Waste Heat Recovery in a Natural Gas Furnace

Overview
Dresser-Rand currently operates a plant in Olean, NY that heat-treats metal in a natural gas furnace. There are currently no heat recovery systems in the process and heat is exhausted directly to the atmosphere. Development of a system solution with a short payback period and economic viability was desired for the furnace.

Objectives
The primary objectives of this design process were to find a replacement to the current Hauck SVG 130 burners installed in the furnace. Use of either recuperators or regenerative burners were needed to meet a desired payback period and rate of return for the project.

Approach
• Problem statement was analysed to understand potential solutions and feasibility
• Customer needs were gathered through multiple talks with sponsor and an on-site visit
• Electric furnaces and parts washer were studied but abandoned for natural gas furnace
• Recuperators and regenerative burners were best calculated solutions for gas furnace
• REGEMAT 350 regenerative burner and FLOX bayonet recuperator were best existing products
• Thermal analysis was used to calculate thermal efficiency improvements with each system
• Burner fuel savings were calculated for both systems across a range of fuel prices
• Payback period was determined using rate of return for a range of natural gas costs
• Solutions to lower payback period were analysed including firing the furnace longer each week
• Results were validated against industry values for similar installed systems
• Economic viability was the main determining factor for which system to recommend

Outcomes
Finally, list the outcomes for this project making sure to clearly convey their implications for the sponsoring company:
• Dresser-Rand will save $7,666 per year with a regenerative burner and $3,833 per year with a recuperator at current natural gas prices
• Payback period of less than 5 years was only attainable with a regenerative burner at current fuel costs
• Increased fuel prices will result in both systems becoming viable
• Firing the furnace for 19 hours a week or more will result in a 3 year payback period for both systems
• Implementation is not recommended unless furnace is utilized more or fuel prices rise