Reducing Emissions while Recouping Costs

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The aluminum division of Central Motor Wheel of America Inc. (CMWA) approached the Environmental and Energy Systems group of Dürr Systems Inc. in keeping with its green factory efforts and a focus on reducing fuel consumption. The plant was in the midst of a company-wide initiative to reduce energy at both the aluminum and steel wheel divisions.

CMWA is a joint venture between Central Motor Wheel of Japan Ltd. and Toyota Tsusho of America, and is located on 55.4 acres in Paris, KY. The company manufactures steel and aluminum wheels for the automotive industry through two divisions.

Dürr targeted two paint lines and their respective emission control devices at the aluminum division as a basis for the initial evaluation. Each paint line consists of primer and topcoat booths that recirculate a significant amount of air back to the spray booth, while a portion of the air is exhausted to a thermal oxidizer emission control system. The air that is exhausted to abatement is then replaced via a fresh air source to the spray booths. Each line is also equipped with primer and topcoat ovens that also exhaust to the oxidizers.

One of the paint lines was equipped with a high-efficiency 15,000-SCFM Dürr Ecopure® RL15 regenerative thermal oxidizer (RTO) with a thermal energy recovery rating of 95 percent and an average temperature rise across the unit of 100°F. The other line treated its emissions with a 13,000-SCFM recuperative thermal oxidizer with a thermal energy recovery rating of about 55 percent and a temperature rise across the unit of about 580° F.

Since both oxidizers treated relatively the same air volume and emission concentration, 11,675 SCFM and 21 pounds/hour on average, the recuperative

oxidizer became an area of distinct energy-saving opportunity.

The recuperative oxidizer probably offered a lower capital cost and improved the bottom line of the initial paint line package investment. However, the inefficiency of the recuperative oxidizer resulted in long-term fuel consumption approaching $500,000/year based upon today's natural gas prices. The comparative fuel consumption costs of the other aluminum line with the Ecopure RL were closer to $65,000/year.

Since the capacity utilization of both aluminum paint line oxidizers was upwards of 84 percent, three options were available: a new high-efficiency RTO could replace the inefficient recuperative unit, recuperative oxidizer exhaust heat could be recovered to supplement the paint process ovens, or implement a creative alternative solution.

After completing a cost benefit analysis of new replacement equipment vs. secondary heat recovery, the alternative and most beneficial solution existed at the end of the steel division's paint line, about 200 yards from the aluminum division. The steel division was equipped with a high-efficiency 40,000-SCFM Ecopure RL40 regenerative thermal oxidizer to treat emissions from a similar paint process as the aluminum division. The capacity utilization of the steel line RTO was only about 35 percent, requiring a nominal 14,000 SCFM of the available 40,000 SCFM. The plant originally expected the utilization of the unit to be greater, but various strategic changes to process formulations, environmental and air balance initiatives have kept the emission control volume of the steel line comparable to the aluminum lines.

The resulting strategy was to optimize the overall emission control scheme for both the aluminum and steel divisions, involving both reconditioning and relocation. The Ecopure RL40 from the steel line would be relocated to treat the combined emissions from both aluminum paint lines, the inefficient recuperative oxidizer would be removed from service, and the Ecopure RL15 would be relocated from the aluminum division to the steel paint line to be operated at about 93 percent of its capacity.

The standardized design of the Ecopure RL was extremely favorable to the project strategy since each system's general arrangement closely matched the other. In fact, the existing equipment foundations had both been reinforced to the extent that no changes were required at either site. During the relocation, both units were reconditioned according to Dürr preventive maintenance recommendations. The reconditioning was further simplified and expedited while the units were dismantled for relocation. CMWA handled utility infrastructure changes that were mitigated by the similarity in orientation between the two RTOs.

Most importantly, even with the combined emissions from both of the aluminum lines, there remains 40 percent spare capacity in the unit if future sources require controls.

The project was successfully executed from start to finish in a remarkably fast six-

week schedule from order receipt to completion. During the third week of the project, the CMWA process engineer and project leader Brent Hurley said: “I think the project is going exceedingly well. I could not be happier with Dürr’s site supervisors and subcontractors. They know exactly what they are doing, and they are able to keep me confident in the success of the project. We have been ahead of schedule virtually the whole time.”

An 80 percent reduction in fuel consumption was achieved with a natural gas reduction of 7.25 million BTUs per hour and a projected $427,000 per year savings based upon current fuel costs and production hours of operation.

The project moved forward quickly, in part, because the return on the project investment was less than twelve months.

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