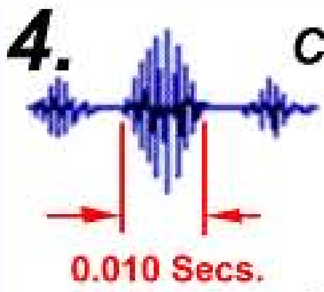
LDi P15 ***95% of all the problems LDi has diagnosed in the last quarter century, were related to, too much pressure, and over sized pipe on the SUCTION side.***

That is why these six samples concentrate on reading the suction pressure pulse signatures. Suction force driving the check valves open, was the worst. There are hundreds of others that may look more similar to your problem.

4.



10 bubble implosions within one 1/100th of a second.

Channel "cavitation", the use of cavitation in this phrase, is connected to the implosion of millions of bubbles. The bubbles are created by massive velocity between two very close surfaces. It is unlikely to occur unless the pressure difference is at least 4:1, from the beginning of the "two close surfaces" to the end of the two close surfaces. Do not confuse this signal with electostatic "noise" or "dirt" on your plots.

What is shown here is from a valve allowing flow then trying to almost totally close. This is similar to a relief valve. The frequency is similar to the 1000 Hz. hissing noise that can be heard when detecting a small leak, Apart from warning that valve seats will be "eaten" and need replacing, the frequency is dangerously close to that used by straight tube mass flow meters.

Bubble collapse causes a most intense heat. This is said to be close to the temperature of nuclear fission. It is believed that when all the energy from a collapsing void reaches its final point, it is all onto a final atom.

To capture the shape of this activity, there needs to be six points plotted per line, and to collect readings 4 times faster than the data points, to prevent aliasing.

That means data capture at a 25 kilohertz minimum. To view this activity in real time, the printer will have to run out , or "stream", at feet per second.

5.

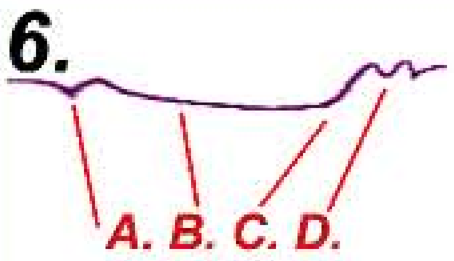
*Vorteces. There are many sources for these. The pressure differences are extremely small, however they may be important. For example:*1 There are flow meters called "Vortex Shedding Meters". These devices depend on the principle that vorteces are created at a frequency that is directly related to the flow velocity passed a sharp edge. The mass wants to carry on, but that causes a low pressure zone on the back side of the sharp edge. Some liquid is pulled into the low pressure zone, and forms a "swirl". The frequency of these swirls or vortex swirls or pulses is sensed through holes in the back surface. The frequency is then displayed as the flow rate.*

If your system plots show these, be sure that their source is not just before a "Vortex Shedding Meter" . If it is, then such a choice of meter will be unsuitable for the system as piped or designed.

To visualize what is happening in your system, recall that when you row a boat, the ends of your oars make "swirls". The center of the swirl is lower than the surrounding ring. Spinning the water has made a pressure disturbance. Or standing by a river, there was a fallen branch, or a rock, the water passing the obstruction made "back waters" or eddies.

In many pipe system designs, there are sudden direction changes, and devices that have abrupt, not "flow contoured" internal shapes. These all cause more or less vortex pulsation sufficient to invalidate a DP meter.

6.

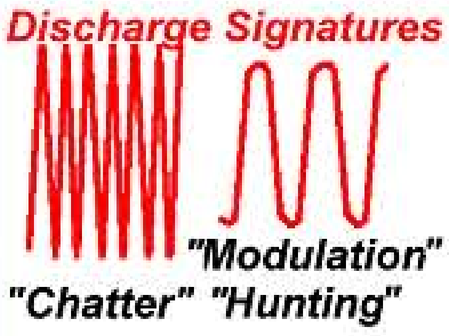


When you see this, make a note of the system designers name, the piping contractor used and all the system parameters. This is HEAVEN, it doesn't get any better than what you see..

It is almost impossible to start a system without some momentary dip A. Then there is aways a gradual fall during the acceleration B. This is followed by a faster recovery C. And as the flow catches up with the system steady state, there is a tad of overshoot, then a settling down D.

If there had been de-solution of absorbed gas, or a fall to vapor pressure, then as the pressure would not have been able to fall any further, there would have been a flat bottom.

Discharge Signatures



With a startup as smooth as this, it is probable that the discharge acceleration head pressure surge was unlikely to have caused "water hammer".

If there is complaint of pulsation, then in this system start by looking for relief valves that chatter, back-pressure valves that "hunt" for a mid position, flow controllers that modulate, and feed-back loops that repeatedly cause an "over correction".

Only if none of the above give reason for suspicion, is it worth going back to look at the suction system.

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LIQUID DYNAMICS INTERNATIONAL Inc.

Diagnostics, Prediction by Software and Analysis.

Phone USA --910-270-2737 Color Fax --910-270-0320 UK (for EC) --44-161-442-6222 Color Fax --44-161-443-1486
Box 506 Hampstead NC 28443 www.liquid-dynamics.com Box 47, Stockport, SK3-0LH, UK