ADVANTAGES OF RETURNING CONDENSATE TO THE BOILER OPERATION

>> Steam Best Practices

Sheet 1

CONDENSATE – THE NATURAL RESULT OF BOILER OPERATION

When steam is supplied to a process application as in a heat exchanger or coil, the steam vapor releases latent energy to the process fluid and then condenses to a liquid better known as condensate. The condensate is comprised of water from the original steam as well boiler treatment chemicals, and while it cannot be used directly in boiler operation, condensate still contains sensible energy from the condensed steam vapor as well as energy transferred during the boiler combustion process. In fact, up to 16% of the total energy in the steam vapor is contained in the condensate.

INCREASED COST OF CONDENSATE WASTE

Two paths can be taken when condensate is produced during boiler operation: the condensate can be returned to the boiler and recycled, or it can be dumped and replaced. With the rising cost of fuel in the economy, it is most cost-effective to recover condensate wherever possible in industrial steam operations. However, a surprisingly large percentage of industrial plants waste condensate by replacing it with raw, untreated water that requires energy input and chemical treatment to prepare for boiler preparation. Still others are wasting condensate by returning it to the boiler through uninsulated tanks, pipes, valves, and fittings – allowing for excessive losses in thermal energy.

REDUCING COSTS THROUGH CONDENSATE RETURN

A significant amount of savings can be achieved by returning condensate instead of replacing it with raw, untreated water. A few areas where costs are cut—and even eliminated—are summarized below:

- **Make-up water**
  Water costs are on the rise across the country. Returning any percentage of condensate reduces the need for make-up water, and thus reduces the overall cost of make-up water.
- **Water Treatment chemicals**
  By reducing the amount of make-up water required for boiler operation, the amount of chemicals needed to treat the water is also reduced—a positive step in a cost-reduction effort.
- **Sewer system deposits**
  Condensate that is not being returned to the boiler is drained to the sewer, driving sewer system costs up. Further, environmental regulations may require that water be treated before it is disposed. Returning condensate to the boiler reduces waste to the sewer, thereby reducing sewer system costs.
- **Condensate system maintenance**
  Even plants that return condensate to the boiler incur unnecessary costs through improper maintenance of the condensate return system. Selecting the appropriate materials and implementing corrosion and insulation safeguards will reduce thermal energy losses and system damage—critical components of keeping costs low.

KEYS TO AN EFFICIENT CONDENSATE RETURN SYSTEM

An achievable return in industrial applications is 90% of the condensate formed in process (the exception being plants with requirements of direct steam injection for process applications). In order to accomplish such a high return, plant managers must mitigate the potential issues that can arise in returning condensate to boiler operations.

- **Condensate pumps**
  In selecting a condensate pump, it is important to select one with an appropriate net positive suction head (NPSH). Common pumps are only appropriate at condensate temperatures less than 200oF, which condensate in most industrial applications reaches temperatures close to atmospheric saturation temperature at 212oF. Without the right NPSH, pumps may show signs of cavitation and damage in a short period of time.

- **Steam traps**
  Most steam trap systems have drain valves that open to vent condensate from the process, allowing for proper operational temperatures to be achieved. Steam traps are susceptible to malfunction when they are under sized or improperly installed, causing the condensate to be lost to the sewer.
- **Condensate line pipes**
  Carbonic acid is a natural result of excessive carbon dioxide in the condensate system, a substance that will lead to corrosion in steel pipes and threaded fittings. Making the switch to stainless steel fittings without threaded connectors will slow the effects of corrosion and improve the lift of the condensate return system.
- **Condensate system insulation**
  Insulation is the most common means of protecting the condensate return system from unnecessary thermal losses as well as plant personnel from burns and injury. Everything over 120°F in the condensate system—lines, tanks, valves, and some steam traps—should be insulated.
- **Leaks**
  It is common for malfunctioning components in the steam and condensate system to leak, contributing to a loss of condensate and increased costs. Plant personnel must implement a means of inspecting for leaks and mitigating such problems when they arise.

ABOUT US

Inveno personnel are experts in the field of steam and condensate systems engineering with vast real-world experience and highly recognized professionals in the industrial arena. Our services include design, engineering, requests for quotations, standard operating procedures, root cause analysis, system optimization, steam balancing and project management. Inveno can review your entire steam and condensate system from steam generation to distribution to end user processes and condensate recovery.