

Waste Heat Recovery From Catalytic Oxidizer Exhaust Commercial Bread Bakery in Pennsylvania

The Problem...

A commercial bread bakery located in Pennsylvania, faced with the reality of significantly increased natural gas prices, wanted to reclaim waste heat from the exhaust of the bakery's Catalytic Oxidation (CatOx) System. The CatOx, used to abate ethanol from the bakery oven exhaust, already uses an air to air heat exchanger to recover a significant portion of the heat generated within the catalyst bed during the oxidation of ethanol.

Secondary Heat Recovery, where additional heat or waste heat is recovered for use in the bakery, was desired. The recovered energy would then be used to provide heat to the bakery's proofer room. The problem of implementing an affordable and efficient heat recovery project was solved by CSM Worldwide, Inc

The Solution...

CSM Worldwide accomplished Secondary Heat Recovery by implementing a unique solution where a custom heat exchanger coil was bolted onto the CatOx exhaust flange just prior to the CatOx exhaust stack. The heat exchanger coil is directly exposed to the clean, hot air exhaust of the CatOx. The "waste heat" contained in this hot exhaust stream is recovered and transferred to a liquid glycol solution used as the heat transfer



medium. This hot glycol solution is then circulated to a "heat sink" at the bakery's proofer room within the bakery. Ultimately this recovered heat adds to that required for the proofer room.

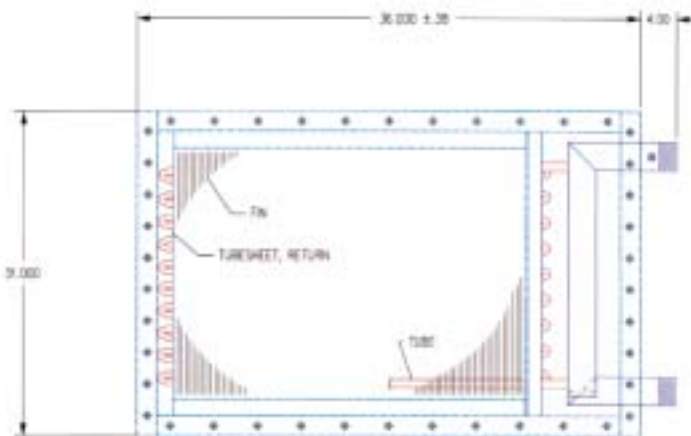
CSM's coil was designed to handle a 5000 SCFM oxidizer exhaust stream at a temperature exceeding 400°F and captured close to 1,000,000 BTU/hr of energy. After heat recovery, the exhaust stream is at a reduced temperature, but remains hot enough to avoid condensation. The heat exchanger coil, which uses a mixture of ethylene glycol and water for its heat transfer medium, is constructed of 304 SS while the fins of the fin-tubes are made of copper. Total pressure drop across the coil was kept very low at about 1.5 in. w.c. The coil is also designed for the unusual situation where the CatOx is operated without any glycol solution being circulated.

The Heat Recovery System

Controls:

The glycol solution temperature, maintained at 200°F, is controlled by a circulating pump and a 3-way solenoid valve.

In addition, the heat recovery system is equipped with an expansion tank to allow for thermal expansion of the transfer fluid.



Technical Specifications

Application: Waste Heat Recovery

Location: Commercial Bread Bakery in Pennsylvania

Heat Recovery: Glycol Heat Exchanger Coil

Heat Recovered: ~1,000,000 Btu/Hr

Heat Source: Clean Hot Exhaust of Catalytic Oxidizer

Heat Use: Bakery Proofer Room

Materials: Fin-Tube Coil - 304 Stainless Steel
Fins are Copper

Heat Transfer Fluid: Glycol Solution
50% Ethylene Glycol
in Water

Return on Investment: ROI < 1 Year!

Applicability: Available in the aftermarket
for oxidation systems of all
makes & models

Safeties:

Heat recovery system safeties include a level switch on the glycol solution, which monitors the glycol level in the system's expansion tank. A low glycol level in the expansion tank indicates a possible glycol leak and results in a signal to a 3-way solenoid valve to release the glycol mixture from the coil. The same switch will also signal the glycol circulation pump to power down.

An additional safety is a temperature switch that will release the glycol and disengage the pump if the temperature of the glycol becomes too hot. The purpose of this safety is to prohibit the glycol from vaporizing inside the coil.

If the glycol mixture is released from the heat exchanger coil, it is drained into a catch barrel and can be put back into the system through the expansion tank.

The Result...

CSM Worldwide implemented a cost effective, heat recovery solution that presented their bakery customer with a reliable way to reclaim waste heat, save energy within the bakery, reduce their monthly consumption of natural gas, save

significant dollars and achieve a Return on Investment (ROI) of less than 1 year!

An already efficient Catalytic Oxidation System, that used little or no natural gas to operate, was able to provide surplus heat to another portion of the bakery - the proofer room.

Even as natural gas prices continue to soar, CSM Worldwide takes on the responsibility to help customers optimize their process and plants. Today, Energy Conservation - Energy Recovery - it's everyone's responsibility - it's the American Way!

For More Information...

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