



## “Don’t Let Profits Go Up In Smoke”

### **Reducing Energy Consumption In Emission Control Systems Key To Increased Profitability**

In today’s competitive economy, few businesses have “money to burn.” However, for manufacturing companies that installed air pollution control systems more than 7 to 10 years ago, these older, less efficient systems could literally be “burning money” by operating inefficient electric motors and by allowing large amounts of useable heat energy to be vented directly out their exhaust stacks.

Historically, air pollution control systems had been designed using integrated air-to-air heat exchanger units ranging from 40% to 70% thermal efficiency. Therefore these older units capture and reuse only a portion of the heat that is required to thoroughly destroy the manufacturing facilities harmful air pollutants. To meet EPA pollutant destruction requirements, catalytic oxidizers typically operate at 650°F, while thermal oxidizers operate at temperatures ranging from 1,400°F to 1,800°F. Depending upon the air pollution control system design, exhaust stack temperatures can vary between 250°F and 1,500°F.

The heat required to operate these systems comes from very large natural gas fired burners. As the cost of energy continues to rise, the importance of operating an energy efficient system becomes a higher priority. Achieving higher thermal efficiency by design has been possible for many years; but it was typically considered to be cost prohibited as a capital purchase. However, a financial payback analysis now clearly favors a change. Advances in pollution control technologies have now made highly energy efficient systems practical.

### ***Save Money, Install a Modern System or Upgrade an Older Design***

Today’s modern air pollution control systems not only exceed all USEPA, state and local regulations by destroying in excess of 99+% of a facility’s air pollutants, but they are also extremely energy efficient. The energy efficiencies of air pollution control systems have risen dramatically in recent years. Using a low-pressure drop structured ceramic media for heat exchange, it is now possible to achieve as high as 97% thermal efficiency with a regenerative thermal oxidizer (RTO). Energy efficient natural gas fired burners, which achieve higher turndown rates, are also used to help reduce fuel consumption.



The use of premium efficient versus standard efficiency electric motors can also yield large electrical savings, especially if a facility operates on a 24/7 schedule. Incorporating an A.C. variable frequency drive unit to control and automatically vary supply fan motor speeds for volumetric control can also lower electrical consumption.

If a current air pollution control system does not have these features, an upgrade or retrofit can net large energy savings. An RTO that was originally equipped with random packed media beds can be upgraded to structured media beds. This both increases thermal efficiency for huge fuel savings and reduces the total system pressure drop, thus saving fan horsepower and ultimately electricity. Original fan motors can also be replaced with high efficiency models and a system with a volume control damper can be refitted with a variable frequency drive for more economical airflow control. Burners can also be replaced with new, lean burning high velocity models to improve turn down and temperature distribution.

Additionally, to help a manufacturing facility further reduce their energy costs and operate as efficiently as possible, almost any air pollution control systems can be equipped with secondary add-on devices which use the heat energy the system would typically exhaust directly to the atmosphere.

### ***Many Options For Use Of Recovered Heat***

A commonly used addition to capture heat from the exhaust stack is an air-to-air heat exchanger. It can be designed for minimal pressure drop so as not to affect the operation of the oxidizer and can return heated, clean filtered fresh air for a variety of uses. This heated fresh air can be used for warehouse or building comfort heating, process make-up air (ovens/dryers, kilns, curing zones, etc), or in some cases, can completely replace the natural gas fired burners presently used in the manufacturing process.

Using the same idea of capturing heat from the exhaust stream, a hot water or thermal oil heat transfer coil can be installed in the oxidizer exhaust stack. Hot water can again be used for building comfort heating or can be returned to the process for use (air preheat, condensation control, etc.) This coil could also be used as a preheat section to preheat cool water for a steam generator. Thermal oil could also be used as a main process heat source where direct flame heating is not desired. Adding a coil in the exhaust stream can reduce or even remove the heat load required from the thermal oil heating system.



Depending on the stack temperature, the exhaust from the oxidizer could be routed directly to a low-pressure steam generator. If the plant uses steam for any reason (carbon bed regeneration, humidity control, etc.), this system could supplement steam production capacity anytime the oxidizer is running. In an ideal situation, the steam produced from the oxidizer exhaust would allow the main steam generator to function as a back-up system.

Another option is to install an adsorption chiller in the exhaust stream. Many manufacturing facilities use chilled water for various reasons (air conditioning, chill rolls, condensers, etc.). While the initial capital cost is higher than a conventional chilled water system, the “free” energy (from the oxidizer exhaust) to run the system can make it an economical choice.

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In summary, as the cost of energy continues to rise, manufacturing facilities should consider all available options to help reduce the energy costs associated with operating their air pollution control systems. Retrofitting a secondary recovery system to an older air pollution control unit can generate significant energy savings, while replacing an older system with one of today's high efficiency systems can now offer a short-term payback on a company's capital investment. Either a retrofit or an upgrade to a new system could provide substantial operating savings and have a positive impact on a company's bottom line.