

A brief A to Z of pulsation and what to do about it - "Don't excite the system so much"

Causes of pulsation, more details. An approach to excitation reduction, & damping the residual.

Modulating devices cause pressure pulsation :

Relief valves bouncing on their seats.

Flow controllers in spill back loops, opening a tad, closing a bit, constantly changing the resistance to flow, and so changing the pressure.

Check valves clacking, "Back Pressure" valves hunting for position.

Pipes that are shaken cause liquid pressure pulsation :

This is highest pressure and lowest frequency when shaken along the pipe axis.

Lower pressure pulsation, but at higher frequencies, come from shaking side to side and shaking up and down. The characteristics are greatly affected by the distance between pipe hangers, Clamps, Saddles and other forms of support,

Pumps on the other hand, make flow.

When

the flow fluctuates because :

The pump shaft deflects, impeller blades pass an opening, vanes cut off a flow slot, lobes nest between each other, worms take new gulps from their supply, diaphragms hesitate between strokes, peristaltic tubes and hose are squashed or rolls lift off them, gear teeth mesh, and the check valves from plunger and piston chambers flutter.

Then

the resistance of the system turns the flow fluctuation into acceleration head pressure change. This is the instigator, or excitor of pulsation. It is like the plectrum that plucks the string.

This excitation is very easy to reduce (Note we did not say prevent) :

Simply provide a soft compressible place, close to the pump, so that the pump can suck and blow-WITHOUT HAVING TO ACCELERATE THE WHOLE OF THE MASS IN THE PIPES.

However

Unless the soft cushion near the pump is infinitely large, there will be some residual acceleration head excitation. How much pressure pulsation this becomes depends on the system response, whether it resonates, whether the system amplifies it.

So :

To address the resulting residual pressure pulsation, however small it may be, because it is now pressure travelling up and down the pipe at 1400 meters per second, and not flow at a 300th of that velocity, it has to be INTERCEPTED. Fortunately, a cushion chamber that is also an in line through flow, in and out device, is smaller and costs less than purely a cushion, or "accumulator".

Provided

the pressure waves can enter the through flow damper, and are not reflected away by elbows, or by orifices, neither resonance nor amplification will occur.

Decoupling, isolating, excitors from system response, with TRUE DAMPERS is simple logic.

PULSATION IS USUALLY A VALVE PROBLEM, OCCASIONALLY PUMP RELATED, AND LEAST OFTEN CAUSED BY A RECIPROCATING PUMP; (because that is so simple to resolve) .



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