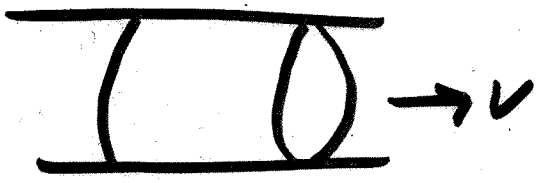
Read 10.2-10.3

Review

Continuity Equation



flow rate = VA

$A_1 V_1 = A_2 V_2$

Bernoulli's Equation

$$P_1 + \frac{1}{2}\rho V_1^2 = P_2 + \frac{1}{2}\rho V_2^2$$

(C)

Interactive Question

A large gravel truck is loosely covered with a tarpaulin. The edges of the tarp are tied down to the truck. When the truck is at rest the tarp is flat. When it cruises at highway speeds

A) the tarp bows down.

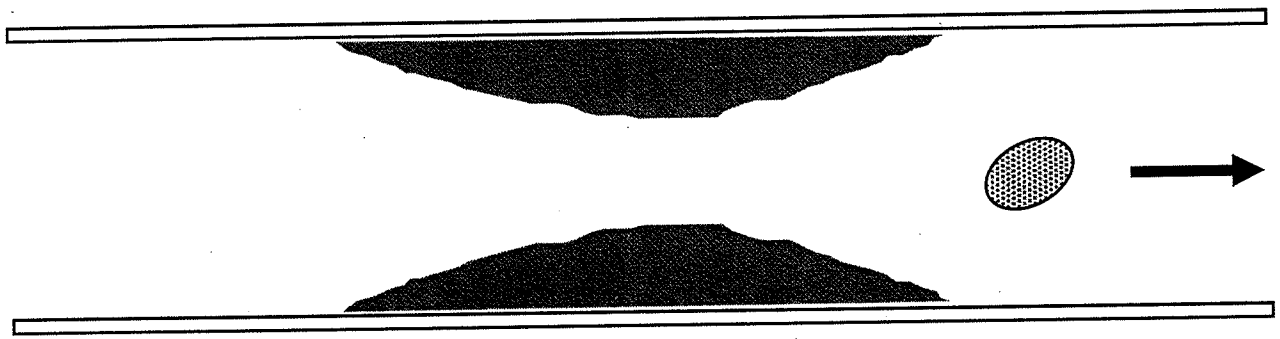
B) the tarp remains flat.

C) the tarp bows up.

(A)

Interactive Question

A blood platelet drifts along with the flow of blood through an artery that is partially blocked by deposits. As the platelet moves from the narrow region to the wider region, it experiences?



A) an increase in pressure.
B) no change in pressure.
C) a decrease in pressure.

Problem: If air moves over the top of an airplane wing at 250 m/s and under the bottom of the airplane wing at 220 m/s, what is the difference in pressure between the top and bottom of the wing at sea level?

Given $v_t = 250\ m/s$ $\quad \rho_{air} = 1.29\ kg/m^3$

$v_b = 220\ m/s$

Want $P_b - P_t$

$$P_t + \frac{1}{2}\rho_{air} v_t^2 = P_b + \frac{1}{2}\rho_{air} v_b^2$$

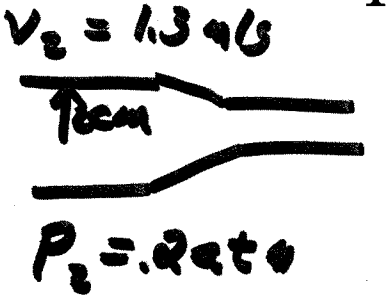
$$P_b - P_t = \frac{1}{2}\rho_{air} v_t^2 - \frac{1}{2}\rho_{air} v_b^2$$

$$= \frac{1}{2}\rho_{air}(v_t^2 - v_b^2)$$

$$= \frac{1}{2}(1.29\ kg/m^3)((250\ m/s)^2 - (220\ m/s)^2)$$

$$= \underline{9100\ Pa}$$

Problem: A water pipe has water flowing at 1.30 m/s in a region where the radius of the pipe is 2.00 cm at a fluid pressure of 0.200 atm. What is the fluid pressure at a point where the pipe narrows to a radius of 1.00 cm?



want

$$P_1 + \frac{1}{2}\rho v_1^2 = P_2 + \frac{1}{2}\rho v_2^2$$

$$P_1 = P_2 + \frac{1}{2}\rho v_2^2 - \frac{1}{2}\rho v_1^2$$

$$P_2 + \frac{1}{2}\rho(v_2^2 - v_1^2)$$

need v_1

continuity equation

$$A_1 v_1 = A_2 v_2$$

$$\pi r_1^2 v_1 = \pi r_2^2 v_2$$

$$v_1 = \frac{r_2^2}{r_1^2} v_2$$

$$v_1 = \frac{(2\text{cm})^2}{(1\text{cm})^2}(1.3\text{ m/s})$$

$v_1 = 4 \cdot 1.3\text{ m/s} = 5.2\text{ m/s}$

$= (0.2\text{atm}) + \frac{1}{2}(1000\text{kg/m}^3)[(1.3\text{m/s})^2 - (5.2\text{m/s})^2]$

$= 0.2\text{atm} - 12675\text{ N/m}^2$

$P_1 = 0.2\text{atm} - .125\text{atm} =$ **.075 atm**

$$\frac{12675\text{ Pa}}{1.013\times10^5\text{ Pa}} \Big| \frac{1\text{ atm}}{} = .125\text{ atm}$$