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Energy Calculations for Return Condensate

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Returning condensate to the boiler operation is great step toward improving energy efficiency. But how do you know if the costs are justified? An example can demonstrate the process. Table 1 shows the operating criteria for a typical operating steam system.

For the purposes of this example, assume no condensate returned to the boiler plant. In that case:

- $(h_c - h_m)$ = Energy Loss per Pound

  (180.33 - 23) = 157.33 BTU/lb Energy Loss per Pound

- 44,000 lbs of steam = 44,000 lbs of condensate (90 percent Return) = 39,600 lb
- 39,600 lb x 157.33 (BTU/lb) = 6,230,268 BTU
- 6.230268 x $15.30 = $95.32 per hour
- $95.32 x 8,760 (hours/year) = $835,003.20 per year

The potential savings of $835,003.20 per year is based on the amount of energy required to elevate the makeup water of energy content (sensible energy) to that energy level of condensate being returned in a gravity-designed condensate system. The calculation does not take into account the savings from chemicals, water and sewer costs. It also does not consider the negative effect of bringing back the condensate at higher pressures, resulting in greater savings.

The above is calculated with no condensate being returned to the boiler, but most industrial plants are returning at least a small percentage of condensate. Each plant should evaluate the cost of failing to return condensate and set forth a roadmap for returning condensate.

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