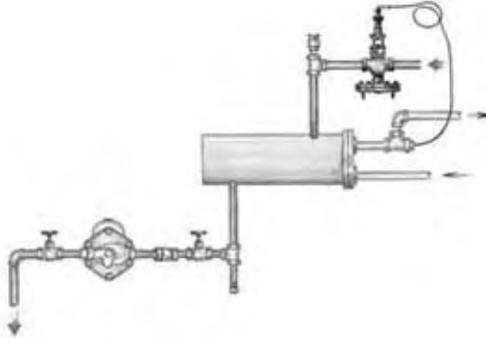




## TECH TIP #21



### WATER HAMMER IN STEAM-TO-WATER HEAT EXCHANGERS

When steam is the heating medium in a shell and tube heat exchanger, it is important that the condensate be immediately removed from the steam space. If condensate, which has cooled below the steam temperature, is trapped in the shell of the exchanger and hot steam enters during opening of the control valve water hammer will occur. Water hammer pressures can exceed 2000 psi, even in an exchanger where the steam pressure is less than 15 psi. Obviously the thin wall of the copper tubes are not designed to take this kind of hammering. Failures in the tubing will result if this problem is not corrected quickly.

We will not attempt to explain in detail all the possible reasons for water hammer; but here are the most likely suspects if you hear the tubes banging.

Condensate can remain in the shell (or tubes if steam is inside the tubes) of a heat exchanger as a result of:

1. Improperly sized steam trap. It is critical that the trap be sized for the worst case differential pressure, which is more than likely the normal operating pressure with a modulating control valve.
2. Improperly sized condensate return line, either out of the steam space or downstream of the steam trap.
3. No steam side vacuum breaker. Sometimes you will see a swing check valve installed so that a vacuum will pull the flapper back to the heat exchanger to allow air into break the vacuum. Vacuum problems are notorious for causing tube bundle failures.
4. Incorrect elevation of the unit in relation to the main condensate return line. In layman's terms, the outlet of the trap must flow downhill at all times into the condensate return pump or main condensate return line. **NO UPSIDE DOWN P-TRAPS WILL WORK!!!!**
5. A quick closing control valve (especially solenoid valves) or a pump that stops can cause a sudden reversal of flow in the piping.

**ADVANCED TECHTIPS...**If you hear a loud banging like a steel hammer on bare steel pipe in your steam (or water piping) system don't ignore it. The longer you wait, the more expensive it will be to repair or the more severely someone will get hurt. We can provide in house training on water hammer elimination or even send you to school at our premier steam system trainer, Spirax Sarco, right in the factory!