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SOME CONSIDERATIONS ON CHOOSING THE SIZE OF A DAMPENER: HOW TO REDUCE THE COST WHEN A PULSATION DAMPENER IS NEEDED IN A VOLUMETRIC PUMP

As you probably know, the size of a dampener is inversely proportional to the percentage of the admitted residual pulsation. Lower levels of admitted residual pulsation demand higher dampener volumes. But how is determined the value of this percentage?

Only in those circuits where a measuring device that needs a certain pressure range to work properly is installed the dampener ought to be sized using a percentage of residual pulsation that absorbs its variability

In any other case, a bigger residual pulsation can be admitted without creating any trouble in the circuit. It is in these cases when the dampener volume, and therefore its price, can be reduced. The following hints should always be taken into consideration:

- Don't choose a percentage of residual pulsation lower than 2%:
  - In case of variability of temperature (either in the liquid of the circuit or in the environment).
  - If the pressure in the circuit is changing according to process requirements.
- As an example, in circuits working at low pressures, for instance 5 bar, the pressure peaks and the pressure variation ranges for the following percentages of residual pulsation are:

		PEAK PRESSURE VARIATION		*PRESSURE VARIATION RANGE*
• **2.5%**	-----------	+ 0.12 / - 0.12	-----------	5.12 / 4.88
• **5%**	-----------	+ 0.25 / - 0.25	-----------	5.25 / 4.75

And so on…

As it can be seen, by working with a residual pulsation percentage of 5% instead of a 2.5% one, we just get a differential increment in the value of the peak pressure variation of +/- 0.13 bar.

Let's now see how the dampener size changes with those two percentage values. As an example we will take a circuit with a single piston pump, of 250 litres per hour at 100 r.p.m.:

The pump volume per stroke (C= displacement) would be:

$$C= (250 \times 1000) / (100 \times 60) = 41,6 \text{ c.c.}$$

Being a single piston pump, its $\partial V = C/2 = 20,8$ c.c. (*).

The abbreviated formula to calculate the dampener size is:

$$(*)\ V_0 = (\partial V \times P_2) / (0.8 \times 0.8 \times (P_2 - P_1))\ ;\ (p \times v = \text{constant});\ \text{where :}$$

V_0 = dampener size
∂V = volume of liquid stored and discharged to the circuit by the pulsation damper
P_2 = max. pressure accepted
P_1 = min. pressure accepted

With a residual pulsation of +/- 2.5% the dampener size would be:

$$V_0 = (20,8 \times 5.12) / (0.8 \times 0,8 \times (5.12 - 4.88)) \approx 693 \text{ c.c.}$$

And therefore, we would choose our dampener size U010….

With a residual pulsation of +/- 5% the dampener size would be:

$$V_0 = (20,8 \times 5.25) / (0.8 \times 0,8 \times (5.25 - 4.75)) \approx 341 \text{ c.c.}$$

And in this case the dampener size of choice would be our model U003. With this dampener size the pressure peaks are 0.13 bar higher, but the dampener size gets reduced to less than a half.

(*) See our technical article regarding dampener size calculations.