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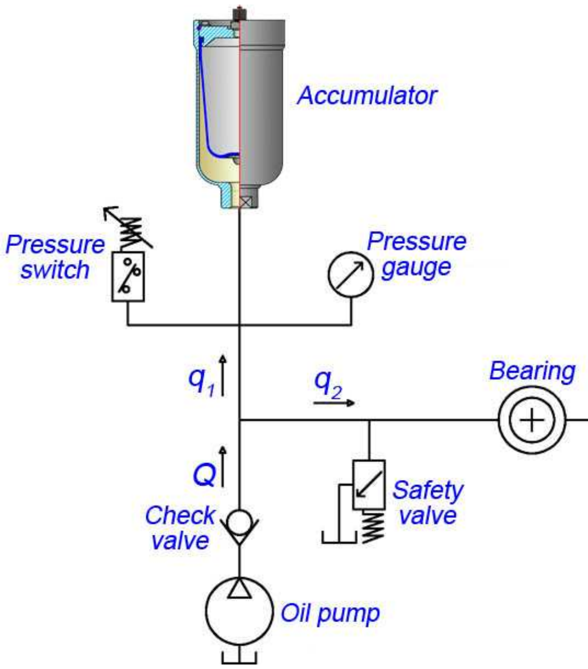
APPLICATION OF OLEO-PNEUMATIC ACCUMULATORS IN BEARING GREASE OR LUBRICATION CIRCUITS

In order to avoid the continuous operation of the grease pump or its repeated starting and stopping in a short time, accumulators are used as energy reservoirs.

The basic circuit layout of a greasing system could be like the one shown below:



Q = Pump flow

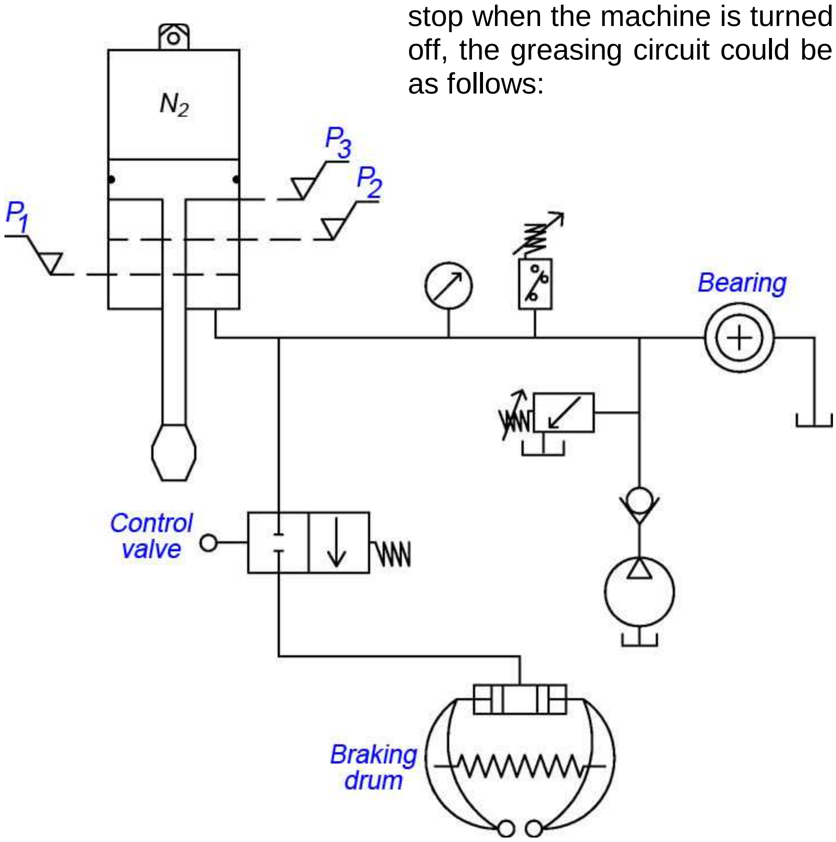
q_1 = Accumulator filling flow

q_2 = Supply / drainage flow of the bearing to be greased

P_2 = Minimum greasing pressure

P_3 = Maximum pressure the circuit can stand

If it is required to maintain the greasing of the bearings during the lapse of time an axle with a high moment of inertia takes to stop when the machine is turned off, the greasing circuit could be as follows:



<u>Operation</u>

On starting the pump and reaching P_3 pressure in the circuit, the pressure switch powers off the motor and the pump stops. The greasing oil stored in the accumulator is then supplied to the bearing and the pressure keeps reducing until reaching P_2 pressure, when the pressure switch starts again the motor of the pump. While the machine is stopped and remains unpowered, the accumu-lator keeps delivering oil to the bearing, which continues spinning due to its high inertia (example: shaft rectifiers).

As pressure keeps falling until reaching P_1 pressure, the stored volume indicator rod keeps coming out of the accumulator until its end head pushes the the control valve opening lever switch, what then lets the oil activate a braking drum that seizes the shaft until stopping it.

Guidelines for the calculation of the size of an oleo-pneumatic accumulator

The data the designing engineer of the grease system or circuit must know beforehand are:

q_2 = Grease drainage flow or consumption of the bearings.

P = Pressure needed for a proper greasing in order to avoid the stiffening or the excessive heating of the bearings to be greased (P_1 in the drawing).

Q = The pump flow, which, of course, must be higher than q_2 to allow for q_1 excess to be stored into the accumulator

It is of great importance to define or establish the time the pump is working and the time lapse or interval between consecutive starts of the pump.

The value of P_3 must also be established, keeping in mind that, the bigger the difference P_3 - P_1, the smaller the required size of the accumulator and, therefore, more economic.

A practical example will make all the previously exposed easier to grasp:

Data required for the calculation:

Q = 15 l/min. q_2 = 2 l/min. P_1 = 8 bar P_2 = 15 bar

T_i (lapse between the stop and the start of the pump) = 5 min.

T_m (time the pump is working, loading the accumulator and greasing the bearing)

Note: As will be seen below, the value of T_i also determines to a great extent the size of the accumulator.

As the proposed lapse of time between the stop and the start is 5 minutes and the supply / drainage flow of the bearing is 2 l/min., the greasing volume de will be 2 x 5 = 10 litres; and therefore this is the amount of oil the accumulator should store. We will call this value ΔV.

The simplified formula for calculating the size or volume of the required accumulator is:

$$V_0 = \frac{\Delta V \times P_2}{0{,}8 \times (P_2 - P_1)}$$ (V_0 = total volume of the accumulator)

Then, we have:

$$V_0 = \frac{10 \text{ litres} \times 15 \text{ bar}}{0{,}8 \times (15 - 8) \text{ bar}} = 26{,}78 \text{ litres}$$

And the time the pump will be in operation, loading the accumulator and greasing the bearing will be:

$$T_m = \frac{60 \times 10}{15 - 2} = 46 \text{ seconds}$$

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