TIP SHEET

Pipe vibration and pounding is a warning sign to check your steam plant piping for proper setup and operation.

- Water hammer occurs in pumped condensate and feed-water return lines when a valve suddenly closes and abruptly terminates the flow
- The three basic types of water hammer are hydraulic, thermal shock and differential
- Proper piping and regular maintenance help to prevent water hammer

What You Need to Know About Water Hammer

How many times have you been in an industrial steam plant and saw steam piping moving erratically back and forth or sideways due to forces exerted within it? What you were witnessing was water hammer, and it should not be happening.

Water hammer occurs in steam supply and condensate return lines, and there are three basic types: hydraulic, thermal shock and differential.

Hydraulic water hammer occurs in pumped condensate and feedwater lines when a valve suddenly closes and abruptly terminates the flow. The hydraulic reaction is a piping vibration and associated pounding sound as the slug of water hits against the valve seat. Quantity of water and velocity will dictate the degree of damage, and if it occurs on a repetitive basis, it can severely damage and/or compromise the piping system.

Thermal shock water or steam hammer occurs in bi-phase piping containing both steam and water. This can be either the steam or condensate lines. What happens is the steam quickly gives up its latent heat in the presence of considerable condensate, and when it does, it collapses forming a large void. The void is like a vacuum, sucking the surrounding condensate to that particular point with heavy force. This puts excessive strain on the piping and supporting apparatus. Sometimes it can be silent.

Differential water hammer occurs in main steam distribution lines and may be the most severe of all because of its shear force.

Steam lines can be very large, in excess of 10” diameter. Those lines that are not properly pitched, pocketed and trapped can be the source of considerable condensate buildup. Picture in your mind a 3” or 4” layer of condensate at the bottom of a pipe and steam rushing across it at a velocity 10 times that of the condensate itself. It forms a wave action. At some point the wave fills the pipe and pushes (let’s say) a 2-gallon slug of water down the pipe that weighs about 16 pounds. If the steam pressure behind the slug is 100 psig, the speed of that bowling ball is approximately 60 mph. If it hits an elbow, which has already been damaged by thermal shock hammer, it will break the pipe.

Now the potential danger begins. All the water in the pipe, which is at 338° F (saturated), expands 1600 times when it is exposed to atmosphere. Depending on the amount of water in the pipe, there can be enough scalding force in the release of this energy to move walls and anything else in its path.

Water hammer can harm people and damage a facility. As a result, it should not be present in any form in your plant.

To prevent the problem, proper piping considerations need to be employed and include maximum steam and condensate velocity considerations along with appropriate drip pocketing and steam trap selection and regular maintenance.