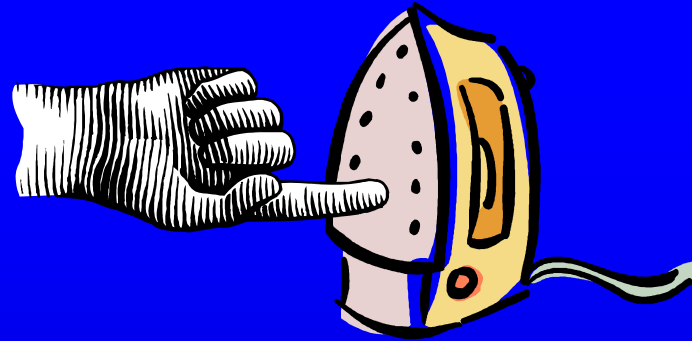
- Maintain optimal control settings
- Clean heat transfer surfaces
- Fix leaks
- Turn off equipment when not in use



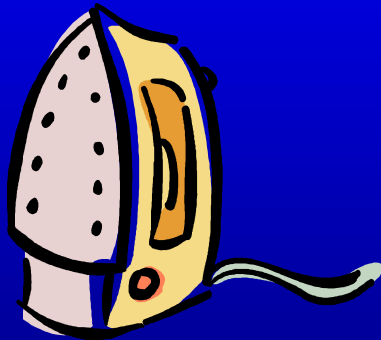


Sources of Heat Loss

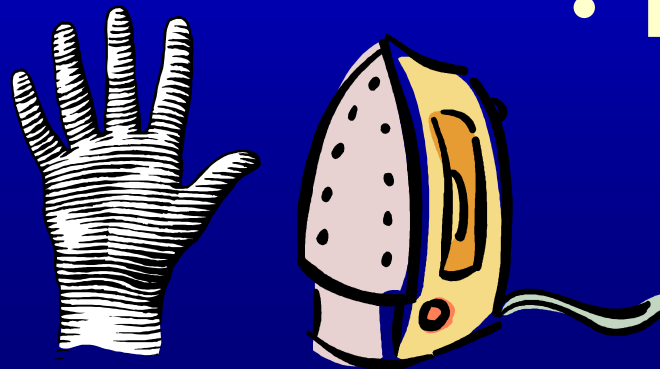
- **Conduction**

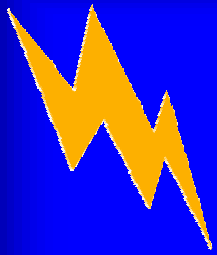


- **Convection**



- **Radiation**

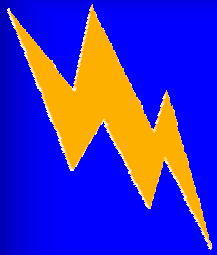




Reduce Heat Losses

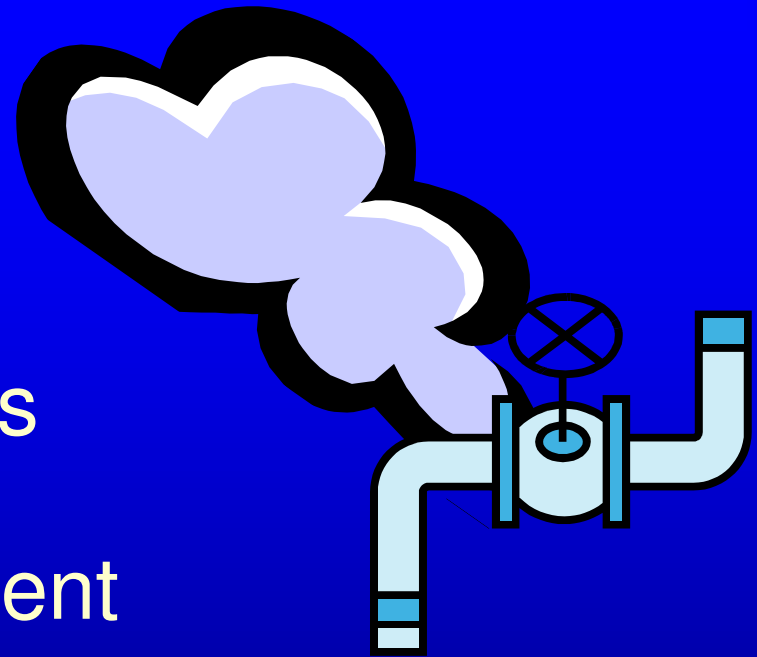
- Fix leaks
- Minimize drafts into ovens, buildings, open process tanks, etc.
- Insulate piping, process tanks, water heaters, etc. containing heated substances

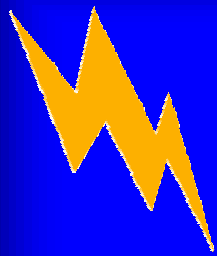




Leaks

- HVAC
- Steam systems
- Compressed air systems
- Heated process equipment

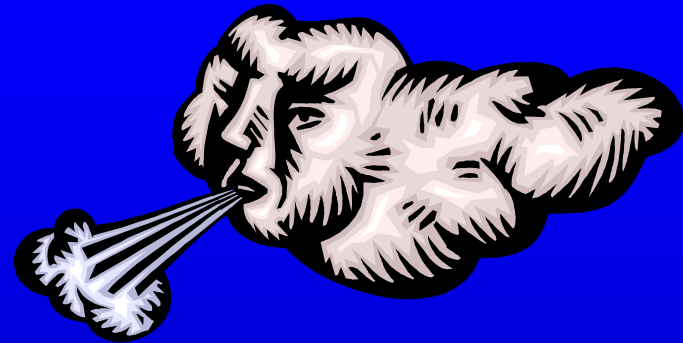




Result

Drafts

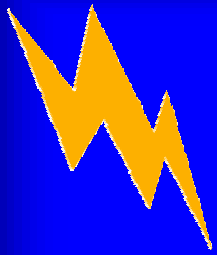
- Cause Equipment to Use More Fuel to Maintain Temperature



Sources

- Corrosion Holes
- Entrance and Exit of Enclosed Process Equipment
- Open Doors, Windows, and Process Equipment





Insulate

- Cover open process tanks – floats or lids
- Insulate steam and hot water systems including piping and valves
- Insulate buildings and HVAC ductwork

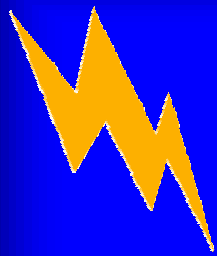


energyconcepts.tripod.com/energyconcepts/



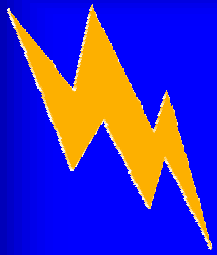
U Dayton - IAC





- **Energy Efficiency measures may allow set temperatures to be reduced**

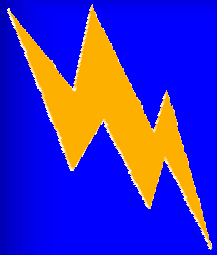




Heat Recovery

- Are there opportunities to use waste heat?
 - Pre-heating water or air
 - Space heating
- Is waste heat available when there is demand for heat?
- How does the amount of waste heat match with application demand - flow and temp.?





Audience Question

- **Name some sources of waste heat**





Waste Heat Source Examples

- Flue gas
- Motors
- Heated process equipment
- Sanitary and industrial wastewater
- Boiler blowdown
- Building ventilation





Commonwealth of Massachusetts

Executive Office of Energy and Environmental Affairs

Office of Technical Assistance and Technology

January 2008

Delaware Valley Corporation Energy Efficiency Case Study Heat Recovery

Summary

In 2006, Delaware Valley Corporation installed an air-to-air heat exchanger at their Tewksbury facility to recover heat for both process and space heating from two of their natural gas-fired textile heat-setting ovens. It cost \$27,000 to purchase and install the new system. The company expected about a one-year payback from savings in gas related expenses. However, OTA worked with the company and identified utility incentives available from their gas provider, which reduced the payback period to eight months. In addition to cutting energy costs, the heat exchanger installation has resulted in more comfortable working conditions for their employees, because the workplace is now maintained at a constant, uniform temperature. Delaware Valley has been so pleased with their heat recovery system that they have gone on to install a second heat exchanger on the third oven, and are investigating the installation of yet another at their Lawrence facility, to capture waste heat from all their ovens. Finally, savings from the heat recovery system will be reinvested to implement future energy efficiency projects.



Roll of Black Industrial Mat Coming Out of a Delaware Valley Oven

Background

Delaware Valley Corporation is a family-owned specialty non-woven textile manufacturer and has been headquartered in Lawrence, MA since its establishment in 1961. They have a second production facility in Tewksbury, MA and employ a total of 44 people at these two facilities. Their products are mainly used in the automotive industry, although Delaware Valley also supplies products to the medical, roofing, flooring & matting, marine, and recreational vehicle industries.

Energy Efficiency

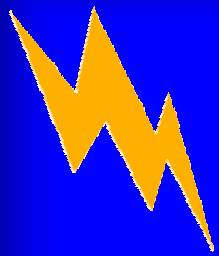
In 2003, Delaware Valley president D. Paul DiMaggio, Jr. realized that their Tewksbury facility's winter process and space heating costs were almost double their summer process heating costs. Since there seemed to be a good match between their winter space heating needs and their supply of waste heat from their ovens, he thought that capturing this 230°-240°F waste heat in winter and using it to heat their Tewksbury factory would be a good opportunity to reduce energy costs. DiMaggio considered the idea of building an air-to-air heat exchanger in-house, but after experiencing "sky high energy costs," (following Hurricane Katrina) during the winter of 2005-06, he made the decision to hire Pre-Heat, Inc. to build a heat exchanger for the company.

During their Christmas shutdown in 2006, Delaware Valley installed a flat plate air-to-air heat exchanger fabricated by Pre-Heat to recover exhaust heat from two of their textile heat-setting ovens. The installation took three Delaware Valley employees five days to complete plus another month of working, as time allowed, to finish the system connection. Hiring an outside company to build the heat exchanger ended up being a good decision. In retrospect, DiMaggio says they not only saved money on the heat exchanger, but also Pre-Heat, Inc. incorporated a summer use for the captured heat into the design of the heat exchanger, which further improved their payback. The system features a control that allows the recovered heat to be redirected from factory heating in the winter to pre-heating fabric entering the oven during the summer, which allows them to take advantage of the heat exchanger all year long.



Delaware Valley's First Heat Exchanger





Wide Variety of Equipment

- Equipment choice will depend on:

Temperatures

Application

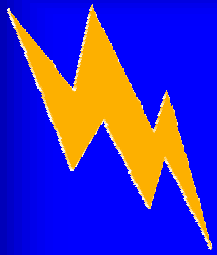
Liquid vs. gas

Contaminants in waste heat stream

- Heat recovery equipment overview:

[www.pge.com/003_save_energy/003c_edu_train/pe
c/info_resource/pdf/HEATRECO.PDF](http://www.pge.com/003_save_energy/003c_edu_train/pe
c/info_resource/pdf/HEATRECO.PDF)

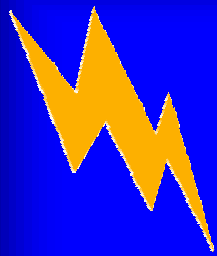




DHW: Special Case

- If heat recovery equipment will come in contact with domestic hot water, that equipment must be approved by the state Plumbers and Gas Fitters Board.
- List of approved equipment:
 - license.reg.state.ma.us/pubLic/pl_products/pb_pre_form.asp

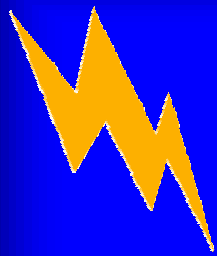




Financials

- Paybacks for heat efficiency and heat recovery projects are often less than 2 years
- Funding is often available from your investor-owned gas utility

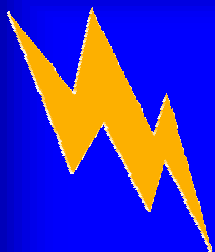




Resources

- Great efficiency ideas!
 - www.engr.udayton.edu/udiac/Documents/ProcHeat.doc
- DOE tip sheets and software (PHAST)
- Funding resources
 - www.dsireusa.org
 - KeySpan, Bay State, & NSTAR offer funding or contact your gas utility





Questions??

Michelle Miilu
MA OTA
100 Cambridge St., Suite 900
Boston, MA 02114
(617) 626-1094
Michelle.Miilu@state.ma.us

