

## How to Destroy a Boiler Stack Economizer

Boiler stack economizers are an excellent investment to retain dollars spent on fuel that would otherwise go out the chimney. But like a lot of equipment, if it is installed without proper forethought or if it is operated improperly. . .

. . . . they will fail

There are three primary means that can be used to destroy an economizer. But there are ways to prevent the occurrence of each.

**Internal destruction:** put water with a good deal of dissolved oxygen in the unit.

Heating the water will liberate oxygen, turn to an acid, and eat the metal.

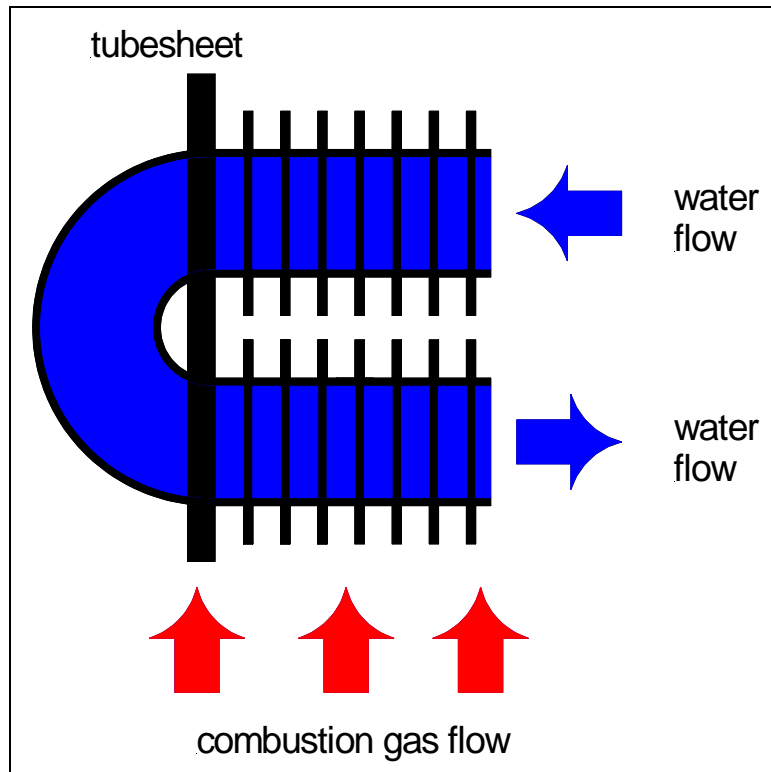
**Prevention:**

Make certain that the deaerator is functioning properly. Deaerators require pressure to drive out the oxygen. Deaerators need to be maintained at the saturation temperature for the operating pressure. If the unit is designed to operate at 5 psig, then the water storage portion of the unit should be at 227 degrees. There needs to be oxygen scavenging chemicals put into a deaerator, even with a perfectly working unit. The "residual" amount of oxygen scavenger should be regularly monitored and adjusted. If any of these factors is not proper then there is a chance that dissolved oxygen is trying to eat the economizer.

**External destruction:** put water in the unit that will make the economizer be a gas condenser.

In that way constituents in the flue gas can condense and concentrate on the carbon steel tubes and eat the metal.

Following is a sketch of an economizer tube.



The metal temperature of a fin and the finned portions of a tube are higher than the bare portion of the heat exchanger. Therefore the coldest area of the economizer will be the bare tube portions containing the coldest water. There is a tubesheet / tube support that is not gas tight, so gas enters but at a slow velocity. In that area there will be condensation *if the water temperature is below the dew point* but very little "scrubbing" so that acid can concentrate and corrode the steel.

#### Prevention:

If the constituents in the flue gas that cause corrosion when they condense are maintained at temperature above their dew point. . . . they cannot condense and cause corrosion.

Feedwater heat exchangers are utilized to accomplish that using steam from the boiler. That may sound like a loss of energy but each BTU used from the boiler goes back into the boiler so that the boiler capacity is not reduced at all. Various fuels have different constituents with the potential to be corrosive at unique feedwater temperatures. #2 fuel oil has a different "danger" temperature than does natural gas and so on. Controls can be

utilized which control the feedwater temperature to a safe temperature depending upon the fuel.

**Freezing destruction:** Let the boiler room be at a negative pressure and do not allow the water to circulate with the boiler off.

Then a negative pressure in the boiler room can induce air below 32 degrees to pass through the economizer to freeze the water and split the tubes.

#### **Prevention:**

Maintaining a slight positive pressure in the boiler room eliminates the downdraft that can cause freezing. Note that downdrafts leading to freeze-ups are not just a potential problem – the boiler itself will freeze given enough time.

Installing a bypass valve that will allow for water to circulate back to the boiler feed tank or deaerator if the pump is turned on will prevent this. Timers or temperature switches are also necessary.

Installing a very small pump that will circulate water back to the boiler feed tank or deaerator is also a workable preventative measure.

#### **Summary:**

It is quite a simple matter to turn a good investment into a loser but there are simple steps that can be taken as insurance for gain.