

• **Zakon o ohranitvi mase-pretok**

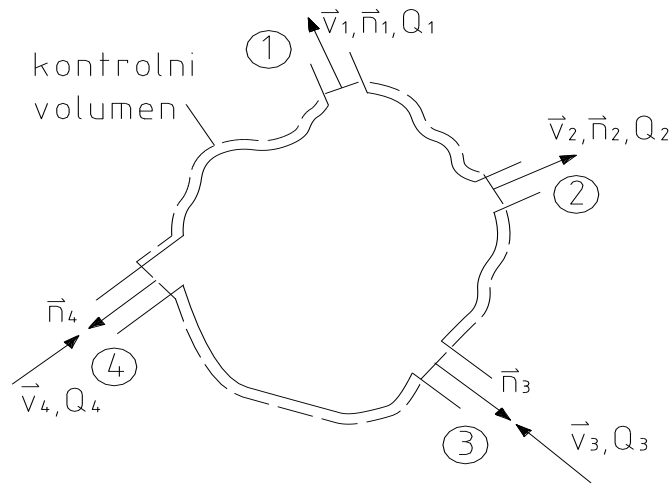
$$\int_A \rho(\vec{v}\vec{n})dA = 0 \Rightarrow \sum_i \rho(\vec{v}_i\vec{n}_i)A_i = 0$$

• **Volumski pretok**

$$Q = \int_A \vec{v}\vec{n}dA$$

Za $\rho = \text{konst.}$ velja:

$$v_1 A_1 = v_2 A_2$$



• **Zakon o ohranitvi gibalne količine**

$$\vec{R} = \int_A p\vec{n}dA + \int_A \rho\vec{v}(\vec{v}\vec{n})dA - \int_V \rho\vec{f}_m dV$$

Po komponentah in z zanemarjeno masno silo:

$$R_x = \int_A p n_x dA + \int_A \rho v_x (\vec{v}\vec{n})dA$$

$$R_y = \int_A p n_y dA + \int_A \rho v_y (\vec{v}\vec{n})dA$$

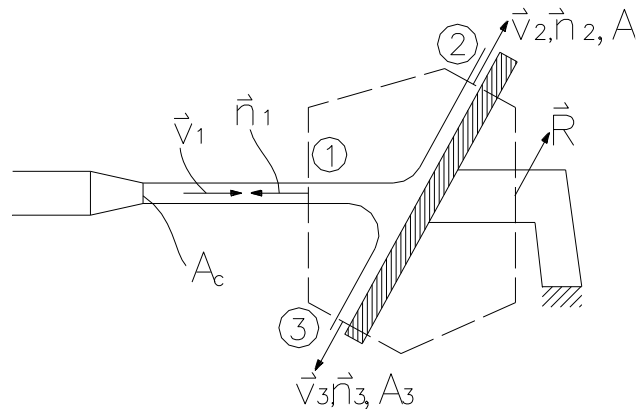
Sila na oviro:

$$\vec{F} = -\vec{R}$$

Za cev:

$$\vec{R} = \int_A \rho\vec{v}(\vec{v}\vec{n})dA + \int_A p^N \vec{n}dA - \int_V \rho\vec{f}_m dV$$

$$\int_V \rho\vec{f}_m dV = m\vec{g}$$



• **Zakon o ohranitvi energije**

Bernoullijeva enačba

Za $\rho = \text{konst.}$:

$$\frac{\rho v_1^2}{2} + p_1 + \rho g z_1 = \text{konst.} = \frac{\rho v_2^2}{2} + p_2 + \rho g z_2$$

Bernoullijeva enačba z upštevanjem izgub in črpalke:

$$\frac{\rho v_1^2}{2} + p_1^n + \rho g z_1 + h_\epsilon = \frac{\rho v_2^2}{2} + p_2^n + \rho g z_2 + h_{izg}$$

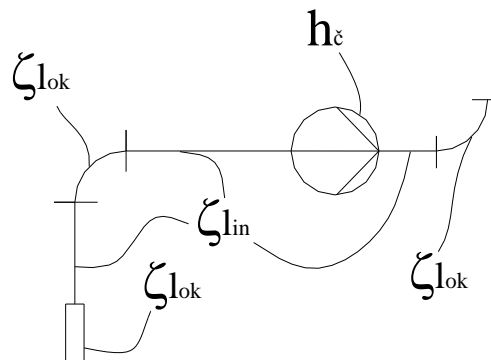
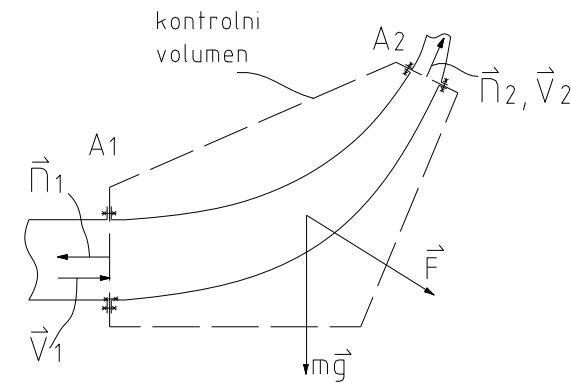
$$P_\epsilon = P_{em} \eta = \Delta p Q = \rho g h_\epsilon Q$$

Izgube za več premerov:

$$h_{izg} = \sum \frac{v^2}{2g} (\zeta_{lin} + \zeta_{lok}) = \sum \frac{v^2}{2g} \left(\lambda \frac{l}{d} + \zeta_{lok} \right)$$

$$Re = \frac{v d_n}{\nu}$$

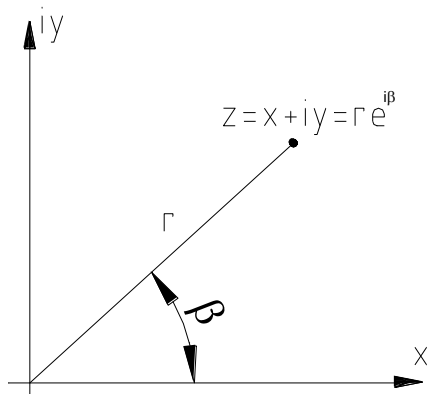
$$\lambda = \lambda \left(Re, \frac{\epsilon}{d} \right) \Rightarrow \text{diagram}$$



• **Kompleksni potencial**

Zapis kompleksnega števila:

$$z = x + iy = r(\cos \beta + i \sin \beta) = re^{i\beta}$$



Kompleksni potencial w:

$$w = \varphi + i\psi; \psi = konst. \rightarrow \tilde{v} = 0$$

Hitrost:

$$\tilde{v} = \frac{dw}{dz} = v_x - iv_y$$

$$v_x = \frac{\partial \varphi}{\partial x} = \frac{\partial \psi}{\partial y}$$

$$v_y = \frac{\partial \varphi}{\partial y} = -\frac{\partial \psi}{\partial x}$$

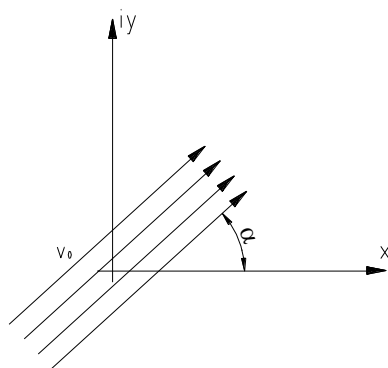
Vsota potencialov:

$$w = \sum_K w_K$$

Vsota hitrosti:

$$\tilde{v} = \sum_K \tilde{v}_K$$

Potenciali in hitrosti za različne primere:



- Paralelni tok:

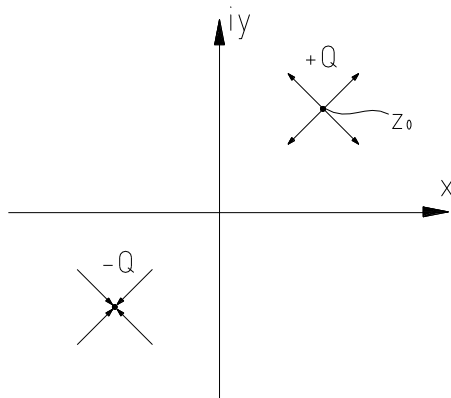
$$w = zv_0 e^{-i\alpha} = v_0 z (\cos \alpha - i \sin \alpha)$$

$$\tilde{v} = v_0 e^{-i\alpha} = v_0 (\cos \alpha - i \sin \alpha)$$

- Izvor, ponor:

$$w = \pm \frac{Q}{2\pi} \ln(z - z_0)$$

$$\tilde{v} = \pm \frac{Q}{2\pi} \frac{1}{z - z_0}$$



- Cirkulacija:

$$w = \mp \frac{i\Gamma}{2\pi} \ln(z - z_0)$$

$$\tilde{v} = \mp \frac{i\Gamma}{2\pi} \frac{1}{z - z_0}$$

Za $\overset{\Gamma}{\curvearrowright}$ je v enačbi -.

Za $\overset{\Gamma}{\curvearrowleft}$ je v enačbi +.

