EnviroAqua CONSULTANTS INC.

Water Talk

Volume 8,Issue 1 *January, 2008*

Energy Conservation, Steam Trap Maintenance and Internal Water Treatment

In an overall study of energy conservation in the steam cycle, certain maintenance practices should not be overlooked. Of particular importance is the regular inspection and maintenance of steam traps. Proper internal treatment to prevent deposits and corrosion can also contribute to energy savings.

Stream Trap Maintenance

The purpose of a steam trap is to remove condensate, air and carbon dioxide from steam heated equipment as rapidly as possible, while not permitting the escape of live steam. Condensate that is not drained fast enough reduces the physical size and capacity of the equipment. It must be removed promptly in order that the equipment can be kept full of steam. If air is present it will reduce efficiency. For example, steam at 100 psig will have a temperature of 338°F. If air were to accumulate to the extent that if occupied 10% of the space in heat transfer equipment, the temperature would be reduced to 330°F.

At the same time, the trap must not waste steam. Traps which blow steam can significantly reduce overall steam plant efficiency. This is illustrated in Table 1, Cost of various sized steam leaks at 100 psig ($5.00 per 1,000 lbs. steam cost).

Orifice Diameter	Lbs. Steam wasted per month	Total Cost per year
½"	607,680	$ 36,461
3/8"	342,000	$ 20,520
¼"	151,920	$ 9,115
1/8"	38,016	$ 2,281

For maximum energy utilization, a regular schedule should be set up for testing of traps and preventive maintenance. Frequency of testing should be determined primarily by the size and operating pressure of each trap. Several test methods are available and the choice depends upon the time available, trap design and other factors. Consult your steam trap supplier for recommendation covering your particular operation.

Internal Chemical Treatment

Full utilization of fuel heating value can be aided by chemical treatment in several ways. Boiler internal surfaces must be kept clean. Deposits on these surfaces will impede heat transfer. Deposits due to hardness precipitation (the typical calcium carbonate or calcium phosphate scales) can best be prevented by a combination of external treatment to reduce feed water hardness together with properly applied internal scale control treatments. The internal treatment may vary depending on the pretreatment and the boiler pressure. Low pressure boilers (<300 psig) typically are treated with an all organic program with the emphasis on scale inhibition, crystal modification and dispersancy. Intermediate pressure boilers (300-1000 psig) may use an all organic, chelant, phosphate/dispersant or coordinated phosphate/pH control or congruent phosphate/pH control program.

A water softener is the preferred pretreatment for low pressure and demineralized water for intermediate to high pressure boilers. A familiarity with those operations and closely monitoring their

operational performance is essential for optimum results.

Dissolved oxygen and carbon dioxide, if present in the steam can cause rapid corrosion of condensate lines, trap internals and other related equipment. Dearate the feed water and supplement with a chemical oxygen scavenger to remove oxygen. Control carbon dioxide with the use of neutralizing or filming amines.

In some cases, it may be economical to dealkalize the feed water, thus removing or reducing the source of carbon dioxide, by controlling corrosion of the condensate return system, plant efficiency can be increased because the condensate flow is less likely to be interrupted and also, steam trap life can be extended.

Regardless of the type of treatment employed, it is extremely important to set up a regular schedule of treatment feed and water testing. If an external treatment system is in use, the effluent from this equipment should also be tested regularly to ensure consistent feed water quality.

Energy Savings Checklist

Use the following checklist to review your plant operation.

1. Improve feed water quality.
    a. Pre-treat the make-up to remove impurities which severely limit feed water concentrations.
    b. Return all possible condensate.
2. Maintain consistent blow down control
    a. Install automatic blow down controllers.
3. Consider the economics of blow down heat recovery.
4. Establish a regular schedule for steam trap inspection.
5. Ensure boiler internal cleanliness.
    a. Maintain pretreatment equipment is in perfect operating condition.
    b. Pay close attention to internal treatment applications and control testing.