

Vendor:

Request For Quotation Date :

Std. Purch / RFQ Spec. Doc # 9714893 Rev 3 06:06:99
 Pulsation suppression devices in liquid systems & or design approach bid
 for use with API Specs. 674 2nd Edition 1995 , 675 2nd Edition 1994 &
 618 4 Th. Edition as incorporated by reference in 675

THIS IS NOT A PURCHASE ORDER

THIS PURCHASING SPECIFICATION - R.F.Q.

(is comprised of : those items where data is shown and of those items which are checked "x")

For Flow Fluctuation reducers AND OR Pressure Pulsation "dampers"

PLEASE PROVIDE NOT LATER THAN YOUR LOWEST PRICE
 & BEST AVAILABILITY IN ACCORDANCE WITH THE FOLLOWING REQUIREMENTS

NOTE : Subclauses denoted by letters a. through p. are thereby cross referenced to the **Pulsation Dictionary of Terms**

The vendor shall provide item/s and or recommendation
 for system modification and or for pump modification,

Performance improvement (not equipment part #) shall form the basis of any contract, that is based on your response to this RFQ , which shall ensure SUITABILITY FOR THE PURPOSE OF:

FLOW FLUCTUATION REDUCTION

1. Flow Fluctuation reduction in a piping system carrying USGPM

1.1 Flow Fluctuations to be reduced to a level of not greater than %
 peak to valley, of the theoretical steady state flow rate

1.1.1 To ensure that :

FLOW CONTROL VALVES

a. Flow Fluctuation generated by the modulation of in line
 or "T" off line "flow / process control - valves", responding @ Hz.

BACK PRESSURE VALVES

b. Flow Fluctuation generated by the modulation of "back
 pressure valves", hunting at a natural frequency of Hz.

CHECK VALVE CHATTER

c. Flow Fluctuations generated by oscillation of
 "check valves" opening and closing at a natural frequency of Hz.

PUMPS

d. Flow Fluctuations generated by the pumping action of
 Air , Hydraulically , Motor / Rotary , DRIVEN pump
 @ R.P.M./SPM to R. P. M. /SPM after any gear / belt speed reduction

CENTRIFUGAL

i. number of cut waters / impeller vanes per rev

GEAR or LOBE

ii. number of gear teeth per revolution

VANE

iii. number of vanes per revolution

TUBE

iv. number of tube / peristaltic "shoes / rollers" per rev

DIAPHRAGM or A.O.D.

v. number of diaphragms displacements per complete cycle
 phased together phased offset degrees

Work Notes

PISTON or PLUNGER

vi. number of piston or plungers displacements per cycle
 phased together phased offset / / / / degrees
 ARE REDUCED TO a flow fluctuation % LEVEL SPECIFIED AT 1.1

Work Notes

PRESSURE PULSATION PREVENTION aka "Dampening"

2. Pressure Pulsation "damping" "dampening" "dampening"
 2.2 To be reduced to a level of not greater than +&- %
 of theoretical steady state pipe line pressure
 2.2.1 To ensure that in the suction supply system:

SUCTION

- a. The pump does not "vapor lock" or "cavitate"
 EX: The requirement of the pump to accelerate the liquid sufficiently to enable the pump to fill, does not cause the pressure to fall to such a level that dissolved air comes out of solution, or the liquid does not phase change to a gas such that the pump fails to fill efficiently .
- b. The requirement for the acceleration of liquid mass does not cause the liquid pressure to fall to an extent, which causes temporary voids to form , which when they collapse generate shock waves which then drive the suction supply line into mass oscillation, causing the pump to become erratic or unstable .

2.2.2 To ensure that, in the discharge pumping system, the pressure pulsations are sufficiently small not to cause :

DISCHARGE

- a. Damage to pump parts, or overload to the drive. 2.2.2.1
 EX: 12% allowable pressure pulsation.
- b. i. weeping of the system relief valve, 2.2.2.2
 ii. premature relief valve lift,
 iii. fatigue of safety overload "burst " or "rupture" disks,
 iv. premature activation of "safety shut down" systems
 EX: 9% allowable pressure pulsation.
- c. i. Shaking of pipework 2.2.2.3
 ii. Weld hardening
 iii. Pipe hanger tearing
 iv. Flange gasket, valve stuffing box, failure
 v. API 618 3.9.2.2.3
 EX: 7% allowable pressure pulsation
- d. API 674 3.6.2.2.1 allowable pressure pulsation not to exceed the relevant percentage peak to valley as tabulated below:

2.2.3. **MULTIPLEX & "POWER PUMPS"**

EXAMPLES : (Note f=frequency)

Nominal Pipe Diameter	1" Pipe	3" Pipe	6" Pipe	12" Pipe ³
Schedule	XXH	160	XXH	160
ID	0.599"	2.626"	4.897"	10.26"
Assuming a quintuplex pump with displacers phased at 72 degrees running at up to 500rpm (f=41.6Hz)				
Allowable pressure pulsation	20 psi	10 psi	7 psi	5 psi
Assuming a triplex pump with displacers phased at 120 degrees running at up to 300rpm (f=15Hz)				
Allowable pressure pulsation	34 psi	16 psi	12 psi	8 psi
Assuming a duplex pump with displacers phased at 180 degrees running at up to 175rpm (f=5.8Hz)				
Allowable pressure pulsation	54 psi	26 psi	19 psi	13 psi

Figures are Calculated by

$$\text{Pulse} = \frac{100}{\sqrt{(\text{ID} \times f)}}$$

2.2.4 **METERING, DOSING, INJECTING, & PROPORTIONING PUMPS**

(may be generally applicable up to 2" pipe systems)

API 675 @ 3.6.2 says see API 618 as below

Work Notes

Total swing

API 618 @ 3.9.2.5 approx. = 2.25% @ 500psi	or 25 psi	<input type="checkbox"/>
1.75% @ 1,000psi	17.5psi	
1.35% @ 3,000psi	40 psi	
1.0% @ 10,000psi	100 psi	

2.2.5 **FOR INSTRUMENTATION**

P.I. 2.2.5.1

e. Damage to bourdon tube type pressure indicators "dial type gages"

EX: 6% allowable pressure pulsation.

SPRAY SYSTEMS 2.2.5.2

f. "Atomization" constant size of droplets which may be drying or solidifying as they fall in a tower (Note - this is not generally smooth enough for film or coating applications)

EX: 5% allowable pressure pulsation

MIXING 2.2.5.3

g. Preventing intermittent jets of liquid entering a pressurized stream leading to a "Static Mixer"

EX: 4% allowable pressure pulsation

METERS 2.2.5.4

h. MAG 2.2.5.4.1

Pulsed magnetic field distortion meter accuracy

EX: 3% allowable pressure pulsation

PADDLE WHEEL "METER" (flow indicator) 2.2.5.4.2

j. Prevent surging or "ratcheting" of paddle wheel blades projecting into the flow path

EX: 2% allowable pressure pulsation

TURBINE METER 2.2.5.4.3

k. Prevent pressure wave impingement on the turbine blades from jerking it to spin at an irrelevant speed.

EX: 1.5% allowable pressure pulsation

CORIOLIS METERS 2.2.5.4.4

m. Prevent pressure wave amplitude, at any frequency that is the same as, a power of, a divisor of, the natural frequency at which the coriolis tube is being vibrated, from causing over-excitation, which will result in the meter indicating a greater rate of mass transfer than is occurring.

EX 1 % allowable pressure pulsation. Typically at 1000Hz for straight tube meters. Typically 90 Hz for loop tube meters.

VORTEX SHEDDING METERS 2.2.5.4.5

n. Prevent pressure wave disturbances from being read as vortex pulsation and causing erroneous readings EX: 0.75 % pulsation

DELTA P (Differential pressure across an orifice) METERS 2.2.5.4.6

p. Prevent all pressure fluctuations in excess of 1 (one) psi

3.0 **THE SYSTEM**

3.1 **System Pressures** 3.1.1 Suction Supply head

3.1.2 Resistance to discharge by the system

3.1.3 Relief Valve set pressure

3.1.4 Design Pressure

3.2 System Temperatures 3.2.1 Design Temp. for allowable metal stress

3.2.2 Maximum working pressure

3.2.3 Minimum working pressure

3.2.4 (for AMSE VIII -1)Minimum design metal temperature "MDMT"

3.3. System Liquid

3.3.1 System Liquid Specific Gravity "SG "Grams / Cubic Centimeter

3.3.2 System Liquid Viscosity cP centepoise

3.3.3 System Liquid Compressibility Liters per bar at system Temperature and Pressure (This is a vital figure)

3.4 Other system parameters :

3.4.1 System Liquid Vapor Pressure at pumping temperature

3.4.2 Pressure of any absorbed gasses EX "Nitrogen" or "Air Pad" applied to the liquid supply - any reduction to which will cause absorbed gasses to come out of solution.

Empty boxes for 3.2.1-3.2.4

Empty boxes for 3.3.1-3.3.3

Empty box for 3.4.1

Empty box for 3.4.2

Large empty box for Work Notes

3.5 System Piping

3.5.1 Pipe Isometric attached, yes [] no []

3.5.2 Length from source of supply head

3.5.3 pipe Internal Diameter

3.5.4 Length from pump outlet to end / vessel

3.5.5 pipe Internal Diameter

Empty boxes for 3.5.1-3.5.4

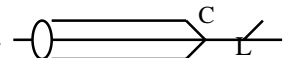
Empty boxes for 3.5.3-3.5.5

3.6 Connections to the system , and configuration / orientation

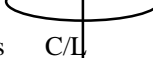
Horizontal

Vertical

Center line axis of cylinder



or of disk axis



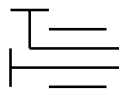
shaped vessel chamber

3.6.1 Cylinder Horizontal or Disk horizontal

Empty boxes for 3.6.1

3.6.2 Cylinder Vertical or Disk Vertical

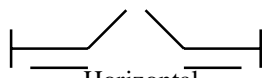
3.6.3 For Vertical One up it & one in left field "New England Style" , For Horizontal



Empty box for 3.6.3

Note = Typical flanged

3.6.4 Horizontal one left one right " Bull horns " "Texas Style" or Vertical

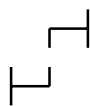


Empty box for 3.6.4

Empty box for 3.6.4

(Would you buy a filter with one connection !

3.6.5 "Seal Horse" Any which way is up aka Louisiana style"



Empty box for 3.6.5

3.6.6 One connection (pressure pulses travel at 3,500 M.P.H. and go straight past , not in-place flushable either) Designed in Washington ! aka "DC Style"



Empty box for 3.6.6

Would you buy a filter with one connection ! Would you fit a "T" under your car and put your muffler on it?

3.6.7 ANSI B16.5 Flanged " # face Preferred Material

Empty boxes for 3.6.7

Empty box for 3.6.7

3.6.8 High Pressure clamp type Hubs "Diameter Rating OTHER

Empty boxes for 3.6.8

Empty box for 3.6.8

4.0 Design CODE 4.1 ASME VIII Div.1 "U" 4.2 LDI Safety Design Code SDC1 Rev.

Empty boxes for 4.0-4.2

6.0 Other requirements EX earthquake and wind loading calcs - describe

Empty box for 6.0

We, above mentioned vendor number [] acknowledge receipt of your specification and will - [] will not [] be tendering -

- or -

Please provide additional information as tabulated on the list which we hereto attach, marked - []

Signed for & on behalf of above named vendor