

## **Hot Water Boilers - Avoiding Thermal Shock**

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I am often asked by engineering firms to help them on hot water system designs, especially regarding thermal shock. Unfortunately, often the help requested is after a problem has been realized. Thermal shock is a situation where the water in a boiler is suddenly displaced by water with substantially different temperatures. It causes rapid expansion or contraction of tubes, boiler plate, pipes, valves and fittings and is not good for the boiler or piping system. The end result will be leaking tubes, cracked pressure vessels, cracked cast iron sections, and a host of other problems.

To prevent problems I remind people that large industrial boilers are not household boilers that typically do start and stop the circulating pump. I suggest primary-secondary systems when possible. If the pump needs to be cycled, I recommend temperature sensors and control strategies to prevent it from sending water at drastically different temperature to the boiler. Slow start up can be done with small start up pumps, V.F.D. ramp up control or very slow control valves. I suggest starting the pump before the boiler, running the pump for some time after the boiler is shut off and always having flow when the unit is running. Use blend pumps to temper the return water when needed. Watch out for control or isolation valves, they need to be slow opening. You should hold the boiler in low fire for gradual warm up and use relays to force it to low fire before shutdown.

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