

Mavzu:

Suyuqlik
mehanikasining
elementlari

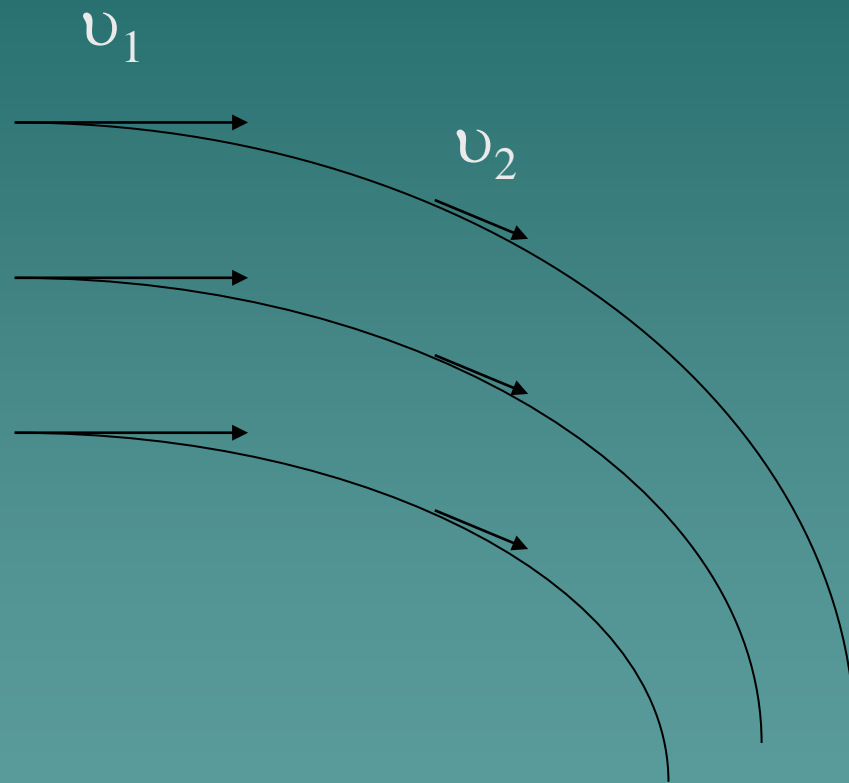
◆ Reja:

1) Oqim chiziqlari, oqim nayi

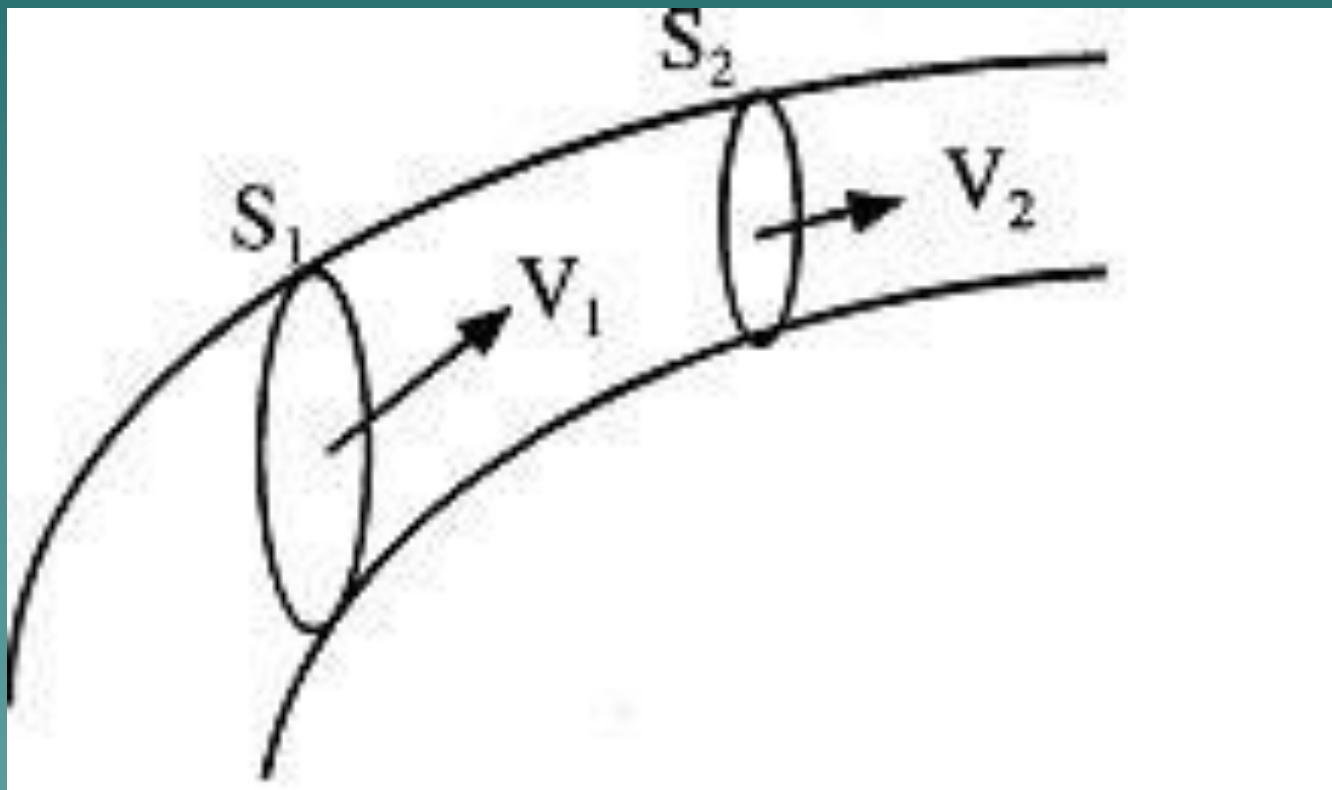
◆ 2) Uzuliksizlik tenglamasi

3) Bernuli tenglamasi

OQIM CHIZIQLARI



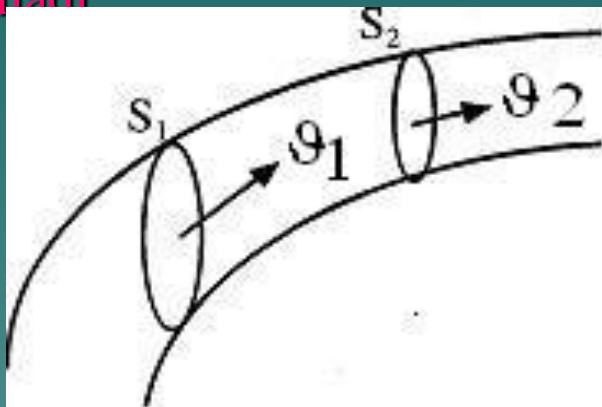
Oqim nayi



Oqim nayi (Оқим найи)

Suyuqlikning Ikki oqim chiziqlari bilan chegaralangan qismiga oqim nayi deyiladi.

Agar vaqt otishi bilan oqim chiziqlarning joylanishi yoki shakli va uning har bir nuqtasidagi tezligi ozgarmasa bunday suyuqlik stasionar suyuqlik deyiladi



$$m_1 = \rho V_1$$

$$m_2 = \rho V_2$$

$$m_1 = m_2$$

$$\rho V_1 = \rho V_2$$

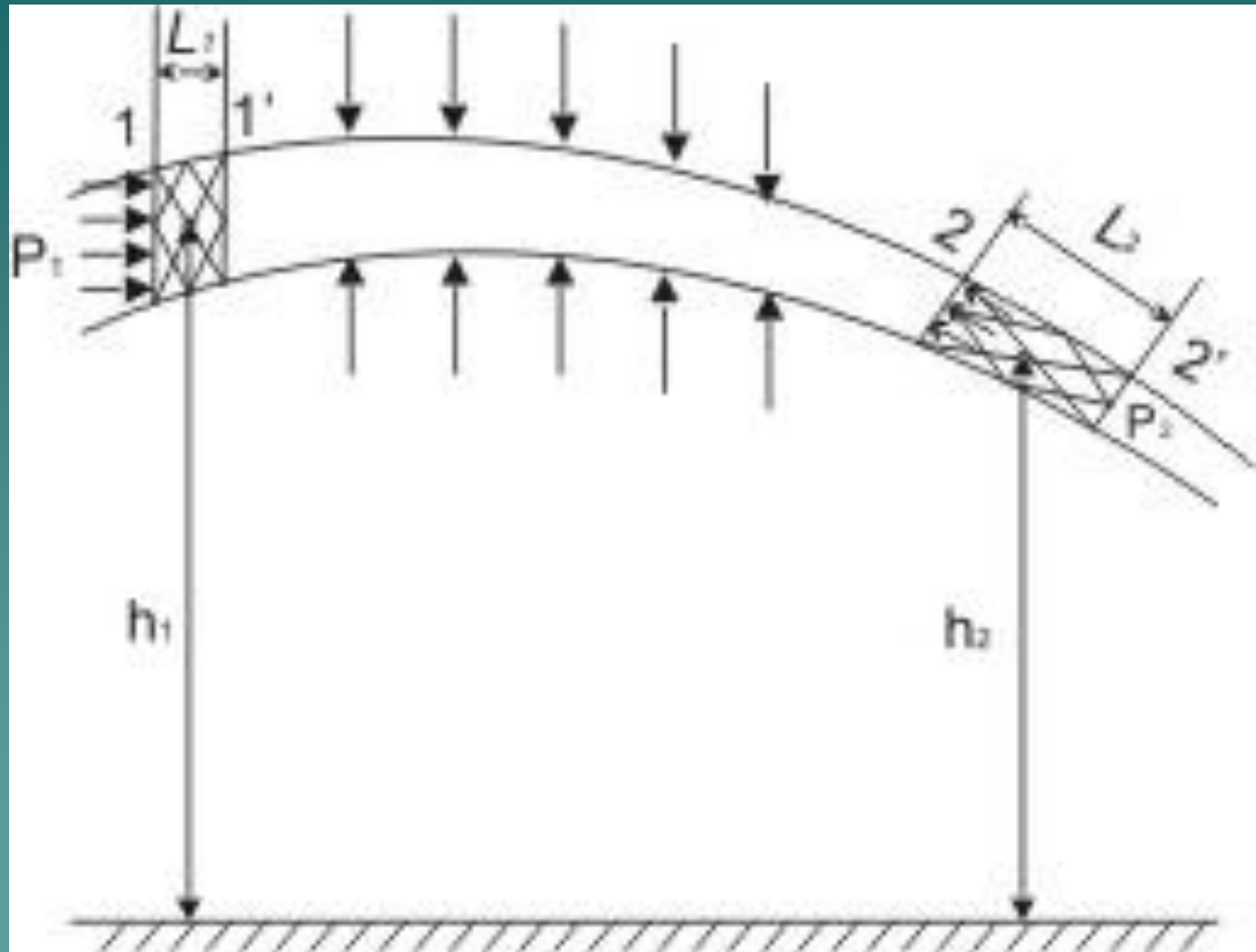
$$V_1 = V_2$$

$$S_1 v_1 = S_2 v_2$$

$$V = S l = S v t$$

Uzilmaslik tenglamasi

Bernuli tenglamasi



Bernuli tenglamasi

Energiyaning saqlanish qonuniga asosan tuliq energiyaning o'zgarishi tashqi kuch tasirida m massali suyuqlikni ko'chirishda bajarilgan ishga teng bo'ladi. $E_2 - E_1 = A$

Ikkinchi tomondan S_1 va S_2 ko'ndalang kesimlar orasidagi m massali suyuqlikni ko'chirilishda bajarilgan ish $A = F_1 L_1 + F_2 L_2$ Bu erda $F_1 = P_1 S_1$ va $F_2 = -P_2 S_2$ manfiy ishora kuchning suyuqlik oqimiga qarshi yunalganligini bildiradi.

Tuliq energiya kinetik va potensial energiyalarning yig'indisiga tengdir.

$$E_1 = \frac{m\mathcal{G}_1^2}{2} + mgh_1 \qquad E_2 = \frac{m\mathcal{G}_2^2}{2} + mgh_2$$

Bu formulalarni yuqoridagi formulalarga qo'ysak quyidagi tenglamani hosil qilamiz.

$$\frac{m\mathcal{G}_1^2}{2} + mgh_1 + p_1V = \frac{m\mathcal{G}_2^2}{2} + mgh_2 + p_2V$$

Bu formulani hajmga bo'lsak va massani hajmga nisbati zichlik ekanligini hisobga olsak ($\rho=m/v$), quyidagi tenglama kelib chiqadi.

$$\frac{\rho\mathcal{G}_1^2}{2} + \rho gh_1 + p_1 = \frac{\rho\mathcal{G}_2^2}{2} + \rho gh_2 + p_2$$

$$\frac{\rho\mathcal{G}^2}{2} + \rho gh + p = \text{const}$$

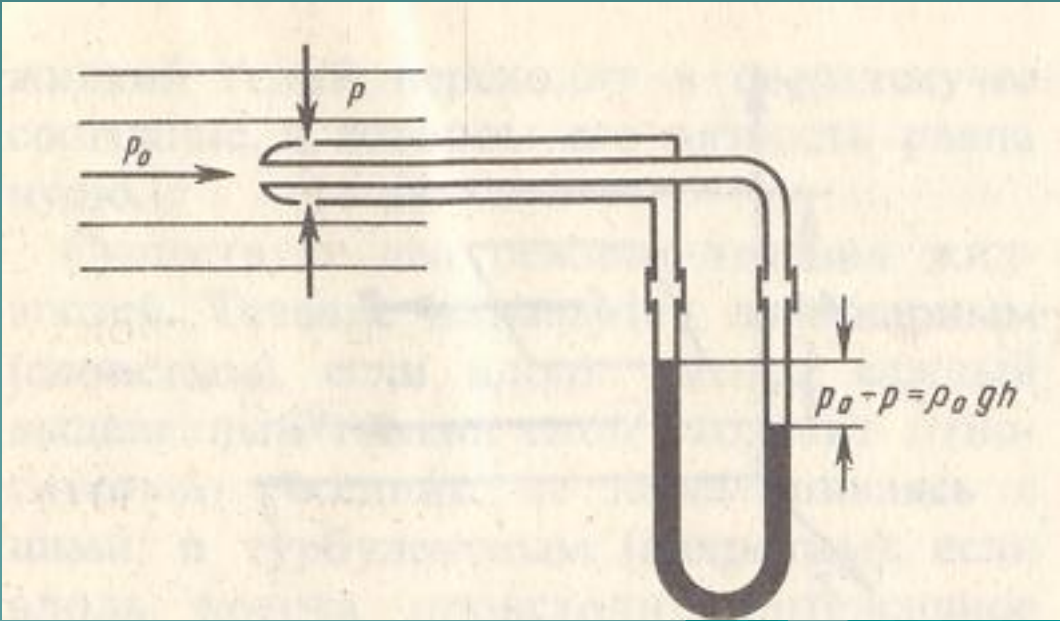
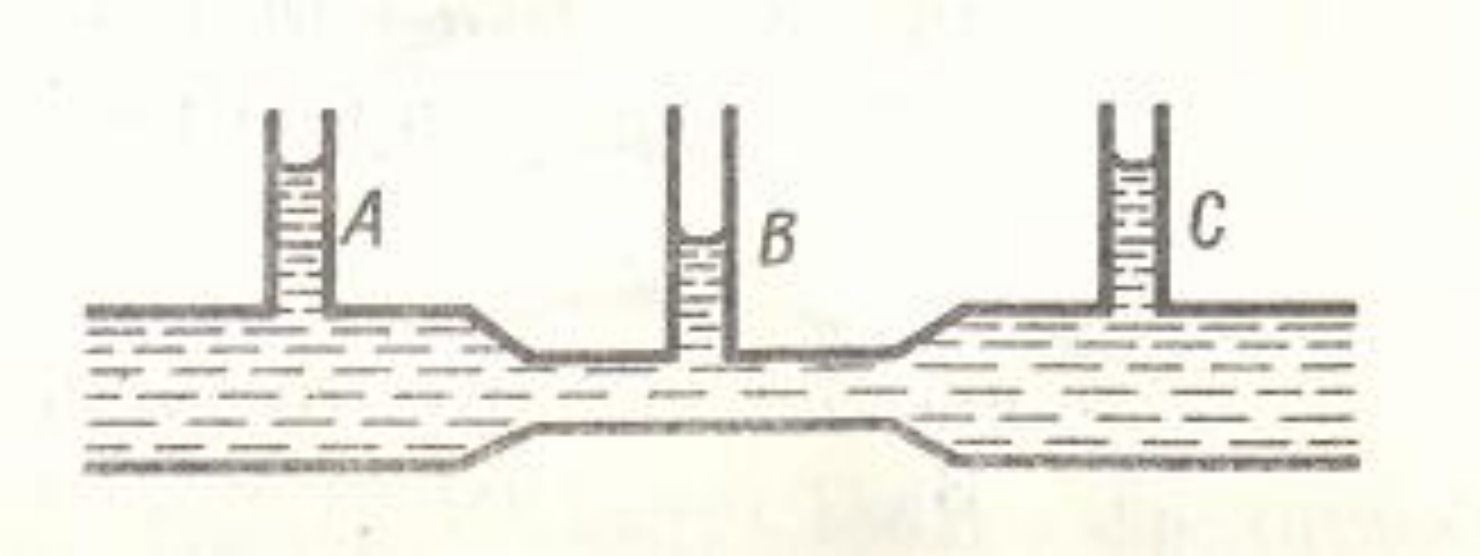
tenglamasidir.

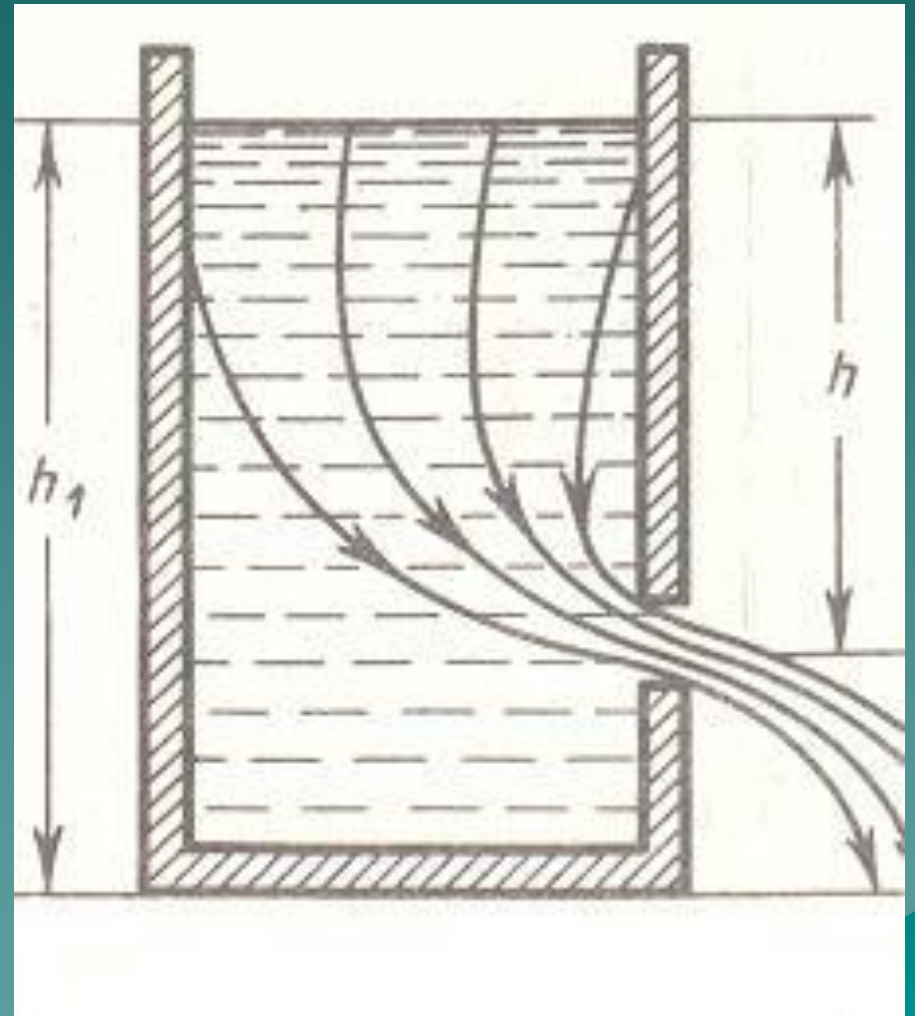
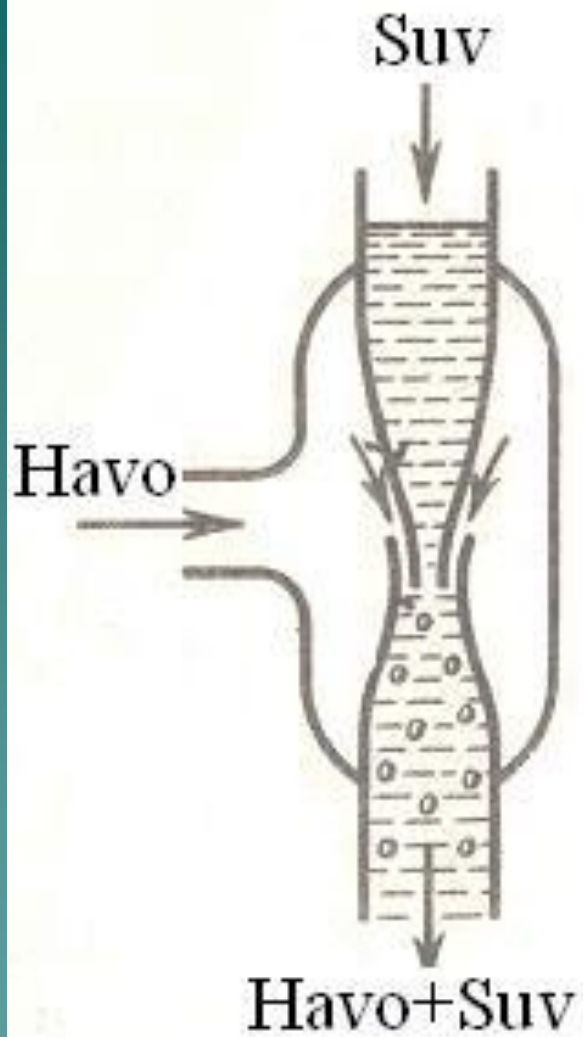
Bu tenglama BERNULLI

Bernulli tenglamasi: $\frac{\rho v^2}{2}$ - gidrodinamik bosim

ρgh - gidrostatik bosim

p - statik bosim





Laminar oqim

Suyuqlikning oqim chiziqlari qatlam-qatlam bolib bir biriga aralashmasa, bunday oqim laminar oqim deyiladi.

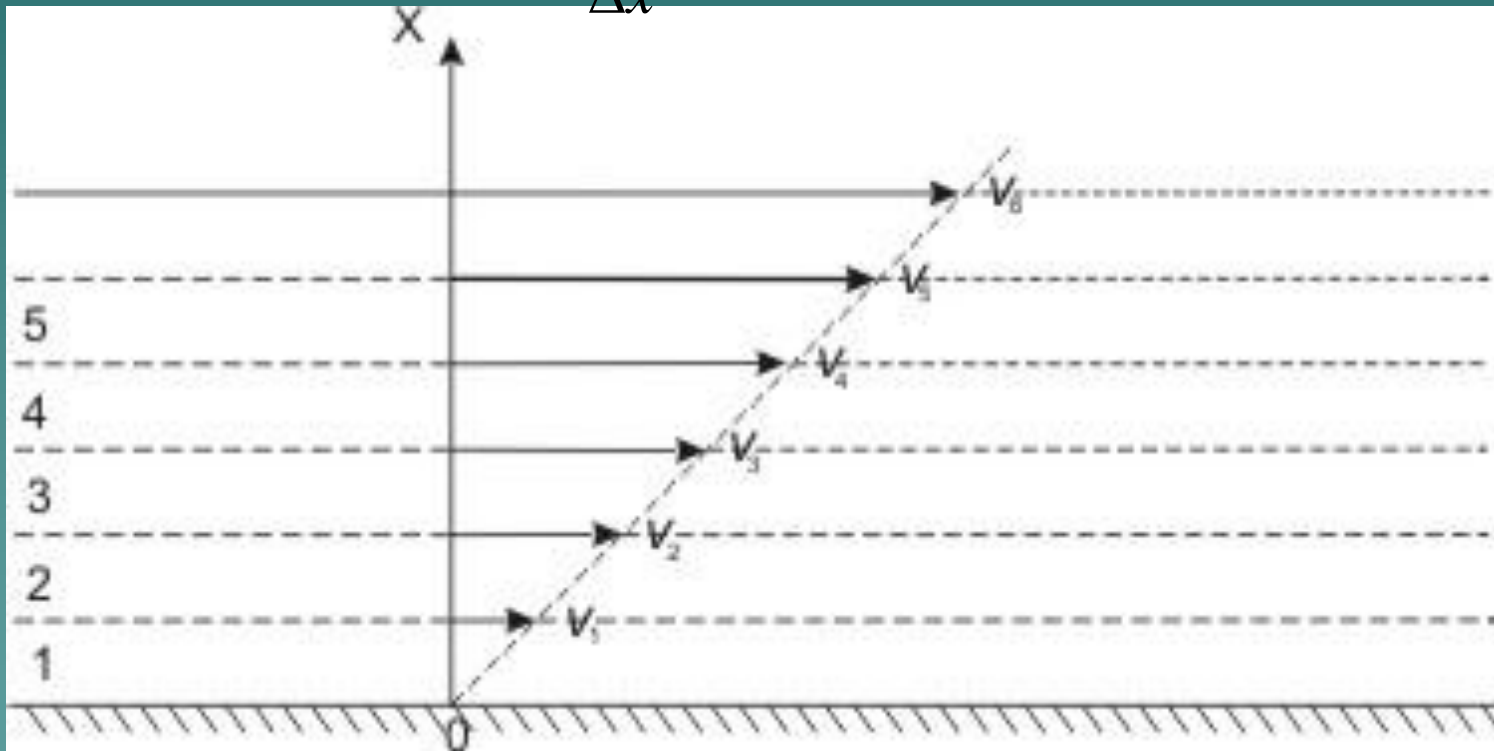


$$\frac{\Delta v}{\Delta x} \text{ -tezlik gradienti}$$

Suyuqlikni qovushoqligi

$$F = \eta s \frac{\Delta \mathcal{G}}{\Delta x}$$

$;\frac{\Delta \mathcal{G}}{\Delta x}$ - Tezlik gradiyenti



Ichki ishqalanish kuchlari

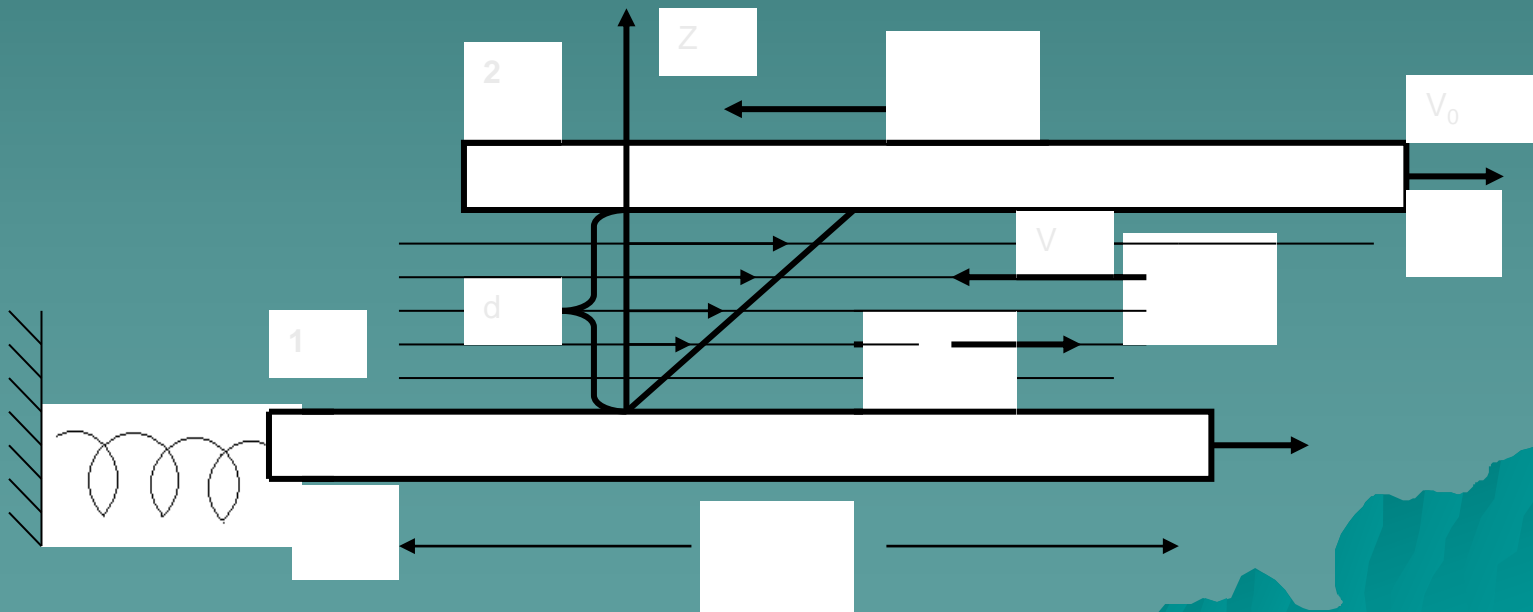
$$f_{\text{ишк}} = \eta \frac{v_0}{d} S$$

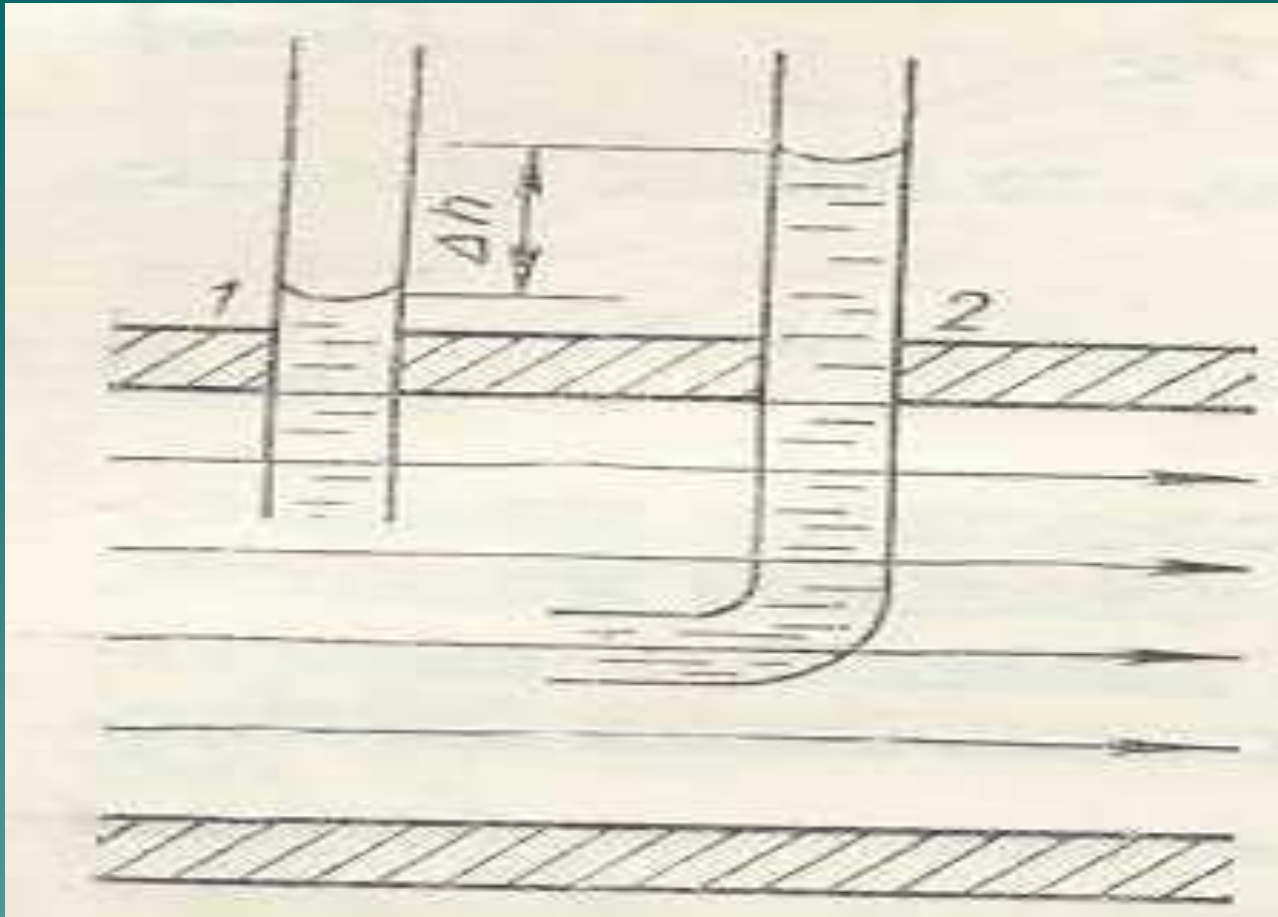
η – ichki ishqalanish koeffitsenti

V_0 - plastinkaning tezligi

d - plastinkalar orasidagi masofa

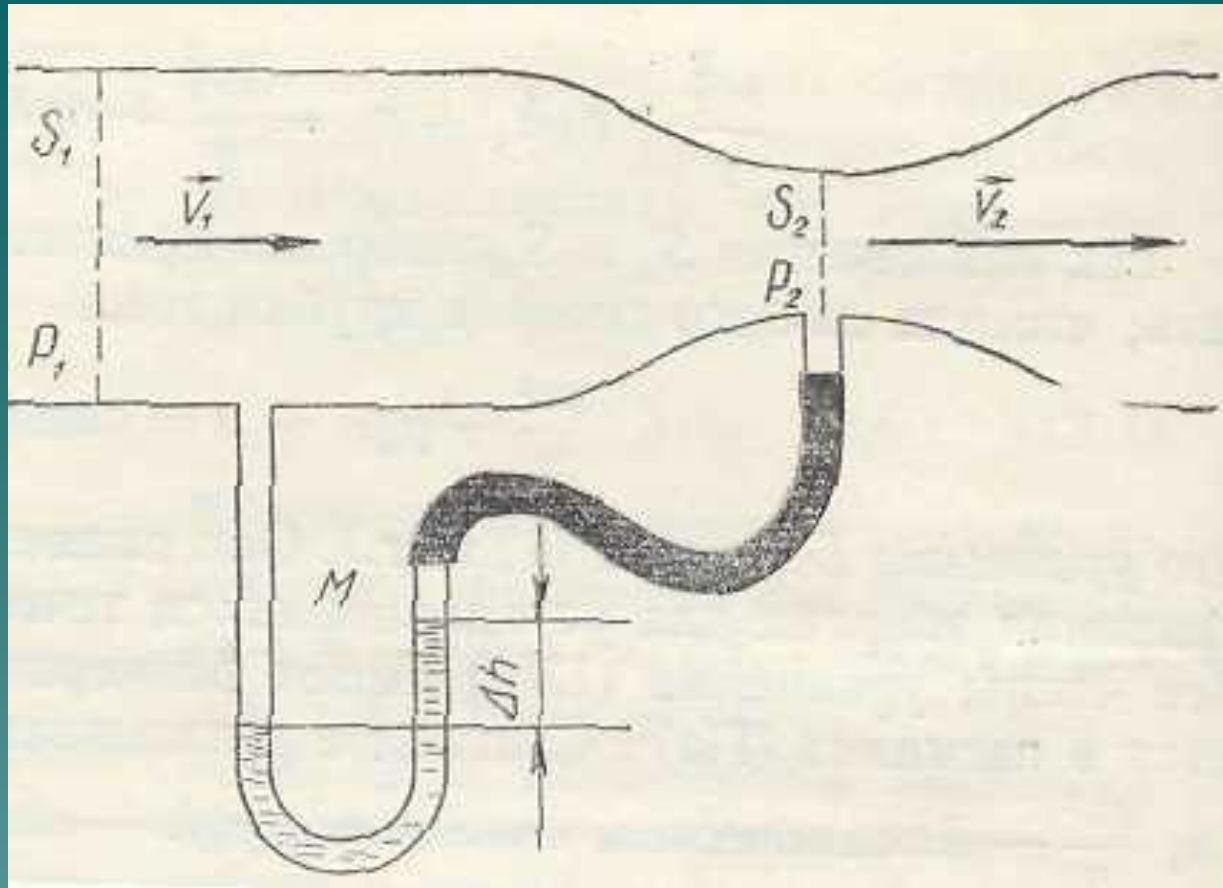
S - plastinka yuzasi





$$v = \sqrt{2g \cdot \Delta h}$$

Suyuqlikning tezligini o'lchovchi asbob



$$Q = S_1 v_1 = S_1 S_2 \sqrt{\frac{2\Delta\rho}{\rho(S_1^2 - S_2^2)}}$$

Suyuqlikning sarfini o'lchovchi asbob

