

What's wrong with 1" tube steam boilers?

We sell a lot of tubes for Bryan steam boilers. All of them are 1" diameter tubes. We never sell tubes for their RV or RW series boilers that use 1-1/2" tubes.

Why is that?

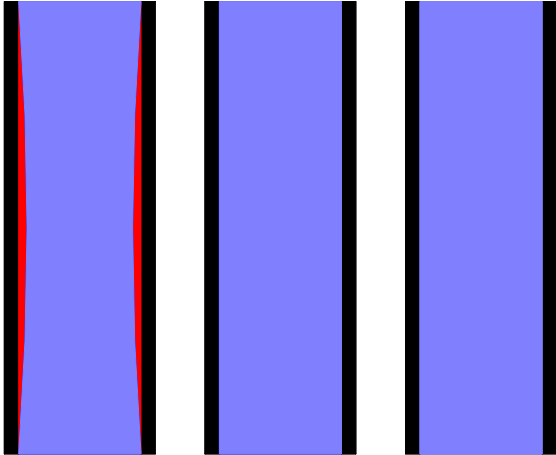
Watertube boilers contain a large number of tubes that offer water molecules a huge choice in which of to go through. But the tubes that best see the flame absorb more heat than others and the higher heat absorption rate prompts greater flow. Higher temperature at the inner tube surface prompts the precipitation of scale. Scale creates a slightly smaller area for flow to occur. The flow rate decreases slightly yet the temperature remains about the same - so even more scale precipitates. Flow continues to become choked and even though the scale build-up acts as an insulator, the temperature is still high enough to precipitate scale. The flow rate becomes almost nil because there are many more tubes that offer less resistance. Scale builds up until the tube is plugged and insulated enough that the metal itself burns and a hole or rupture takes place.

Once the scaling process has commenced, bottom blowdown has not effect in stopping the process of destruction.

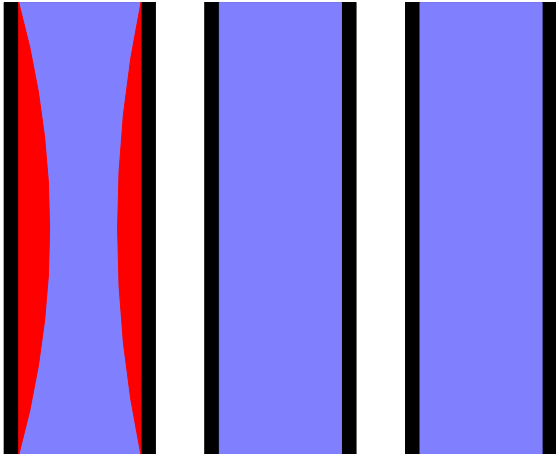
The cross sectional area of one-inch tubes is so small that the process seems almost unstoppable. Boilers with larger, 1.5" diameter, tubes do not have the same problem.

Of course proper chemical treatment would prevent the problem by keeping the solids in suspension so that they would not precipitate, but these boilers with one-inch tubes hold such a small volume of water that maintaining the chemical treatment is a difficult and full-time job. A job that simply does not occur very regularly in the real world. A job that is not NEARLY so demanding if boilers with larger tubes are used.

Scale begins in tube
with high heat flux



Scale grows due to
slightly lower velocity
and high temperature



Scale grows as flow is
choked off and tube
continues to be
subjected to high
temperature

