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APPLICATION OF OLEO-PNEUMATIC ACCUMULATORS IN PLOUGHS TO RELEASE A JAMMED PLOUGHSHARE

dV = Volume of oil that fills the accumulator in the moment of the jamming (**dV** = **ø**^{2} x 0.785 x **c**)
S.r.a. = Share rotation axis
F1 = Ground resistance during ploughing
F2 = Resistance force in the moment of the jamming
f1 = Force applied by the accumulator gas at pressure **P1**
f2 = Force applied by the accumulator gas at pressure **P2**
N_2 = Dry Nitrogen gas
a = Share rotation in the moment of the jamming

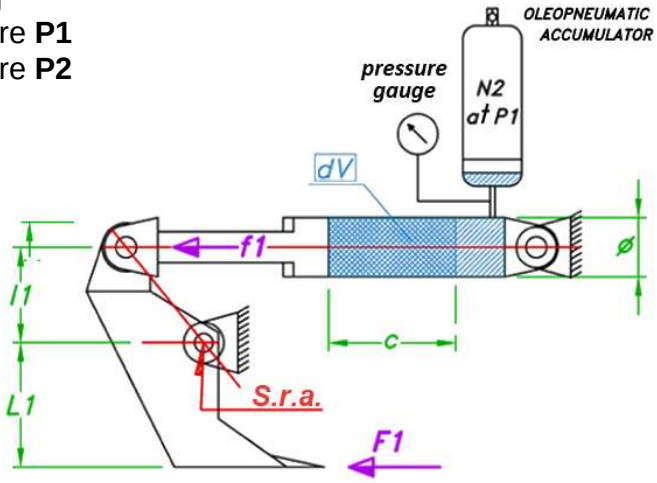
During normal operation: **f1** x **l1** = **F1** x **L1**

In the moment of the jamming:

f2 x **l2** = **F2** x **L2** and **f1** = **P1** x **ø**^{2} x 0.785

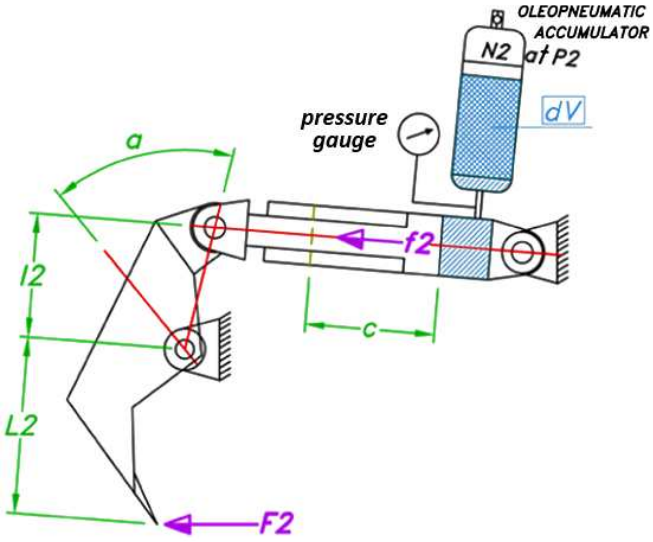
f2 must not be higher than 1.5 x **f1** and

f2 = **P2** x **ø**^{2} x 0.785



Calculation of the size of the accumulator:

$$V_0 = \frac{dV \times P2}{0.7 \times (P2 - P1)}$$



When the tip of a ploughshare gets jammed in the ground, the share tilts back rotating around a fixed point of the plough, what pushes the rod back, into the cylinder and drives a volume of oil (**dV**) out of the cylinder and into the accumulator, what in turn compresses the **N_2** gas.

The resulting reduction in the volume of the gas, following the formula *P x V = Constant* leads to an increase in the pressure of the gas and, therefore, to an increase in the force **f1** opposing the tilting of the share. The force **F1** also increases proportionally, so the tractor must also increase its power in order to keep moving forward.

Once the tip of the ploughshare gets released or the obstacle has been overcome, the compressed gas in the accumulator takes care of driving the share back into its initial working position.

When designing the plough anchor points it is advisable to make the length of the lever arm in the moment of the jamming (**l2**) shorter than the distance **l1**. This way the structural rigidity and the weight of the plough are reduced and the ploughshare is prevented from being driven abruptly into the ground.

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