



# Problem 2

A piston moves without friction in a cylinder of section  $S_1$  and diameter  $d_1 = 4$  cm filled with water. The piston is pushed by a force  $F$  of intensity 62.84 Newtons at a constant speed  $V_1$ . The fluid can escape towards the outside by a cylinder of section  $S_2$  and diameter  $d_2 = 1$  cm at a speed  $V_2$ , pressure  $P_2 = P_{atm} = 1$  bar.

$S_1$   
 $d_1 = 4\text{cm}$   
 $\rho = 1000 \frac{\text{kg}}{\text{m}^3}$   
 $F = 62,84 \text{ N}$   
 $d_2 = 1\text{cm}$   
 proj'x

$P_1 \propto F, P_0, (d_1)$

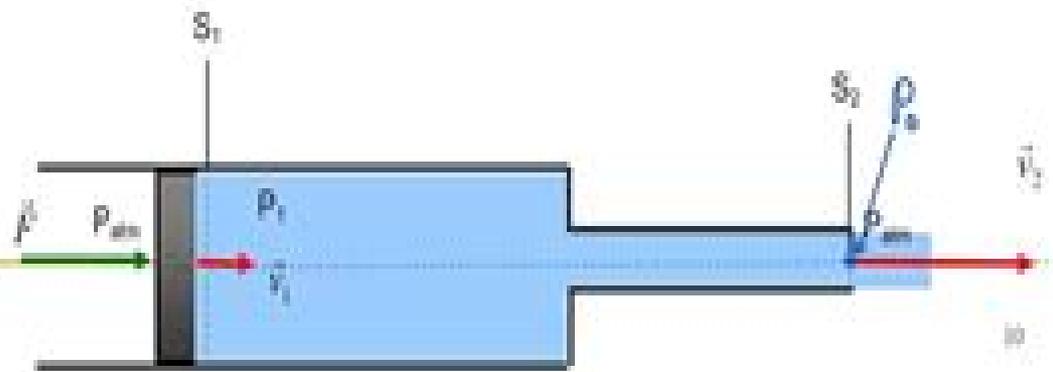


$\sum \vec{F}_x = \vec{F}_0 + \vec{F} + \vec{F}_w = m\vec{a} = \vec{0} \quad (v = \text{const})$

$F + F_0 - F_w = 0$   
 $F + P_0 \times S_1 - P_1 S_1 = 0$

$$P_1 = \frac{F + P_0 \times \pi \left(\frac{d_1}{2}\right)^2}{\pi \left(\frac{d_1}{2}\right)^2}$$

- 1) Determine the pressure  $P_1$  of the fluid at the level of section  $S_1$  as a function of  $F$ ,  $P_{atm}$  and  $d_1$ .
- 2) Determine  $V_2$  as a function of  $P_1$ ,  $P_{atm}$  and  $d_1$ .



# Solving Problems In Fluid Dynamics

**Jack B. Evett**



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