Leslie Heaters with Pre-Heating Economizer...

by: Alex Luciani, Product Manager, Leslie Controls, Inc.

ECONOSteam™ It is our intent to show how Leslie Controls' Constantemp heaters with Economizers are key components for efficiency improvements based on heat recovered, measured in BTU/hr, from the hot waste condensate, which is then converted into pounds per hour of steam and dollar savings. Leslie Control's goal is to increase the efficiency of our customer's Heating System by recovering energy from one fluid (hot condensate) and transfer it to the other (cold water) while in so doing avoiding waste of energy going down the drain.

In our example, using a 90 gpm Econosteam™, The addition of a pre-heating economizer to utilize hot condensate will raise a fraction of the 90 gpm of cold water by 19 deg F Delta T: about a half of the flow directed through the economizer, while the other half is supplied to the main blending valve.

How it affects steam consumption when compared with standard heaters:

The Hot Condensate is the heat source and at 7.5 gpm or 3735#/hr of mass flow, we can make it work in our favor and turn the heater into a profit center instead of just a first cost burden.

Assuming we are operating at 50% capacity, (actual capacity will dictate the real saving amount), with Leslie Controls' Econosteam™, we can drop 190F to 61F of condensate temperature, making available a saving budget of 482K btu/hr. Recovering this heat saves the building the need of using a potential 482 lbm of steam per hour.

This can be translated into dollars and cents with the following comparison:

482 lbm/hr x $25/1000 lbm of steam (current steam rate) = $15.00 /hr
or
$145/day per each heater

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How it works:

The principle upon which this energy-recovery system works is based on the conservation of energy based on:

(1) Energy = Delta T* flow rate * specific heat of water

Now, the question is, how much energy can we recover from the hot condensate?

At full load, the Econosteam™ discharges about 9.0 gpm MAX of hot condensate (your energy source). In our example, we use only 7.5 gpm hot condensate @ ~190F and 3735 lbm/hr, so that we can demonstrate with a conservative approach how much energy is recoverable.

When we apply (1) we find out that we have a potential saving budget of 482 btu/hr to transfer to the cold side.

Considering we selected 45 gpm of cold water passing through the economizer, based on conservation of energy principle, we can solve the one unknown variable equation (in the cold side, the unknown is the Delta T) and we can find out the maximum Delta T. Considering the savings energy is fixed (482K Btu/hr) then we have a range of combination of Delta T and flow rates matching the energy available that will work for our savings.

In our selection we are limited though on how high that Delta T on the cold side can be, because the cold temperature water outlet cannot be higher than the hot condensate temperature inlet.

We can now compare the flows used to recover the heat and find out the percentage of Hot-to-Cold flow rates via a temperature-ratio analysis:

(2) % pre-heated water = (Tf-Tc)/(Th-Tc)
Where Tf=setpoint 120F,
Th= hot condensate temp 190F, Tc=cold water 50F

Solving this equation we find out that preheated water is ~ 50% of 90 gpm of entire water flow = 45 gpm.

Our work shows hitting the calculation flow up to 45 GPM going through the economizer. Because the heat input is fixed, if there is a difference between actual and calculated flow, it will be made-up into the delta T, which will adjust accordingly. This reflects a conservative heat budget coming from the 7.5 gpm of hot condensate that can be completely transferred onto the cold water side, thus saving the equivalent in heat input to the building by reducing incoming steam requirement.

By applying these findings Leslie Controls is capable of matching the right heater to any application today on the market.

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