Energy Efficiency Analysis
Gerdau – St. Paul

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Minnesota Technical Assistance Program

UNIVERSITY OF MINNESOTA

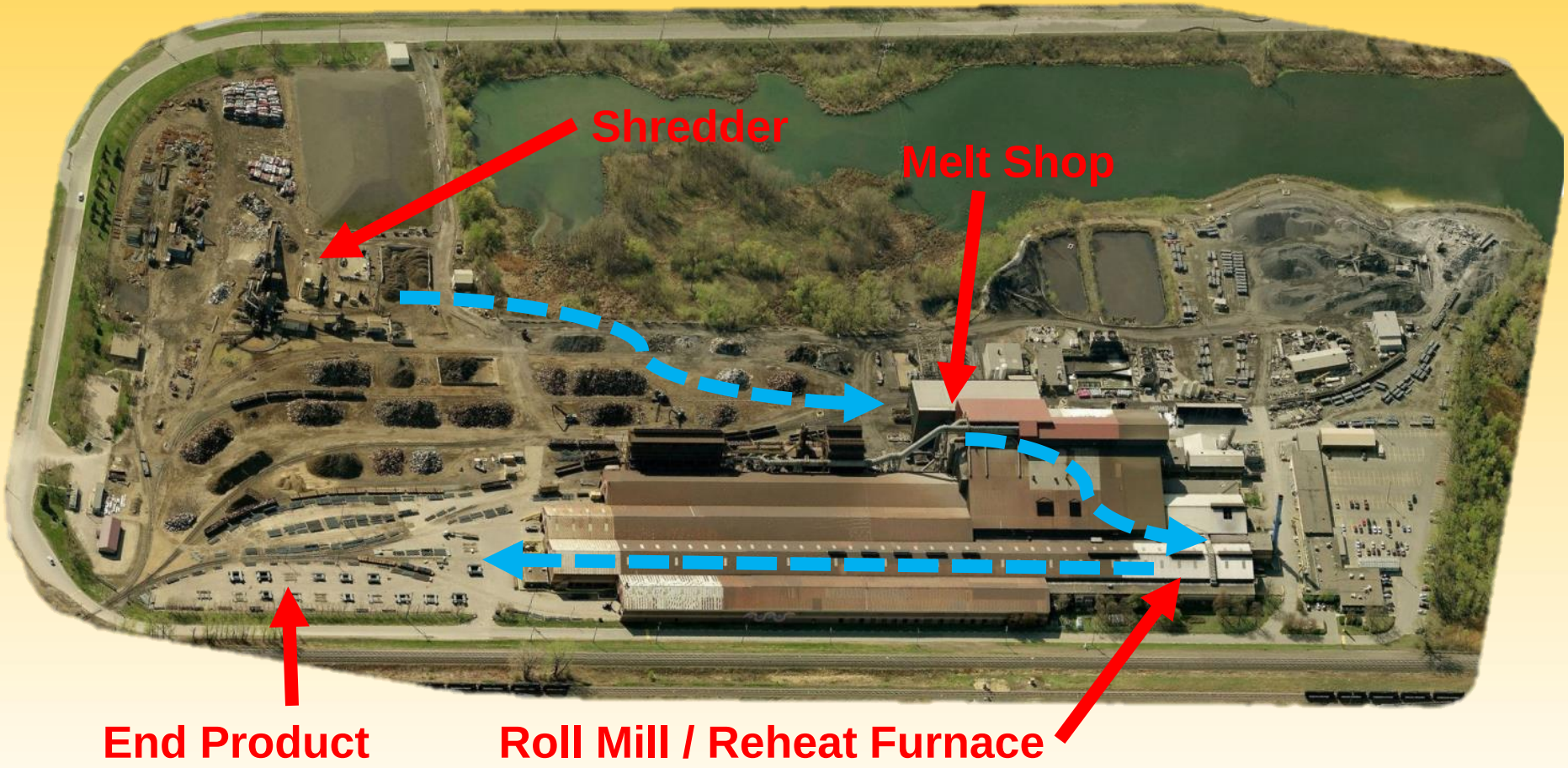
Driven to Discover℠

Company Overview

- Global Steel Manufacturing Company
- Began Operations in 1901
- Operates in 14 Countries Worldwide
- Largest Producer of Long Steel in the Americas
- Leader in Steel Recycling in North America
- Strong Mission and Values

Company Overview

- Saint Paul, Minnesota – Steel Mill



Motivations for Change

- Utility Rates are Rising
- Sustainability Concerns
- Pollution Reduction
- Quality and Reliability
- Remain Competitive

Approach

- Work with Employees to Determine Areas of Possible Improvement
- Gather Process Data
- Research More Efficient Options
- Quantify Savings Potential
- Determine Implementation Costs
- Relay Results and Attempt to Move Forward

Projects

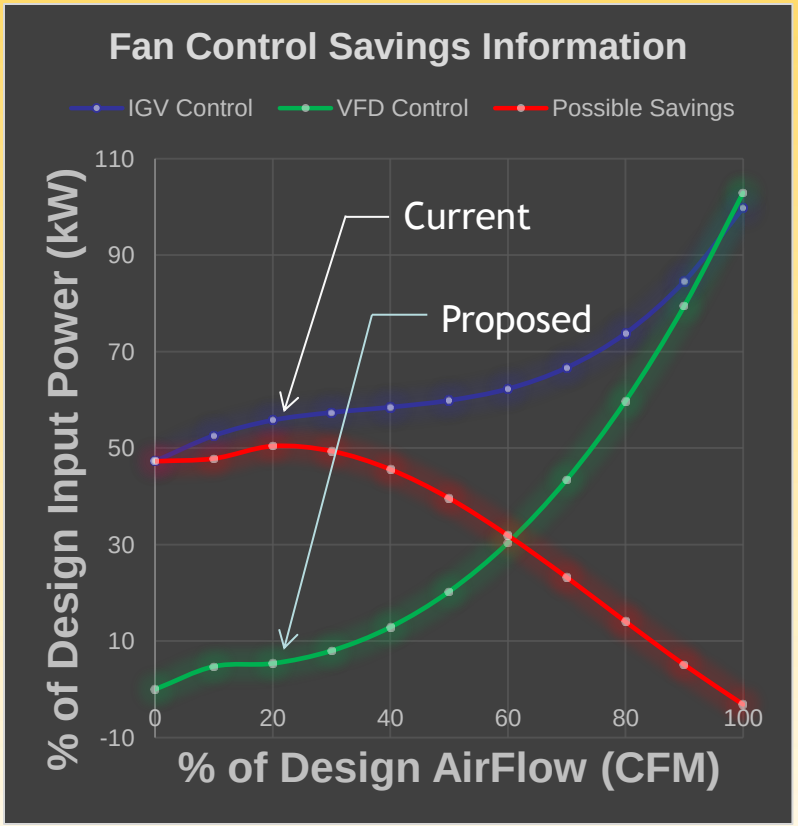
- Electrical Savings
- Water Savings
- Natural Gas Savings
- Waste Reduction

Combustion Air Supply

- Current System
  - 125hp Blowers
  - Inlet Guide Vane Flow Control
  - Typical Damper Settings 15 - 30% Open
  - Annual Operating Cost $900{,}000\ kWh \rightarrow \$65{,}000$

Combustion Air Supply (cont.)

- Proposed System
  - Variable Frequency Drive (VFD) Flow Control
  - Annual Savings $640{,}000\ kWh \rightarrow \$49{,}000$
  - VFD Install Estimate $\$74{,}100$
  - Payback Period 1.6 Years



Shear Clutch Cooling

- Current System
  - Pneumatic Venturi Blower
  - Consumes 68 CFM of Compressed Air
    - Equivalent Load on Compressor – 16hp
  - Produces 1,700 CFM of Cooling Airflow
  - Annual Operating Cost $102{,}000\ kWh \rightarrow \$7{,}400$

Shear Clutch Cooling (cont.)

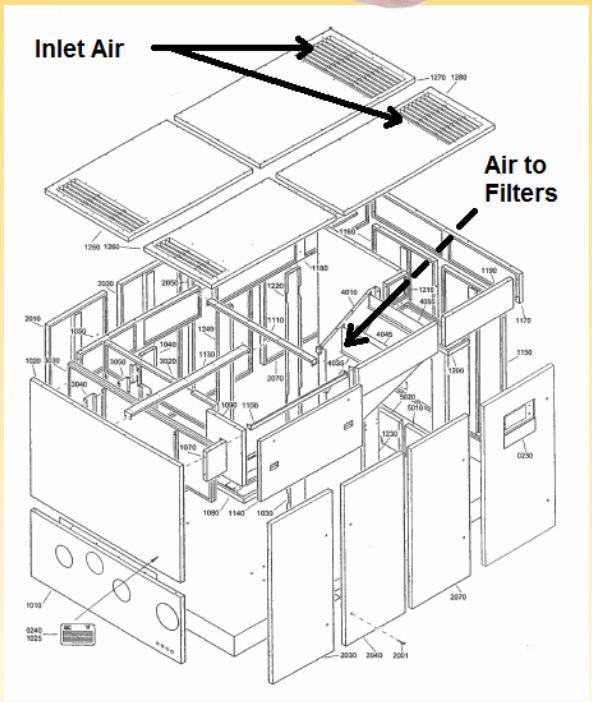
- Proposed System
  - Electric Blower
  - Produces 3,000 CFM of Cooling Airflow
  - Annual Savings
    $94{,}000\ kWh \rightarrow \$6{,}800$
  - Blower Install Cost
    $\$19{,}200$
  - Payback Period - 2.8 Years

Compressor Intake Air

- Current System
  - Oil Free Screw Compressor
  - Draws Air Supply from Inside Room
  - Compressor Room is $14°\mathrm{F}$ Warmer than Outside
  - Annual Operating Cost $3{,}125{,}000\ kWh \rightarrow \$225{,}000$

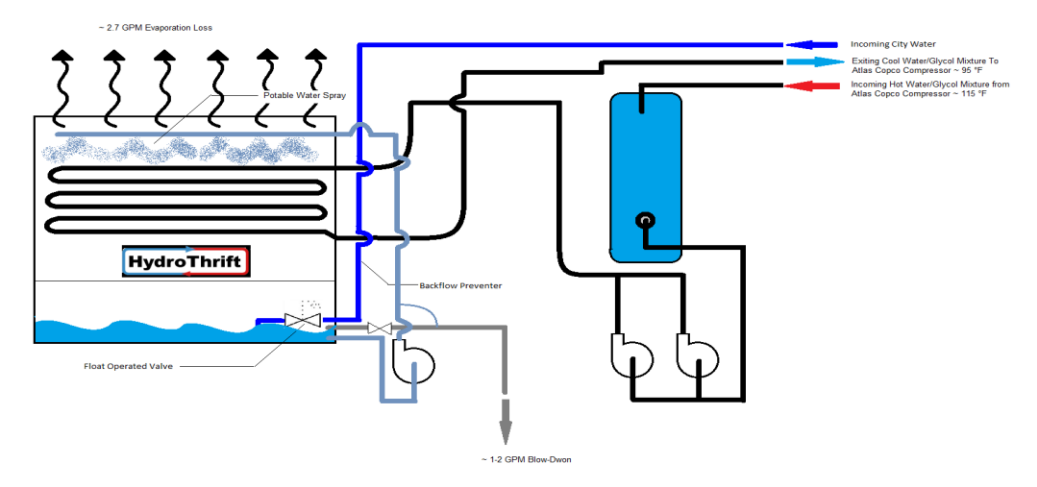
Compressor Intake Air (cont.)

- Proposed System
  - Intake Cooler Air from Outside
  - Studies Suggest 2.5% Annual Electric Savings
  - Annual Savings $78{,}000\ kWh \rightarrow \$5{,}600$
  - Ducting Cost Estimate $\$4{,}000$
  - Payback Period - 9 Months



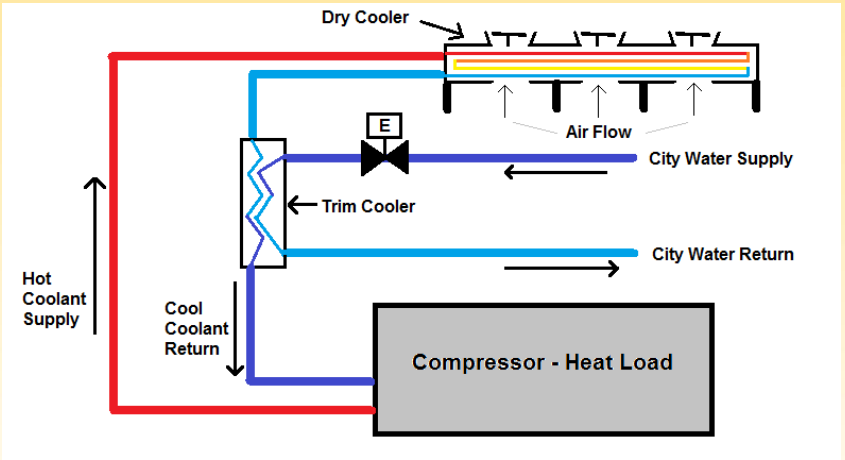
Compressor Cooling

- Current System
  - Closed Loop Evaporative Cooling
  - Annual Operating Cost
    $3{,}600{,}000\ gallons\ of\ water \rightarrow \$43{,}400$



Compressor Cooling (cont.)

- Proposed System
  - Closed Loop Dry Cooler
  - Annual Savings Estimate
    $3{,}100{,}000\ gallons\ of\ water \rightarrow \$19{,}700$
  - Implementation Estimate $\$76{,}000$
  - ROI 3.9 Years

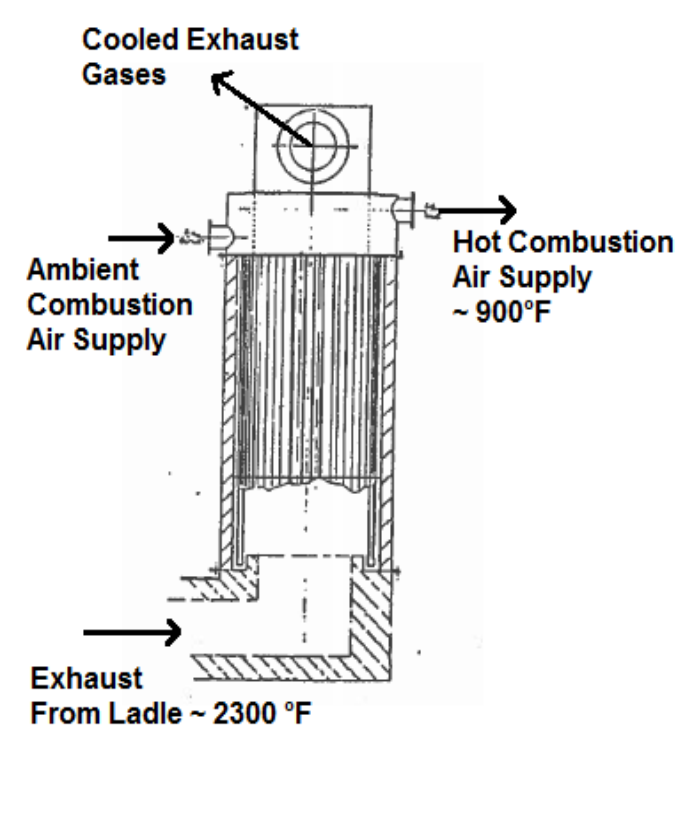


North Ladle Pre-Heater

- Current System
  - Natural Gas Fired Ladle Heating
  - Ambient Combustion Air Supply
  - 2,300°F Gases Exhausted to Surrounding Room
  - Annual Operating Cost
    $162{,}000\ therms \rightarrow \$86{,}000$

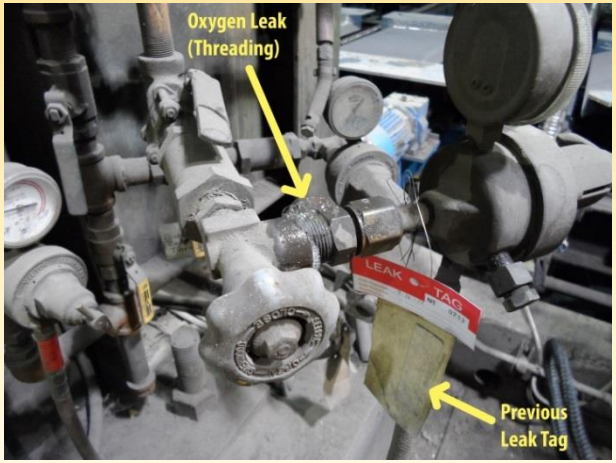
North Ladle Pre-Heater (cont.)

- Proposed System
  - Exhaust Gas Energy Recuperation
  - $900°\mathrm{F}$ Combustion Air Supply
  - Annual Savings Estimate $82{,}000\ therms \rightarrow \$43{,}500$ *
  - Recuperator Cost Estimate $\$140{,}000$
  - Payback Period 3.2 Years



Leak Testing

- Current System
  - Ultrasonic Leak Detection
  - Annual, Quarterly, and Monthly Leak Test Routes
- Identified & Fixed Leaks
  - 7 Gas Leaks Were Found
    - Oxygen – $2{,}130{,}000\ ft^3$
    - Compressed Air - $4{,}260{,}000\ ft^3$
    - Natural Gas - $73{,}000\ ft^3$
    - **Annual Savings** → $\$9{,}800$



Leak Testing (cont.)

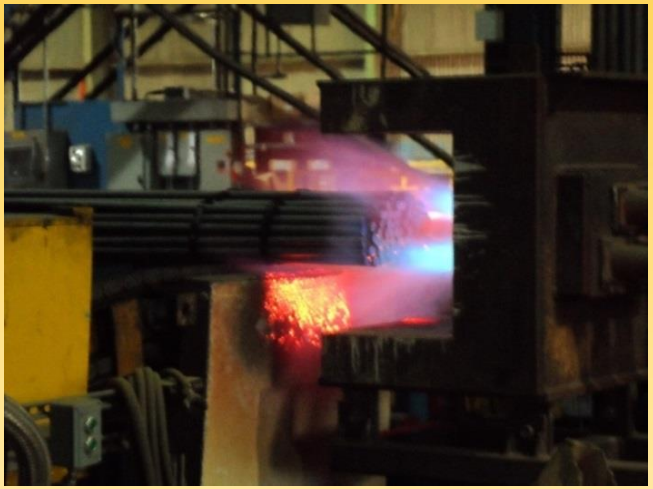
- Proposed System
  - Prioritize Leak Fixes
  - Install Leak Testing Solution Stations
    - Estimated Cost ~ $1,000

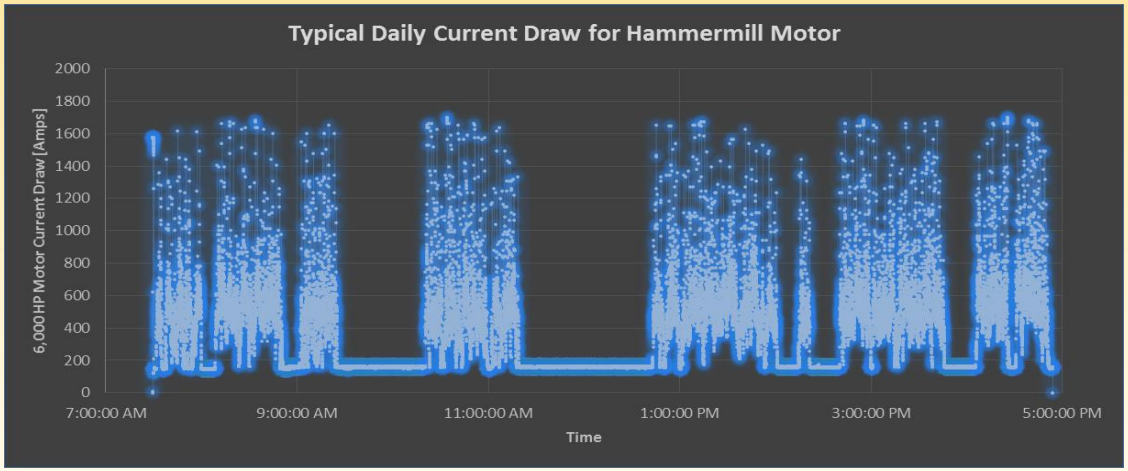
Summary

Recommendation	Annual Reduction	Annual Savings	Payback Period	Status
Install VFD Units on Combustion Air Fans	640,000 [kWh]	$49,000	1.6 Years	Recommended
Install Electric Blower for Shear Clutch Cooling	94,000 [kWh	$6,800	2.8 Years	Recommended
Duct Cooler Air to Main Compressor	78,000 [kWh]	$5,600	9 Months	Recommended
Install Dry Cooler for Compressor Cooling	3,100,000 [gallons water]	$19,700	3.9 Years	Recommended
Install Recuperator on Ladle Pre-Heater	82,000 [therms]	$43,500	3.2 Years	Recommended
Fix Identified Gas Leaks	6,400,000 $[ft^3 of\ gases]$	$9,800	Immediate	Completed

Additional Analysis Required

- Post Heater Process
  - Possible Temperature Control
- Shredder Motor Idle Avoidance
  - Motor Shutdown





Personal Benefits

- Communication Skills
- Experience in an Industrial Setting
- Gained Knowledge through Real-World Engineering Problems
- Experience Writing Reports

Questions?