PULSE GUARD® USA & UK Inc. & Ltd.

Under licence from M. Packer - since 1963

If in doubt shout

In USA 1-910-270-2737 or **1-888-DAMPERS** 326-7377

In UK (0)161-442-6222 or **08080-LO-PRICE** 567-7423

Volu-Mnu.pdf

EXPERTS ONLY

DO NOT READ ITEMS Shown in these colors

To Estimate The Max Volume -"Size" of a PULSE DAMPER for flow fluctuation reduction

Nomogram ("3-axis graph") - to help you specify allowable residual pressure fluctuation.

$$\frac{100 \times \text{Volume Of One Movement Of One Displacer}}{\text{Number of displacers}^2 \times F \times \text{The Percentage figure of allowable residual fluctuation}}$$

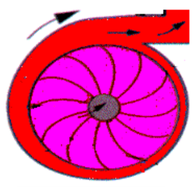
Abbreviation $\dfrac{100 \bullet V}{N^2 \bullet F \bullet \%\text{age fig.}}$

"F"** is a correction Factor on the square of number of displacers, Example , Centrifugals are intrinsically good - have a high F, Sandwich diaphragm metering pumps **have a low F.

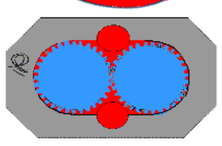
N : N Squared, *N^2, N Exponent 2, means multiply the Number of displacers by that same number.*
Example N^2 : 1 Diaphragm head 1x1=1, 11 Blades 11x11=121, 2 Lobes 2x2=4, 3 Plungers 3x3=9

"%age figure" : *0.5% allowable residual fluctuation - use the figure 0.5 in the equation, for a residual fluctuation of say +&- 3% , 3 positive plus 3 negative = 6 - use 6 in the equation, $\pm$ 5% total 10, use the figure 10.*

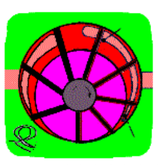
Explanations of "V" "Volume Of One Movement Of One Displacer" :

F= 7 

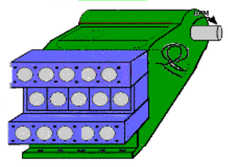
A centrifugal pump has 11 blades, at 725 RPM it Displacers 500 gpm, @ 133 Hz.
500 gls. x 231 in3 per Gallon / 11 blades x 725 rpm = 14.5 in3 displacement

F= 5 

A gear pump has 17 teeth, @ 440 rpm it produces 2 Kg per second @ 125 Hz.
2 Kg per second x 60 secs per minute x 1000 gms per Kg / 17 teeth per rev x 440 rpm x SG 1.35 = 12 cm3 per tooth

F=3.0 

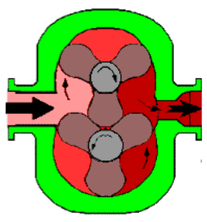
A vane pump with 23 vanes, driven at 2,900 rpm, pumps 380 barrels per day @111 Hz.
40 Liters x 1000 cm3 per Liter / 23 vanes x 2900 rpm = 0.6 ml displacement

F=0.4 

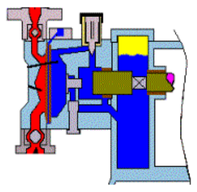
A quintuplex plunger pump turned at 880 rpm, generates 60+ M3 per 8 Hr shift @ 73.5 Hz.
2000 gls per hour x 3,800 ml per gallon / 60 minutes per Hr. x 5 piston per rev x 880 rpm = 28.8ml / stroke
F for triplex = 0.5

EXPERTS ONLY

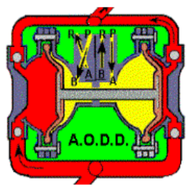
A diaphragm, gas bag, bladder or sleve, "a membrane" , will move up to 15 times per second. 15Hz. when it is hidden from system fluctualtions by being "Td" off the line.
All the above applications require an in the line, flow through, multiconnection, in and out port, damper . A flow through damper also intercepts pressure waves, which typically travel at 3500mph
For all those applications below a 15 Hz. frequency, flow through enable:
Flush in place before system service. Constant temperature by first in first out. No sedimentation. and intercepts the pressure disturbances which make meters and instruments in-accurate
FOR THESE REASONS, INVENTORY - LOWEST COST DAMPERS - HAVE 2 CONNECTIONS.
For those who do not want the advantages of FLOW THROUGH, save buying a T for drain, RV, or gauge. use the extra connection for that, and still buy the least expensive - the flow through damper.

F=1.0 

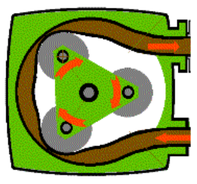
A tri-lobe pump at 173 rmp, discharges 3 tons per hour @ 8.7 Hz.
100 lbs per minute x 25 in3 per pound / 3 lobes per rev x 173 rpm = 4.8 in3 per lobe

F=0.8 

F for duplex diaphragm heads also = 0.8
A simplex diaphragm head pump is pushed by a 100mm diam. piston with a 150mm stroke @ 205 spm @ 3.4 Hz.
5 cm Piston Radius x 5 cm pist. rad. x (Pi) 3.142 x 15 cm stroke = 1.18 Liters per stroke

F=1.8 

The F figure assumes that the air supply to the A.O.D.D. is enough to ensure no return stroke delay.
An air operated double end diaphragm pump empties a 40gl drum in 4 mins., on a 2 second cycle . @ 1.0Hz.
10 gls per minute x 231 in3 per gallon / 2 diaphragms per cycle x 30 cycles per min. = 38 in3 per end

F=0.4 

The F figure assumes that the size of the shoe or wheel is approx one third of the volume between shoes or wheels.
A hose pump squeches out 150 liters of effluent sludge per minute, with 3 shoes revolving 15 times per minute.
150 litres / 3 shoes x 15 revs = 3.33 Liters between shoes @ 0.75 Hz

EXAMPLE $\dfrac{100 \times 90\text{ml per stroke}}{\text{[From a triplex] 9} \times \text{[plunger factor] 1.5} \times \text{0.5 [for 1/2\% residual]}} =$ **3000 ml = 3 litres = approx 0.8 US gls = 183 in3 damper**

HOME

IT REALLY IS JUST THAT EASY TO OVERSIZE A DAMPER BY IGNORING HOW MUCH PULSATION YOU WOULD HAVE WITHOUT ONE