Energy Use Reductions at the Ford Assembly Plants

DESCRIPTION OF THE OPPORTUNITY BEING ADDRESSED

As an environmental leader, Ford Motor Company continues to search for opportunities to reduce its environmental impact. One of the methods that has gained recent focus is the discovery of more energy efficient modes of operating pollution control equipment. Pollution control equipment is used extensively by assembly plants for the abatement of volatile organic compound (VOC) emissions, mainly subsequent to paint booth operations. It has been determined that approximately 70% of the total energy budget at Ford Motor Company's assembly plants is due to painting operations. A significant amount of this energy requirement is linked specifically to pollution control equipment.

Regenerative Thermal Oxidation

The greatest energy consumption associated with pollution prevention occurs in the large regenerative thermal oxidizers (RTOs), which are used to achieve thermal destruction of VOCs. How well the unit performs this function is called its destruction efficiency. Figure 1 outlines the flow of air through an RTO.

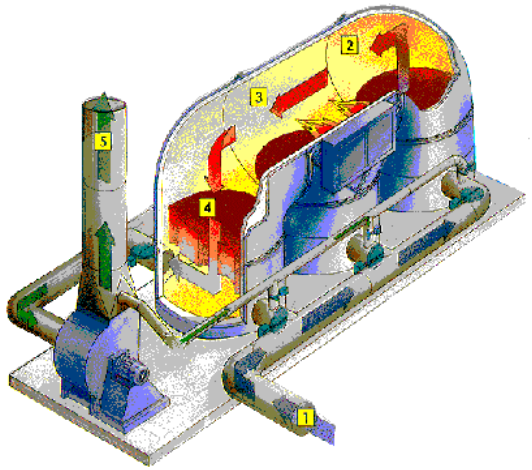

FIGURE 1. AIR FLOW THROUGH A REGENERATIVE THERMAL OXIDIZER

VOC-rich air from the emission source enters the system at Point 1. Before entering the RTO,

simple thermal oxidation involves significant energy savings mainly through the recovery of heat into the ceramic material instead of exhausting directly to the atmosphere.

DESCRIPTION OF THE IMPROVEMENT

In accordance with the ISO 14001 environmental management system standard, Ford Motor Company has committed itself to operate its facilities in a manner that minimizes their environmental impact. To assist in this endeavor, the corporate Environmental Quality Office completed an independent investigation to determine possible methods to achieve a reduction of energy consumption by RTOs. Intuitively, if these units are modified to operate at lower temperatures, significant energy consumption reduction and cost savings could be realized. Two aspects of this project were completed. The investigation was primarily focused on the manipulation of the Air-to-Fuel ratio (AF), present in the combustion chambers. Combustion within the RTOs was previously operated in the presence of 10% excess oxygen, leading to a cooling effect within the chamber due to the lower temperature of the incoming air. The conclusion was to maintain combustion at 10% excess natural gas, thus eliminating the lower temperature air from the process.

A secondary objective of the project focused on the maintenance access hatches located on each RTO. These hatches are bolted and sealed to prevent too much air from infiltrating, but a gap was purposely left to allow the passage of air around the doors to keep them cool in the event that they must be removed. However, it was discovered that the gap did not produce the desired effect. Therefore, as a means to reduce the amount of air infiltrating into the combustion chamber, the gaskets surrounding the hatches were replaced by tighter-fitting models and more bolts were added to seal the gap, leading to a resultant decrease in the amount of natural gas required to maintain operational temperature.

Ford Motor Company has recently issued a division-wide project for all assembly plants to complete these and similar measures to reduce energy consumption by increasing the efficiency of their RTOs. The results show a reduction in natural gas use as well as electrical energy use. Capital investment payback times for this project are approximately 4 months.

SUBSTANCE ADDRESSED: Natural Gas Usage

REDUCTION OBTAINED: 27% per unit

CAPITAL INVESTMENT: $160,000 division-wide

ANNUAL SAVINGS (ENERGY COSTS): $600,000 division-wide

ENVIRONMENTAL HIERARCHY LEVELS: