

**PROJECTS WITH INDUSTRY
and THE CENTER FOR
BUILDING ENERGY
EFFICIENCY**

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**Department of Mechanical and
Aerospace Engineering**



▶ These projects are made possible by:

- ▶ The West Virginia Development Office
- ▶ Division of Energy



- ▶ **Goals:**
- ▶ **Make West Virginia institutions and industries more productive and energy efficient**
- ▶ **Provide a real world design experience for WVU Mechanical Engineering students**
- ▶ **Encourage West Virginia companies to hire WVU engineering graduates**



- ▶ CONTACT COMPANY AND INITIAL VISIT
- ▶ VISIT COMPANY AND COLLECT DATA AND INFORMATION- COMPANY VISITS ARE USUALLY LIMITED TO THREE
- ▶ SELECT PROJECT TEAM – USUALLY 6-7 SENIOR MECHANICAL ENGR. STUDENTS
- ▶ DEVELOP CONCEPTS AND PRELIMINARY DESIGNS
- ▶ VISIT COMPANY AT MID SEMESTER FOR A MIDCOURSE REPORT
- ▶ VISIT THE FINAL TIME AT THE END OF THE SEMESTER FOR A FINAL PRESENTAION
- ▶ SUBMIT A FINAL REPORT TO THE COMPANY OR INSTITUTION

TYPICAL PROJECT OUTLINE



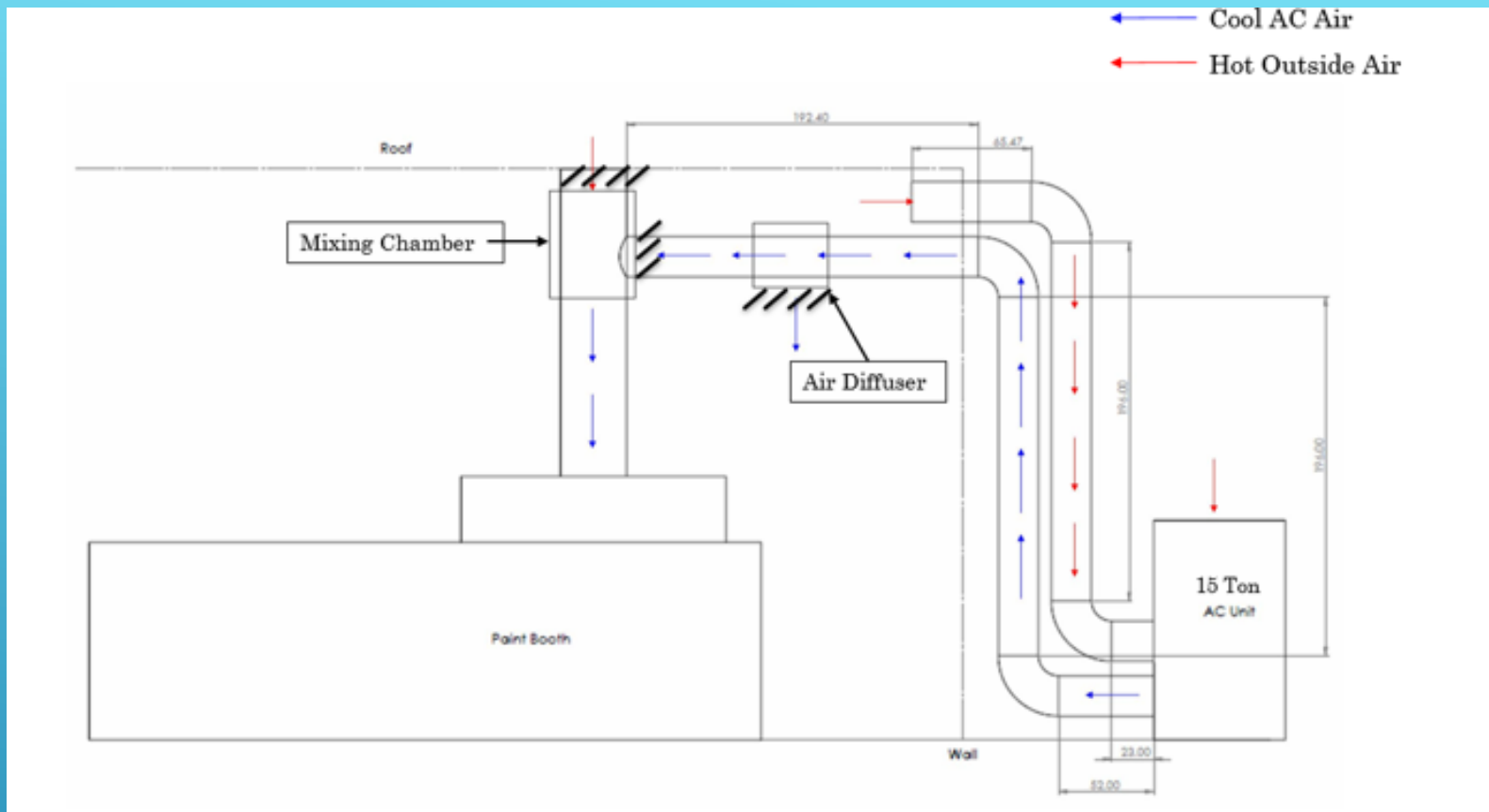
- ▶ AURORA FLIGHT SCIENCES
- ▶ SIMEX CORPORATION
- ▶ SCHOOL ENERGY STUDIES
- ▶ ZIGENFELDER CORPORATION
- ▶ DOC'S TEAS
- ▶ NOVELIS ALUMINUM

PROJECT EXAMPLES



**Economic Development
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HVAC SYSTEM DESIGN FOR A COMPOSITE CURING CHAMBER

AURORA FLIGHT SCIENCES - BRIDGEPORT, WV

HVAC DESIGN ALLOWS YEAR ROUND USE OF CHAMBER

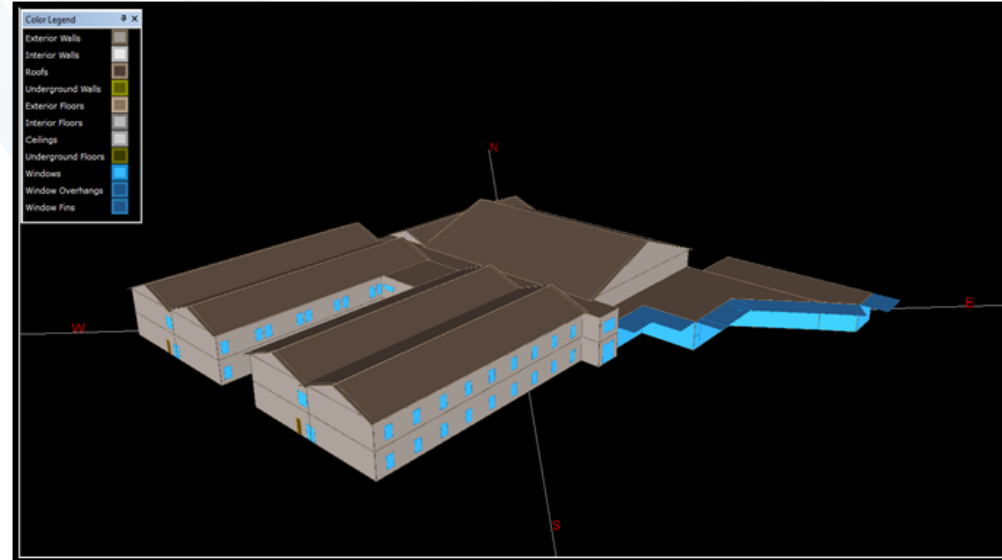
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 Division of Energy
 Hosts

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eQuest

- ❖ Multi shell design - 9 shells
- ❖ Each shell specified by type of activity area
- ❖ Building operation schedule
- ❖ Interior lighting loads
- ❖ Equipment loads
- ❖ 16 thermal zones & units



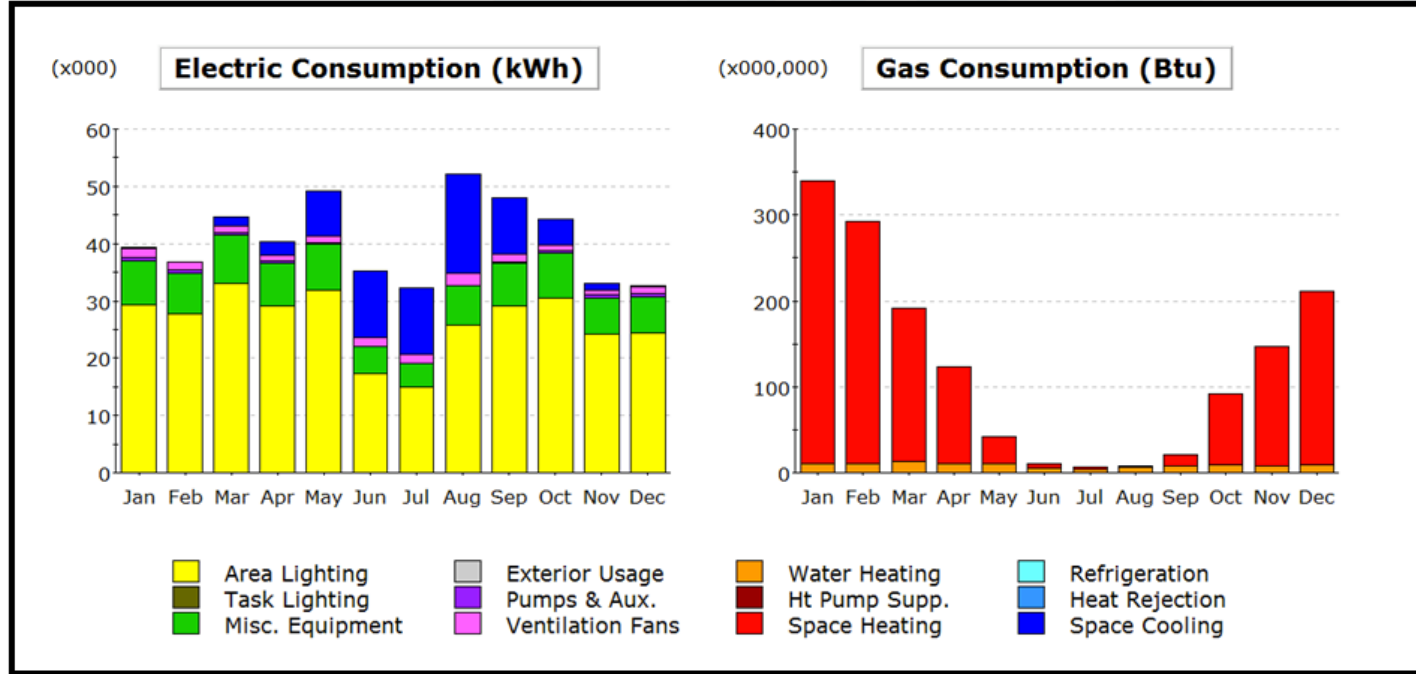
BUILDING ENERGY ANALYSIS FOR SCHOOLS AND INSTITUTIONS



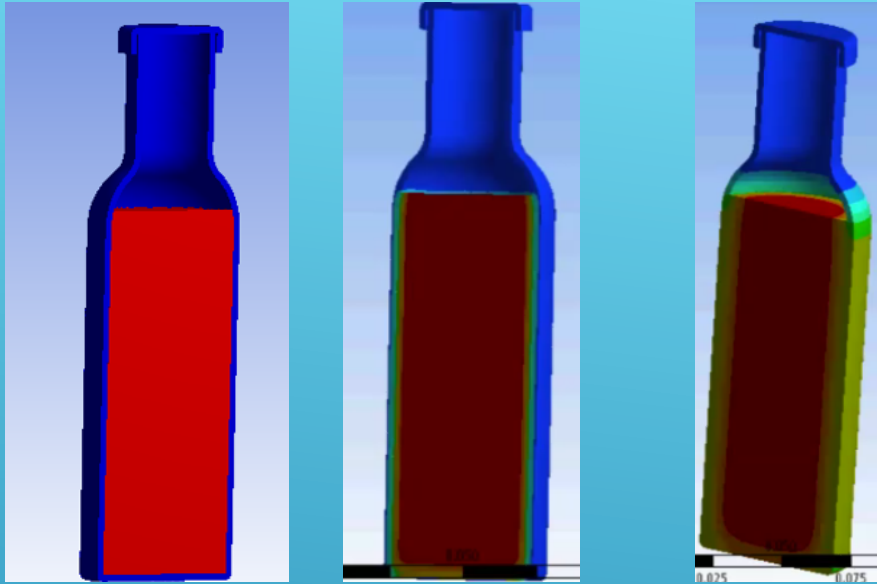
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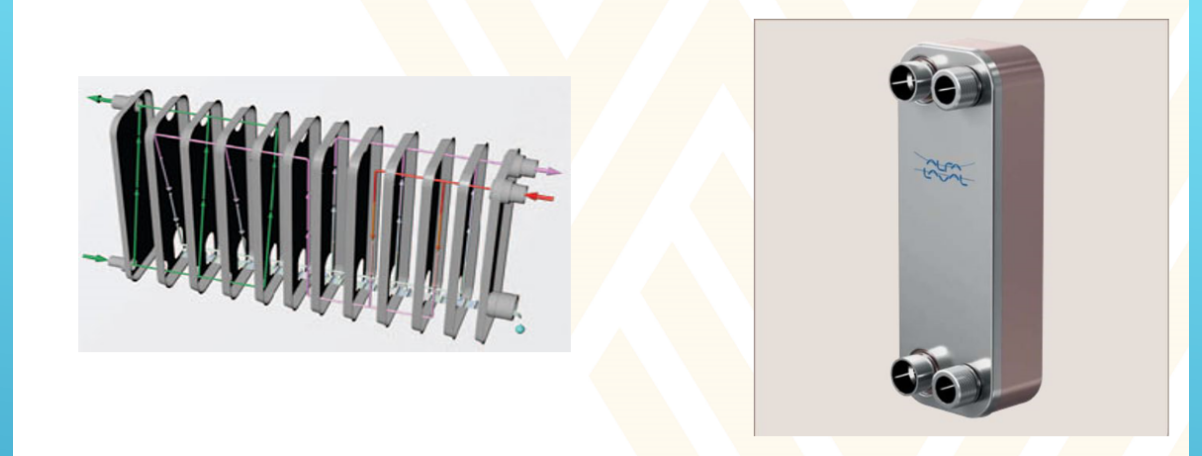
Energy Plot



DETAILED YEAR LONG ENERGY USAGE LOCATE AREAS OF HIGH ENERGY USE



Thermal Modeling of the Cooling Process



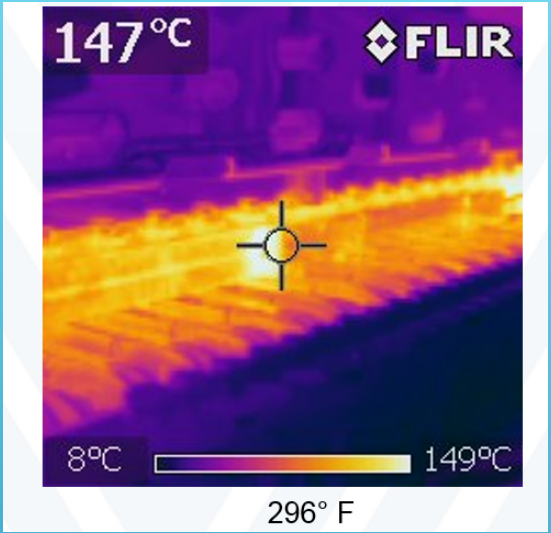
Efficient heat exchanger design

DOC'S TEA COMPANY
EFFICIENT HEATING AND STERILIZATION
FASTER COOLING
75 % REDUCTION IN TOTAL PROCESS TIME

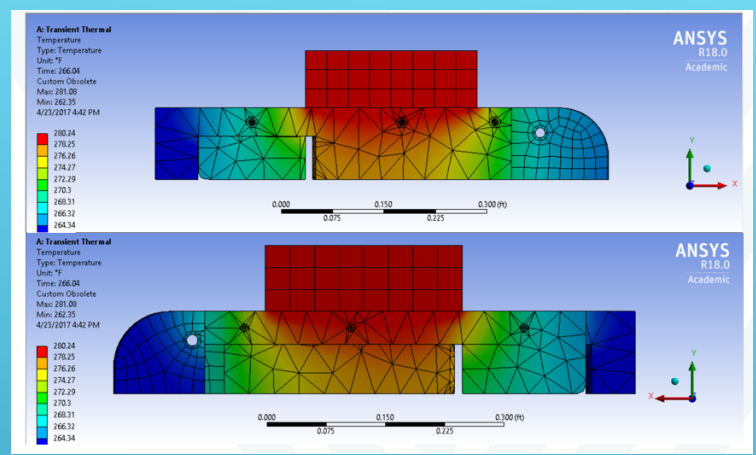


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Infrared Image of Package Sealers



Thermal Model of Package Sealer



Robotic Packaging System

ZIGENFELDER CORPORATION- WHEELING, WV

IMPROVED PACKAGE SEALING

AUTOMATED ROBOTIC PACKING SYSTEM

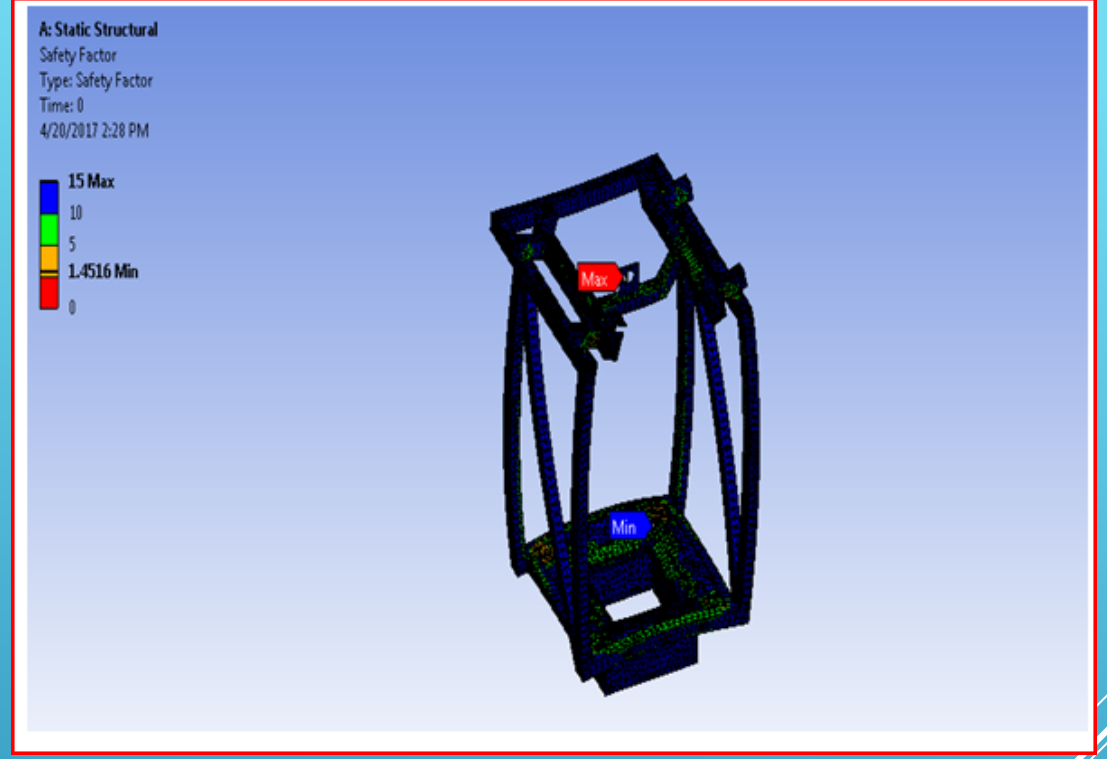


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CHEMICAL FEED SYSTEM



BAG SUPPORT SYSTEM DESIGN

SIMEX CORPORATION

ST. MARYS, WV

NEW DESIGN PROVIDES A SAFER WAY TO SUPPORT THE CHEMICAL BAGS



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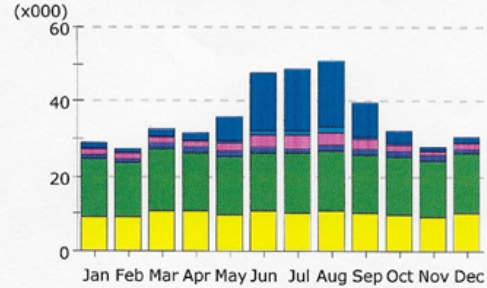
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DARK ROOF

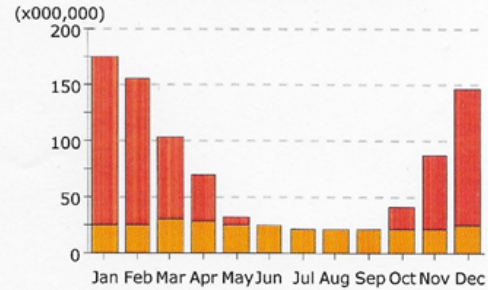
Project/Run: B26 - Baseline Design

Run Date/Time: 04/08/16 @ 11:49

Electric Consumption (kWh)



Gas Consumption (Btu)



Area Lighting
Task Lighting
Misc. Equipment

Exterior Usage
Pumps & Aux.
Ventilation Fans

Water Heating
Ht Pump Supp.
Space Heating

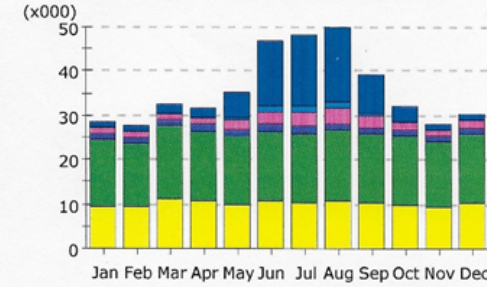
Refrigeration
Heat Rejection
Space Cooling

WHITE ROOF

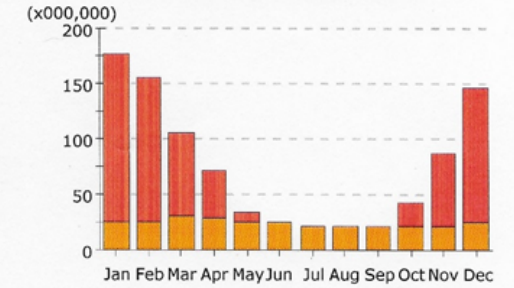
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Run Date/Time: 04/08/16 @ 11:47

Electric Consumption (kWh)



Gas Consumption (Btu)



Area Lighting
Task Lighting
Misc. Equipment

Exterior Usage
Pumps & Aux.
Ventilation Fans

Water Heating
Ht Pump Supp.
Space Heating

Refrigeration
Heat Rejection
Space Cooling

ROOF COLOR STUDY

NATIONAL ENERGY TECHNOLOGY
LABORATORY
MORGANTOWN, WV

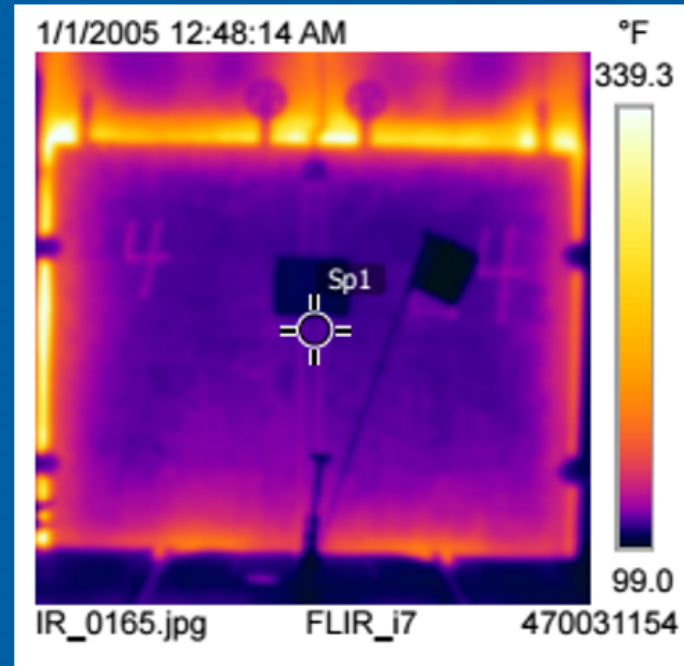


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Furnace 4 Losses



ANNEALING FURNACE ENERGY EFFICIENCY

NOVELIS ALUMINUM

FAIRMONT, WV

IMPROVED FURNACE INSULATION REDUCES UTILITIES

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Hosts

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- ▶ **INCREASED ENERGY EFFICIENCY**
- ▶ **REDUCED UTILITY BILLS**
- ▶ **IMPROVED MANUFACTURING EFFICIENCY**
- ▶ **MODERN DESIGNS**
- ▶ **REDUCED CARBON FOOTPRINT**
- ▶ **ENVIRONMENTALLY BENEFICIAL SOLUTIONS**
- ▶ **KNOWLEDGEABLE DESIGN ALTERNATIVES**
- ▶ **ECONOMIC PAYBACK ESTIMATES**

TYPICAL RESULTS



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