



Tech Sheet #101

Heat Exchange Institute

1300 Sumner Avenue • Cleveland, Ohio 44115-2851 • 216-241-7333 • Fax: 216-241-0105 • www.heatexchange.org

OPERATIONAL ALERT: STEAM DUMPS

The ability to by-pass steam around the steam turbine, and to dump it directly into the surface condenser, is a fundamental design requirement of both nuclear and fossil plants. While each HEI surface condenser member has utilized somewhat different design philosophies, very few, if any, problems have been reported during by-pass operation in fossil and nuclear operation.

Recently however, there have been a spate of problems reported during steam by-pass operation of combined cycle plants, mostly during initial start up.

The rapid growth in the Combined Cycle Power Plant market has resulted in an unusually high number of start ups in a very concentrated time period. It has become apparent that the method of plant operation has resulted in the steam by-pass operation being the fundamental design criteria for a surface condenser in combined cycle service. The design and lay-out of the condenser neck, support plate spacing, etc, are no longer dictated by normal operation but by the steam dump conditions, based upon highly increased steam flows, pressures and temperatures, often projected over a smaller footprint on the condenser tube bundles.

It is not possible to introduce the high pressure/temperature by-pass steam directly into the condenser. Typically the pressure and temperature are reduced by a pressure reducing station with water injection located sufficiently far from the condenser to ensure proper mixing. To minimize the potential for overheating the turbine, a condensate spray is incorporated into the condenser neck between the steam header and the steam turbine.

An important part of the design of the steam by-pass is to determine the amount of attemperation water required for the pressure reducing station and neck spray.

Several problems, resulting in tube failures, have been reported during start up that are not isolated to a particular plant design, steam turbine or surface condenser supplier.

While each failure may be the result of unique circumstances, **the majority of these failures are believed to result from the use of excessive water flow to the by-pass steam and neck spray**, resulting in erosion of the condenser structure and tubes and tube vibration failures. Often such failures are reported after only a few hours of operation.

It is therefore the recommendation of the HEI that particular attention be paid to the proper setting of Instrumentation and Controls of the steam by-pass and neck spray systems.

This Tech Sheet was developed by the members of the Heat Exchange Institute's (HEI) Condenser Section. HEI is a trade association comprising the leading manufacturers of heat exchange and vacuum equipment. HEI Tech Sheets are information tools and should not be used as substitutes for instructions from individual manufacturers. Always consult with individual manufacturers for specific instructions regarding their equipment.