

5 COMMON STEAM BOILER SYSTEM FAILURES

WHAT TO LOOK FOR, WHERE THEY OCCUR AND HOW TO ADDRESS THEM.

Steam boiler systems depend on both mechanical performance and proper water chemistry. When either side is out of balance, reliability can suffer and equipment damage can follow. Many waterside failures show warning signs before they become major problems. This guide highlights five common causes of waterside boiler failure, along with photos and descriptions to help identify what may be happening inside the system.

01 Oxygen Pitting Corrosion



Appearance: Deep, defined pits in metal surfaces, sometimes covered by corrosion deposits.

Location: Boiler tubes, deaerators, feedwater tanks and lines, economizers, and condensate systems.

Causes: Poor oxygen removal, oxygen entering offline equipment, or cold makeup water mixing with hot condensate.

Corrective Actions: Verify deaerator operation and venting, maintain proper oxygen scavenger treatment, and store offline boilers correctly.

02 Carbonic Acid Attack



Appearance: Thinning or grooving in heat exchangers and condensate piping, often first seen at leaking threaded joints.

Location: Steam distribution and condensate return lines.

Causes: Carbon dioxide from makeup water alkalinity can travel with steam and form corrosive carbonic acid in the condensate.

Corrective Actions: Lower feedwater alkalinity, keep open feedwater tanks above 170°F, maintain proper venting, and use appropriate condensate treatment.

03 Overheated Tubes



Appearance: Thick-lipped failures have rough, heavy edges; thin-lipped failures show smooth, knife-like edges.

Location: Economizer and boiler tubes.

Causes: Long-term overheating from firing issues, flame impingement, or scale; short-term overheating from blocked flow or low-water conditions.

Corrective Actions: Maintain proper water chemistry, control scale buildup, verify burner alignment, and ensure correct boiler operation.

04 Cavitation



Appearance: Deep, localized circular pits caused by aggressive metal erosion.

Location: Most often found in feedwater pumps, but also in condensate pumps, steam traps, and blowdown piping or valves.

Causes: Rapid pressure changes can form and collapse vapor bubbles, while turbulent flow can make the damage worse.

Corrective Actions: Improve pump conditions by reducing feedwater temperature, increasing suction head, minimizing turbulence and pressure swings, or adding a slip stream where appropriate.

05 Boiler Sight Glass Failure



Appearance: Gradual thinning or grooving on the inside of the glass.

Location: Boiler sight glass.

Causes: Leaking gaskets, excessive condensation, or hot condensate that gradually attacks the glass.

Corrective Actions: Repair leaking gaskets and install a mica shield to protect the glass and reduce excessive condensation.

Protect your steam system before damage becomes downtime.

SPEAK TO AN EXPERT:

(514) 333-5340

| info@prestonhipps.com

| prestonhipps.com