# Reheaters: Out-Of-Service Corrosion

## Purpose

Advise Customers of the potential for out-of-service corrosion damage in reheaters, which may cause forced outages and reduced reliability.

## Problem

Out-of-service corrosion can take place in almost any circuit of a boiler. Since the reheater operates at a lower pressure, reheater tubes typically have thinner walls, so any wall loss due to corrosion has a greater impact on the integrity of the reheater tubing.

Out-of-service internal corrosion damage is usually caused by dissolved oxygen pitting, and is a very common problem in reheaters. When a boiler is taken out of service, and as it cools, condensate can form and accumulate in the low areas of horizontal tubing. Many horizontal tube sections are non-drainable due to arrangement or tube sag between supports. Condensate can also form in any other low spot, such as in the bottom bends of pendant tubing. Corrosion damage, due to dissolved oxygen attack, can occur on any wetted internal tube surface. However, it is usually more severe at the water-air interface areas. The corrosion will be in the form of pits of various depths (see Figure 1). This internal corrosion or pitting will eventually result in pin hole leaks.

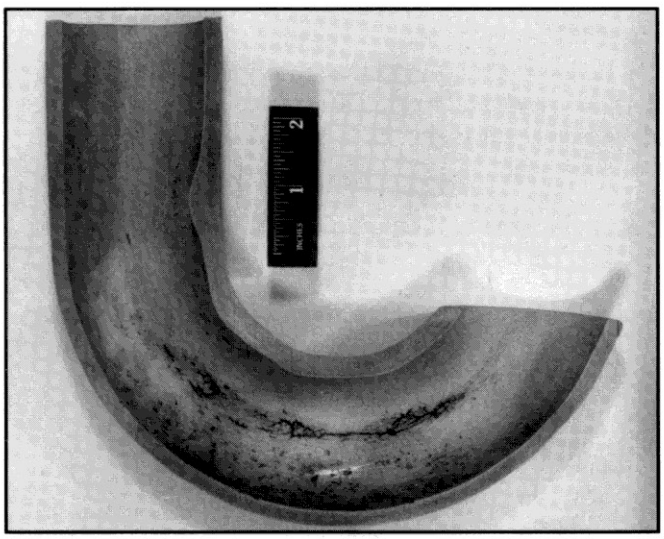

**Figure 1** *Tube cross-section showing typical out-of-service corrosion.*

Since reheaters are not normally hydrostatically tested, these small leaks from out-of-service corrosion are often not detected. These small leaks, however, can cause many outages and severe availability losses, because they can cause additional leaks by steam impinging on adjacent tubing.

## Recommendations:

Increased reheater reliability can be attained as follows:

1. Visually inspect and ultrasonic test (UT) as much of the horizontal portion and bottoms of pendant loops of reheater tubes as possible by scanning (see Figure 2). Due to space limitations and access problems, it often is not possible to accomplish detailed inspections, or to obtain UT readings of other than the leading or trailing tubes in each bank. Radiography of suspect areas is sometimes effective in indicating major corrosion damage. Cutting suspect tubes for an internal visual inspection and remote instrument analysis is more accurate. *(Continued on reverse side)*

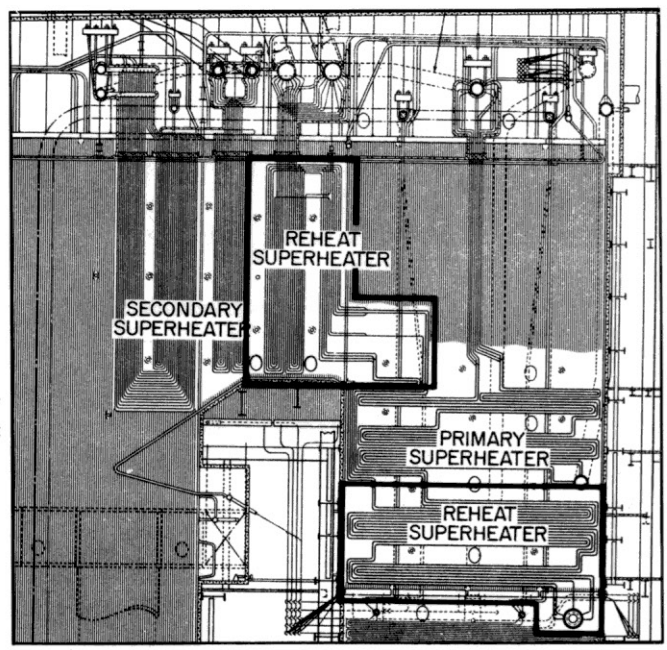


**Figure 2** *Typical location.*

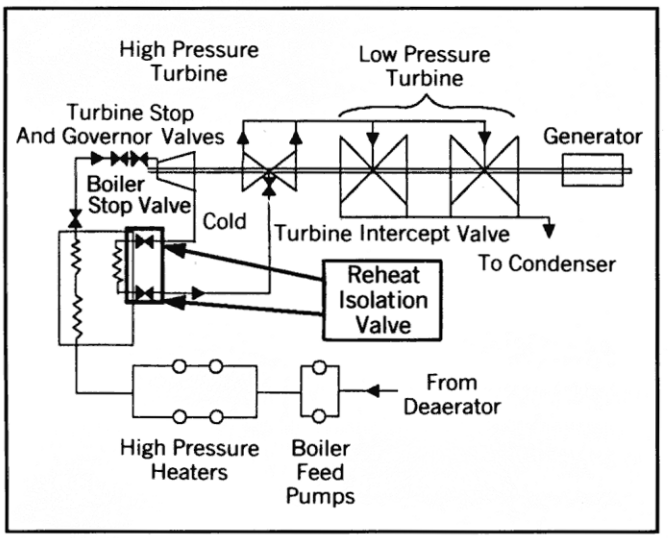


**Figure 3** *Typical location of reheater isolation valves.*

2. The best way to prevent dissolved oxygen out-of service corrosion damage is to prevent oxygen from entering the reheater tubing. Provide a means to isolate the reheater and to apply a nitrogen blanket when the unit is out of service (see Figure 3).
3. If the reheater is not equipped for the nitrogen blanket application, open reheater vents and pull a vacuum on the condenser for as long as possible, while the unit is still hot and being shut down, to help the reheater dry out. This procedure will minimize condensate accumulation.
4. Modify the storage procedures during lengthy outages to include one of the following methods:
   a. Wet storage with $O_2$ scavenging *
   b. Nitrogen blanketing

   Freeze protection must be considered during winter months.
5. Hydrostatically test for leaks. Make provisions to enable hydrostatic testing of the reheater during annual outages. These should include:
   a. Locating the reheater isolation valves as close as possible to the boiler, to reduce the volume and concern for pinning the reheater piping hangers. The pinning of the spring hangers for the hydrostatic test must be reviewed with the boiler and piping manufacturer.
   b. Maintaining proper temperatures when filling the reheater. The hydrostatic test water temperature should be within 150° F of metal temperature to reduce thermal shocking. When applying the hydrostatic test pressure, the reheater metal and water temperature must both be at least 70° F.
   c. Requiring a proper boiling out of a non-drainable section after a hydrostatic test or wet storage.
6. For early detection of small leaks, consider installation of a reliable on line acoustic leak detection system.
   a. Pull a vacuum on the reheater and listen for leaks with an acoustic leak detection system.
7. Redesign of the horizontal surfaces for adequate drainage, or pressure part material upgrades should be considered when replacement becomes necessary.

## Support:

If you have any questions, require more information, or need assistance for these inspections, please contact Babcock & Wilcox Field Service Engineering

*Items 5a through 5c also apply to 4a.

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