LDi-P28

Please collect the following information to use in the selection of pipeline shock, surge, & hammer prevention equipment.

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Please first consider whether the addition of pressure vessels to your piping system, can be avoided completely.

A Can the need for pump start-up surge prevention be made un-necessary ?

1). To start a pump without a surge, start the pump slowly. If you specify a pressure that must not be exceeded *Liquid Dynamics* will quote for working out how slowly you must start your pumps, for you . Please Quote

2). Start as normal, but allow the flow to by-pass back to suction against a gradually increasing resistance of a slow closing valve in the bypass line. If you state the space available, and the pressure that must not be exceeded, - *Liquid Dynamics* will quote the by-pass system for you. Please Quote

B Can the need for valve closure shock prevention be made un-necessary ?

1). To close a valve without a shock, close the valve more slowly. When you specify a pressure that must not be exceeded, *Liquid Dynamics* will quote for working out how slowly you must close your valve, for you. Please Quote

2). Stop the flow going through the fast closing valve in the normal way, but first open another valve in a smaller line from a "T" immediately ahead of the fast closing valve, this line will be piped back to a point nearer to point of volume supply. State the space available and the pressure that must not be exceeded.
Liquid Dynamics will quote for determining the back-pass system dimensions for you. Please Quote

C Can the need for pump shut-down back-flow hammer prevention be made un-necessary?

1). To stop a pump , without a back-flow hammer, slow the pump down gradually; or de-clutch the pump from its driver & allow the pump to spin down, while the inertia of the mass flowing away from the pump pulls liquid through the pump .

2). If you can not decouple the pump drive, then provide a "suck-by'" circuit, allowing the void that is sucked out behind the liquid that continues to travel away from the pump, to be filled by sucking past the pump.
Liquid Dynamics will quote for establishing the dimensions of the "suck-by" circuit, for you. Please Quote

When neither 1. nor 2 of **A, B, C,** above , "preventive methods" are possible, we can provide a list of companies who can provide vessels suitable for the duties established by a ***ShockView*** model of the data that you provide to LDi, as below.

Both ASME vessel code and the EU Pressure Equipment Directive require your full disclosure of all use parameters.

INFORMATION Reqd.	UNITS	LIQUID Examples.	Customer Guestimates from past.	Please mark :- U = From process log. V = Physics tables W= Guestimation
Liquid Density. Specific Gravity SG @ System Temp.	Grams per milliliter Grams per Cubic cm. Kg / Liter or g/cm3	Water 30% NaOH Solution Ammonia NH_3	1.00 1.30 @ -30 C 0.68	SG **g/cm3**
Liquid Viscosity @ System Temp.	Centipoise, cP	Water w/ absorbed CO_2 30% NaOH Solution Ammonia NH_3	1.00 30.0 0.35	Viscosity **cP**
Compressibility, reduction in volume per unit change in pressure, @ system pressure & Temp.	parts of a Liter per Bar L/Bar Liters /Kg cm2	w/ absorbed air Water @ 10 Deg. C Pentene &Pentane+HFacid Ammonia NH_3	50e-6 @ + 40 C 19.6e-5 11.389e-4	Compressibility **L/Bar**
		Which is like saying that hot light hydrocarbons are like 98 Deg C water and are 4 x compressible than cold water, and the second example, liquid ammonia is 22 times more compressible than cold water.		
A Dynamic (dt) equation must be resolved, accurate Time figure is essential It has an exponential effect.	Pump run up time (For a positive diaplacement pump time for first 5% of a displacement) or valve closure time or pump run down Secs. ("Instantaneous" shall mean 0.01Sec., 10ms)	1450 motor 6"x4" Centrif. 6"Air actuated butterfly Diesel driven 24"x20" Cenrif. Meter stop valve (depending on size.)	2.0 Secs 1.0 Sec 5.0 Secs 0.05 to 0.300 Secs.	Time **Secs**
Bulk Modulus , Elasticity of pipe material	Pascalles Pa	Steel Concrete Plastic PVC	2e+11 4.2e+10 2.89e+9	Elasticity **Pa.**
Pipe Wall thickness mm	Millimeters	(Dilation of pipe wall combined & liquid compressibility determins shock reduction & frequency) "effective softness"		**mm**

Pipe Internal Diameter Millimeters mm	**mm**	**Force, Pressure at Pipe Inlet**	**Bar or Kg/cm2**
Pipe Length Meters (Feet x 0.305)	**M**	**Pressure that Shock must not exceed.**	**Bar or Kg/cm2**
Theoretical mass flow Kilograms per second Kg/Sec. US GPM x 3.8 /60 x SG	**Kg/Sec**	**Acceptable Materials of Construction**	**Metals** **Plastics** **Synthetic Rubbers**
Frequency of any current vibration Hertz, Hz.		Vapor pressure at suction temperature for item C2 above.	

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