



# Energy Efficiency Opportunities With Steam Systems



**National Grid Training**  
**March 10, 2009**

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## Terms Used With Steam

**BHP - Boiler Horse Power - 1 boiler horse power is approximately 42,000 BTUs of INPUT**

**Lbs/hr – (Pounds of Steam per Hour) - 1 pound of steam is about 1,200 BTUs of INPUT fuel, and about 1,000 BTUs at the point of use, depending on the pressure of the steam**

**PSI – pounds per square inch of pressure – Low pressure steam is considered to be up to 15 psi; high is generally 100 psi and higher.**

**Smaller boilers are generally rated in horse power; larger are generally rated in thousands of pounds of steam (500 hp and under will typically be rated in hp)**

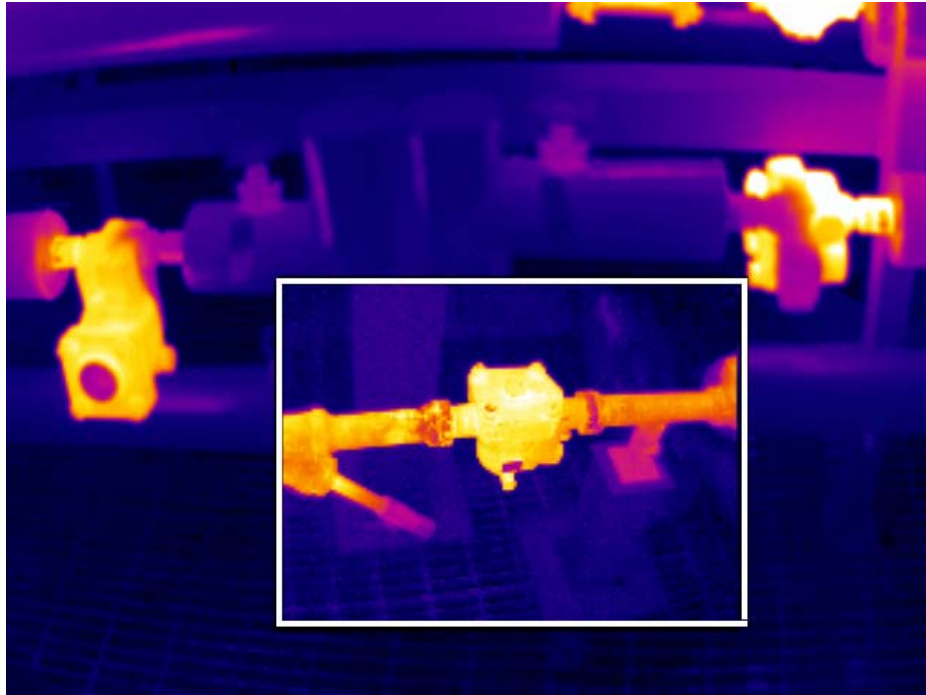


# Popular Energy Efficiency Measures For Steam Plants

## Steam ECM's

- Steam Trap Audits & Maintenance
- Blow Down Heat Exchangers
- Combustion Controls
- Boiler Stack Economizer
- Lower Steam Pressure
- Back Pressure Turbines for CHP

# Steam Trap Audits

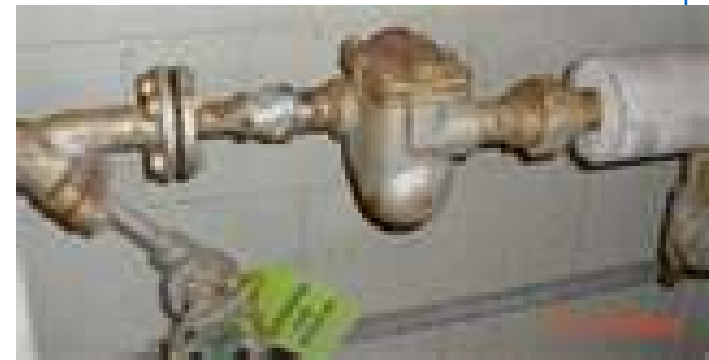
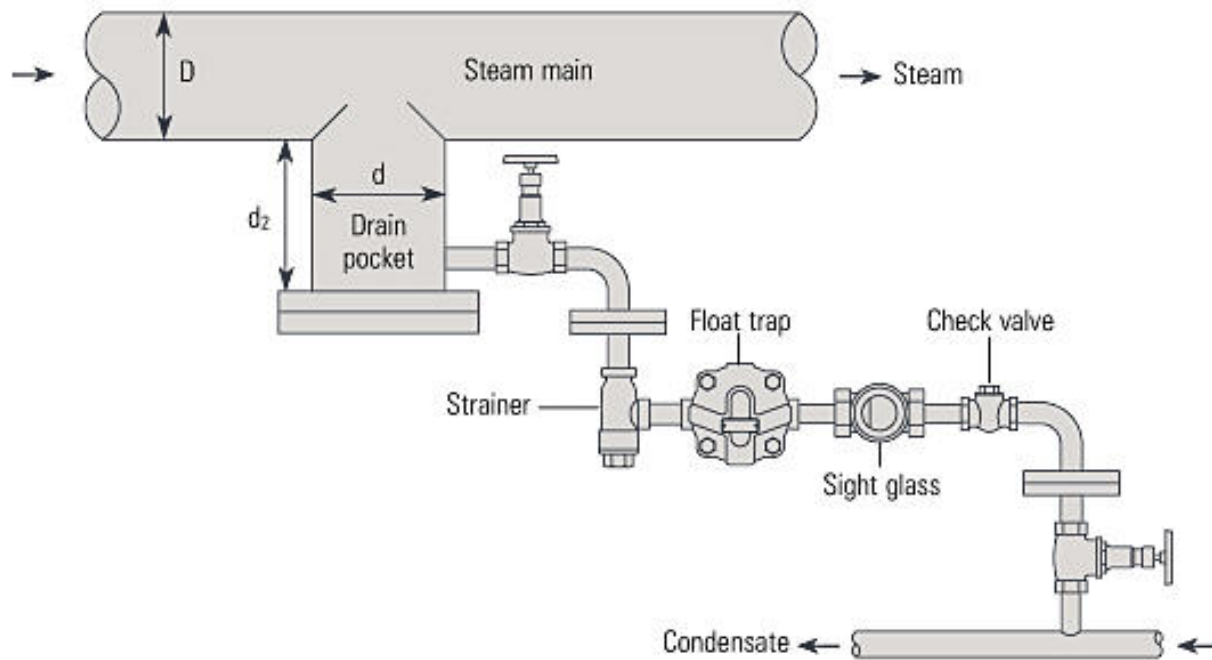


DOE research has found “in steam systems that have not been maintained for 3 to 5 years, between 15% to 30% of the installed steam traps may have failed”

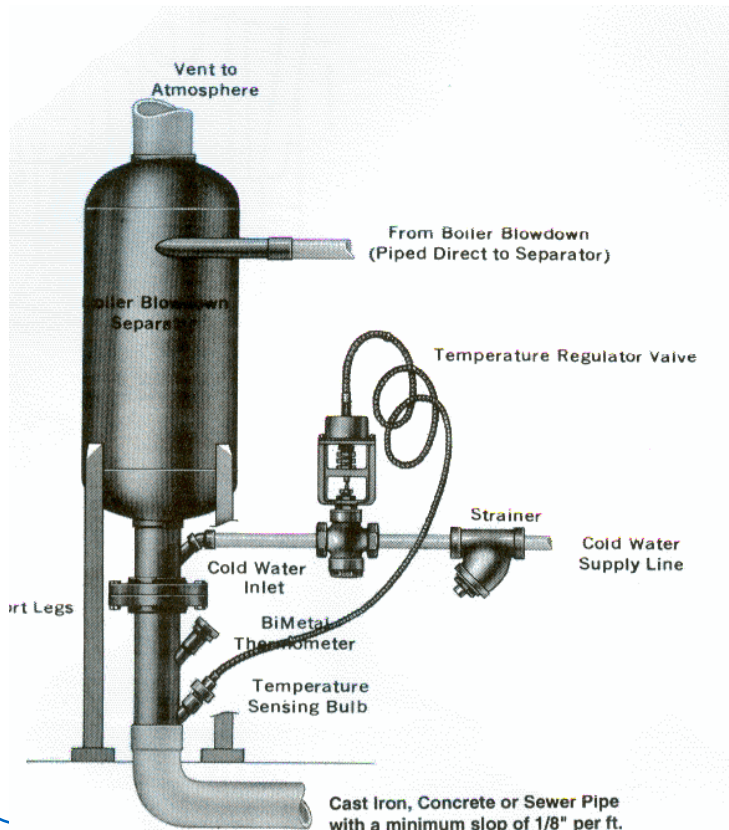
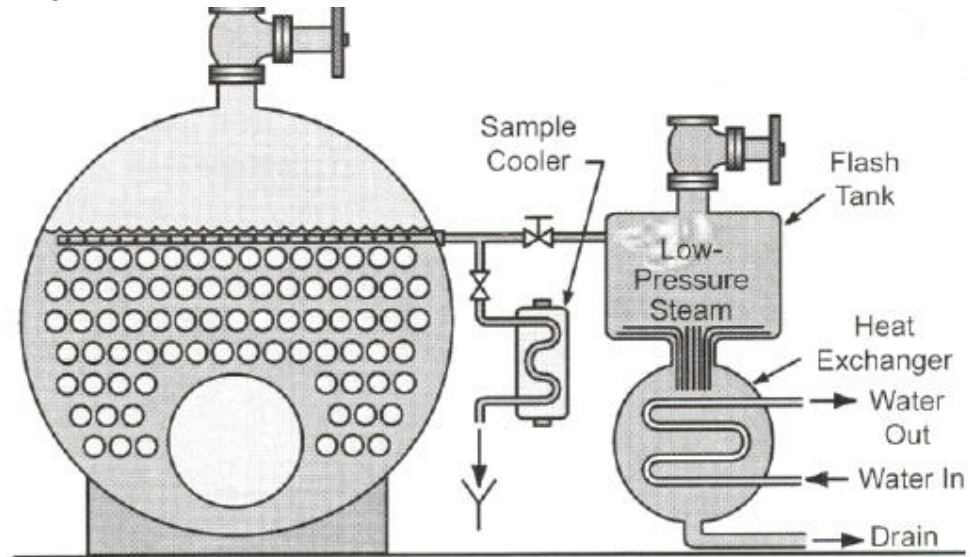
These failures allow live steam to escape into the condensate return system. Steam in condensate loops causes overheating in adjacent rooms.

In a recent steam trap audit of a RI school, we found that 54% of the facilities steam traps were leaking or blowing by. The payback to install all the measures was under a year.

# Steam Traps Continued



# Blow Down Heat Recovery



Blowdown rates typically range from 4% to 8% of total steam generated, but can be as high as 10% where incoming water has high solids content. For example, if a 150 psig saturated steam boiler generates 10,000 lbs/hr of steam and has a blowdown rate of 10%, the heat recovery potential is ~220,000 Btu/hr. At a fuel cost of \$12 per million Btu and 80% combustion efficiency, an annual savings of about \$25,200 could be achieved.

# Combustion Controls



Traditional firetube and watertube boilers have had linkage driven combustion controls. Newer controls like parallel positioning and O<sub>2</sub> trim have brought us closer to stoichiometric (perfect) combustion throughout the firing rate of our larger gas and oil fired boilers.

Parallel Positioning is when the linkages are removed and replaced with servo motors along with a new combustion controller to insure repeatability along the entire firing range of the boiler.

O<sub>2</sub> trim controls is when a O<sub>2</sub> sensor is installed in the stack of the boiler to provide a feedback mechanism on the air/fuel ratio of the burner.

While your at it, maybe a VFD on your forced draft fan?

# Boiler Stack Economizer

- **Flue gases from large boilers are typically 450 - 650° F. Stack Economizers recover some of this heat for pre-heating water. The water is most often used for boiler make-up water or some other need that coincides with boiler operation.**
- **The savings potential is based on the existing stack temperature, the volume of make-up water needed, and the hours of operation. Economizers are available in a wide range of sizes, from small coil-like units to very large waste heat recovery boilers.**



# Other Measures

Back Pressure Turbines for CHP

**Lower Your Steam Pressure**

**Flash Steam Heat Exchangers**

**Insulation**