Feasibility of Using Low Quality Waste Energy

Northern Iron & Machine

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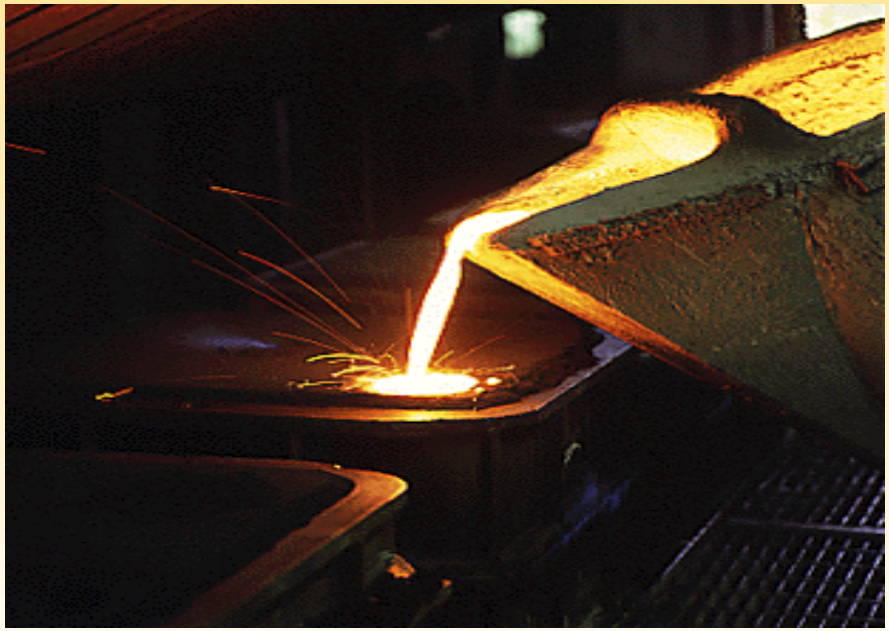
Minnesota Technical Assistance Program

UNIVERSITY OF MINNESOTA

Driven to Discover℠

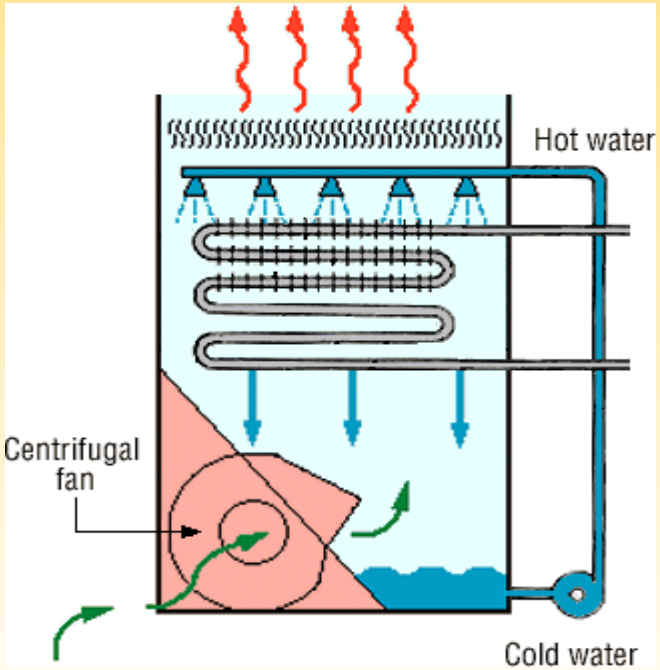
Company Overview

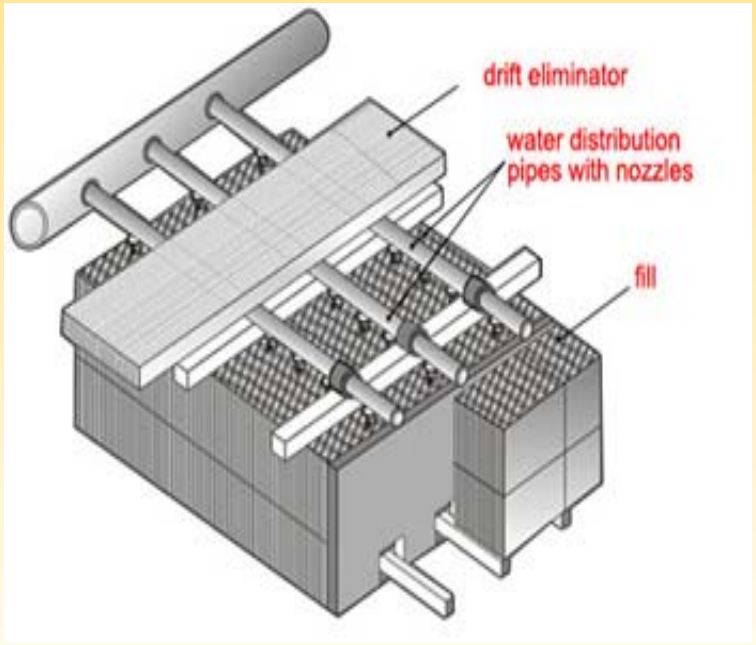
- Ductile Iron Foundry
  - Manufacture off-road machine parts
- 150 Employees
- Machine Shop



Process Changes

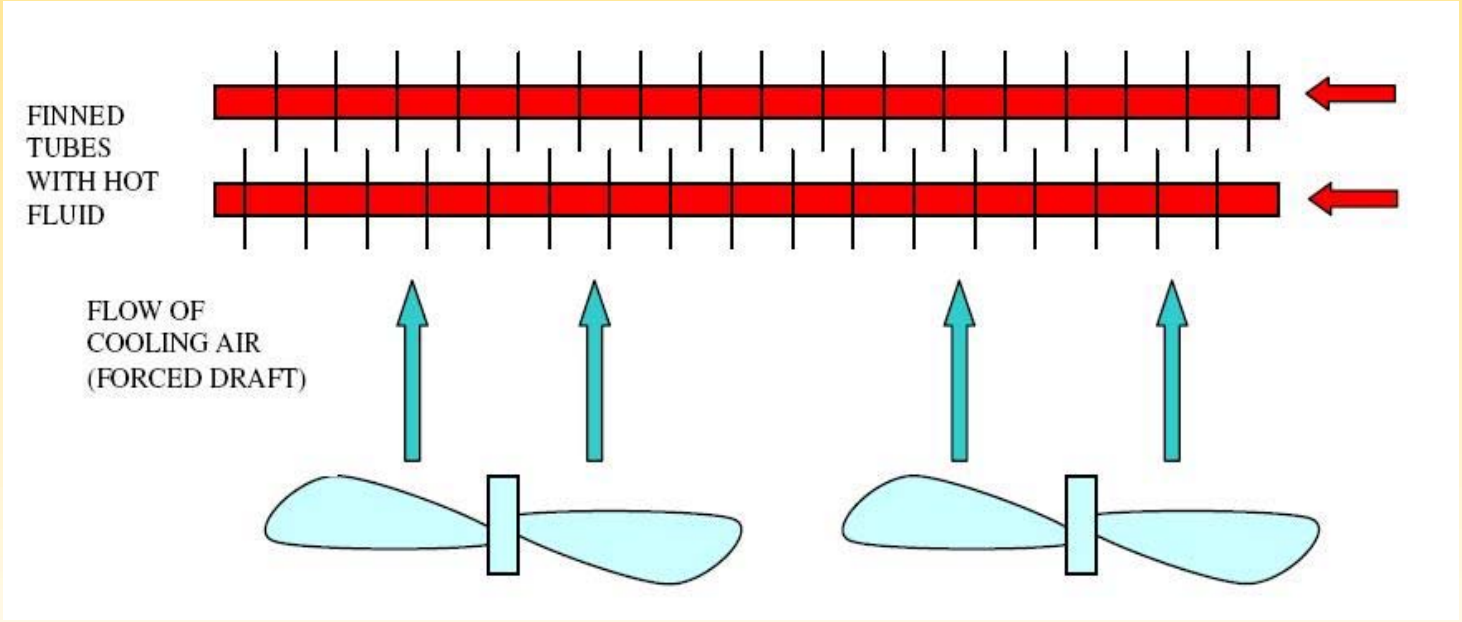
- Eliminate Cooling Tower
  - Evaporative heat exchanger





Process Changes (Cont.)

- Replaced With 2 Dry Coolers
  - Water to air heat exchanger



Process Changes (Cont.)

Air Flows through fins then into the building

Motivations for Change

- Energy
- Environment
- Process

Reasons for MnTAP Assistance

- Document effectiveness
- Support University of Minnesota and its Students
- Improve energy management

Approach

- Understand Processes
- Quantify and Verify Heat Transfer

Low Quality Energy

- Energy at low temperatures can't be used for process heating
  - Low Range (90 deg F)
  - Energy being recouped
  - Comfort heating

Dry Cooler Savings

Energy	Usage	Savings Yearly
Save Electricity	60,000 kWh	$3,800
Save Gas	1350 DkT	$5,400
Environment	**Usage**	**Savings Yearly**
Well Water	500,000 Gallons	N/A
Chemical Use	N/A	$1,000
Waste Water Discharge	18,000 Gallons	$480
Maintenance	**Usage**	**Savings Yearly**
Less Man Hours	N/A	$2,500
	Total Yearly Savings	**$13,000**

In Reality

Old System

- Atmosphere
- 30,000 cfm
- 30 Hp max
- 0% Recouped

New System

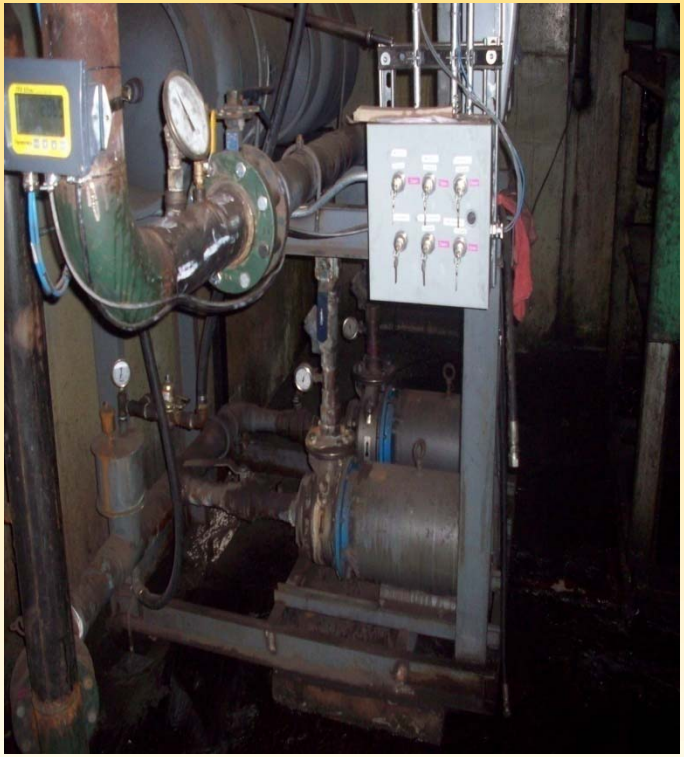
- Plant
- 40,000 cfm
- 10-30 Hp
- 70% Recouped

Determining Feasibility

- Dry Cooler Benefits
  - Pros and Cons
- Data Collection
- Quantifying Data for Comparison

Plant Benefits

- Conserve Natural Resources
- Reduce New Capital
- Remove MUA
- Reduce Reporting

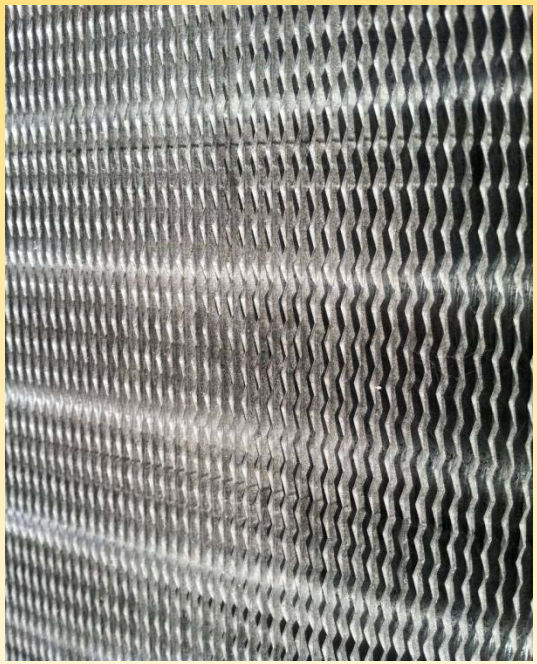


Maintenance

- Reduce Man Hours
  - Cleaning Pipes
  - Fixing Leaks
- Minimal Maintenance
  - Dirt and fuzz restrict air flow
  - Reduces cooling ability

Maintenance (Cont.)

1 Day Old

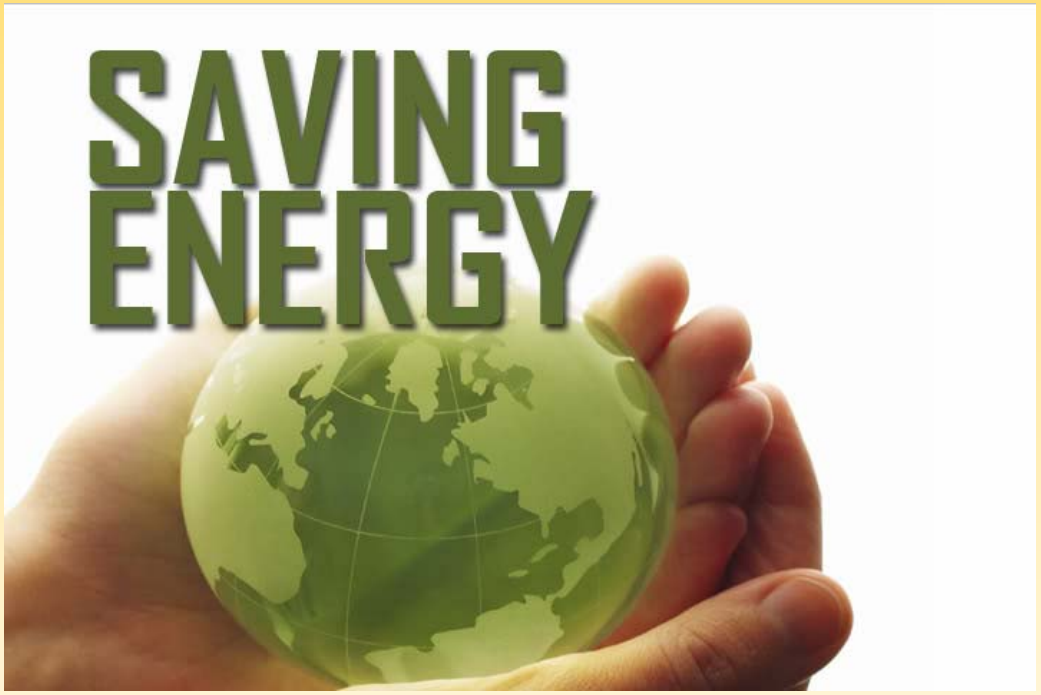


1 Week Old

2 Years Old

Feasibility Conclusion

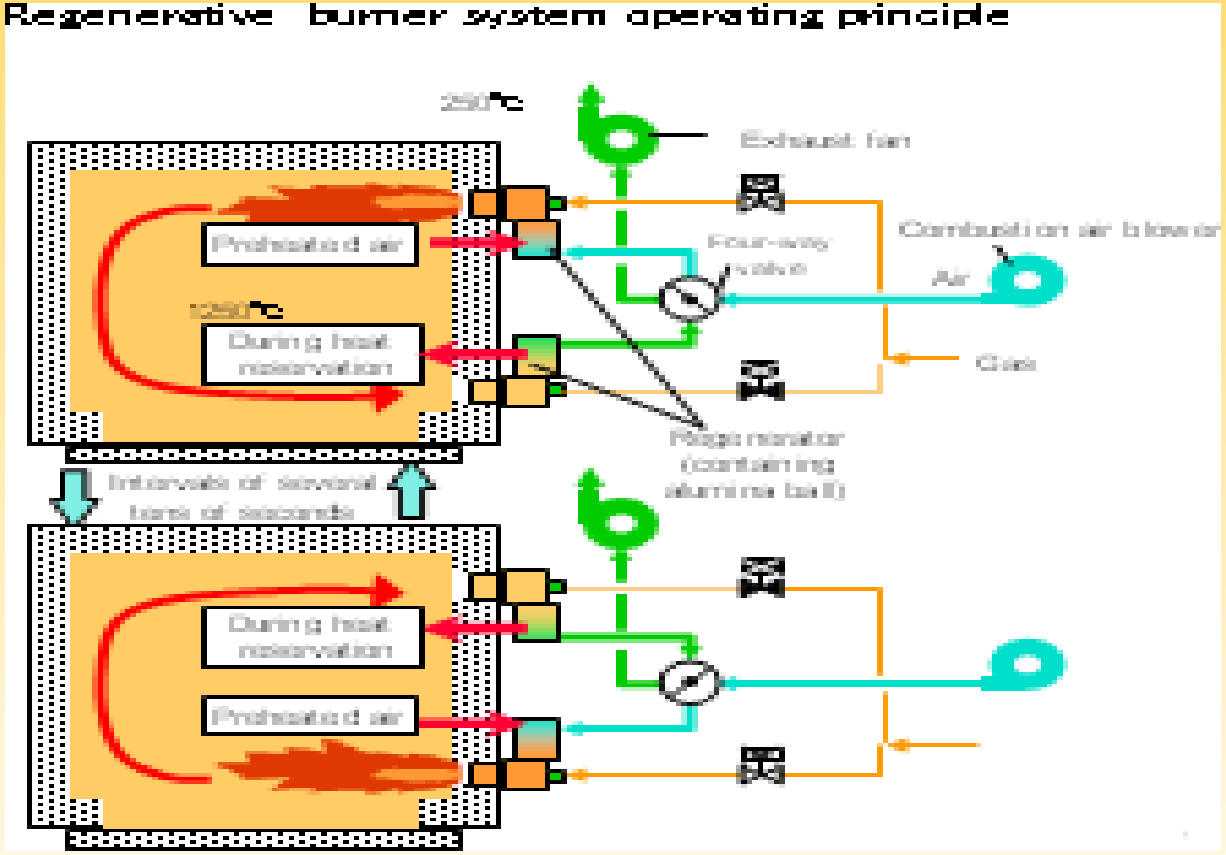
- Energy
- Environment
- Process



Feasibility Conclusion Cont.

- Xcel Energy Rebate
  - $38,000
  - Validated by Engineers

Heat Treat Oven



Personal Benefits

- Work Experience in Industrial Setting
- Analyzed Real World Engineering Applications
- Applied Principals from Classroom
- Improved Writing/Communication Skills

Questions?

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