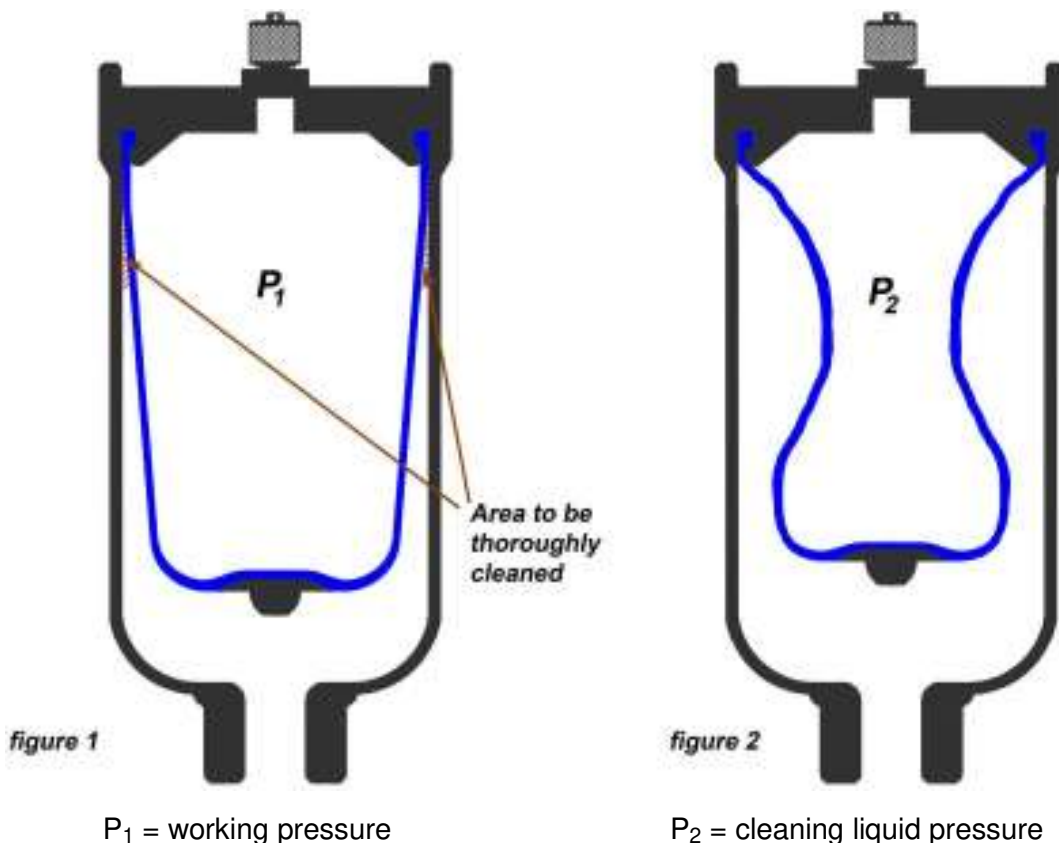


RECOMMENDED PROCEDURE FOR THE PERIODICAL CLEANING OF BLADDER TYPE PULSATION DAMPENERS

In dosing pump applications, both the circuit and the dampeners attached to it must normally be submitted to periodical cleaning by pumping some kind of special cleaning liquid, instead of the process liquid, for removing off the whole circuit all process liquid residue because of either a change in the process liquid or to avoid any kind of contamination of the process liquid (this is of special importance in food and beverage applications).

Due to the nature of the anchorage of the bladder to the body of the dampener, there is a ring-shaped area between the top of the bladder and the inner wall of the body difficult to clean thoroughly (see figure 1). To achieve a proper cleaning of this area, it is necessary to make the bladder to shrink in order to further separate the bladder from the inner wall of the dampener, so the cleaning liquid can reach and clean completely this area (see figure 2). This can only be achieved if the pressure in the circuit when the circuit is running the cleaning liquid (P_2) is higher enough than the pressure in the circuit when the circuit is running the process liquid (P_1), as then the bladder will shrink under the higher pressure until the pressure inside the bladder gets equalized.



Therefore, we recommend the cleaning liquid pressure to be higher than the product working pressure, with a P_2 / P_1 ratio between 1.2 and 1.5.

If it is not possible to make the cleaning liquid pressure higher than the product liquid working pressure then the dampener will have to be over dimensioned.

Let's see an example:

Considering a working pressure (wp) of *16 bar* and a cleaning liquid pressure of *4 bar*, we must then pre-charge the dampener at a pressure below *4 bar* to make it effective, and allow the clean liquid to get inside the dampener.

If the dampener size for a *16 bar* working pressure has been calculated at a value of *2.5 litres*, and we pre-charge the dampener at $4 \times 0.75 = 3 \text{ bar}$, following the equation:

$$P_0 \times V_0 = P_{wp} \times V_{wp} ,$$

as $P_0 = 3 \text{ bar}$, $P_{wp} = 16 \text{ bar}$ and $V_{wp} = 2.5 \text{ litres}$,

then, $V_0 = P_{wp} \times V_{wp} / P_0 = (16 \times 2.5) / 3 = 13.3 \text{ litres}$

As demonstrated, using a cleaning liquid pressure lower than the working pressure makes necessary to over dimension the size of the dampener, therefore increasing the cost.