Net positive suction head (NPSH) :-

it is the energy available with water at inlet to the ~~pot~~ pump in the form of head which can be utilised in the form of suction height.

$$\left.\frac{P_1}{\rho g}\right|_{min} > \frac{P_v}{\rho g} \quad \text{(to avoid cavitation)}$$

☆ $$\boxed{NPSH = \frac{P_1}{\rho g} - \frac{P_v}{\rho g}} \ m$$

{ Submerged pump in borwall & coolar

Area affected by cavitation :-

* In Reaction turbine: At exit of runner or entry to draft tube.

* In Centrifugal pump: At the entry to impeller or pump.

Thoma's cavitation Factor (σ)

$$\sigma = \frac{NPSH}{H} = \frac{\frac{P_1}{\rho g} - \frac{P_v}{\rho g}}{H}$$

H → Pump (Manometric head)

H → turbine (H = Net head)

$$\sigma = \frac{H_{atm} - h_s - h_f - h_v}{H}$$

$$\sigma = \frac{\frac{P_{atm}}{\rho g} - h_s - h_f - \frac{P_v}{\rho g}}{H}$$

σ_c = critical Factor

$\sigma > \sigma_c$ (No. Cavitation)

$\sigma < \sigma_c$ (cavitation)

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$H = 150\ m \qquad Q = 0.2$

$N_s = 30$

$N = 1450$

$$N_s = \frac{N\sqrt{Q}}{(H)^{3/4}}$$

$$30 = \frac{1450\sqrt{0.2}}{(H)^{3/4}}$$

$H = 60.211$ for each pump

$(H_m)_{total} = n \times (H_m)$

$150 = n \times 60.21$

$n = 2.49$

$n \simeq 3$ pump

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$Q = 0.10\ m^3/s \qquad H = 30 m$

$\sigma_c = 0.12$

$P_{atm} = 96\ KPa$

$P_v = 3\ KPa \qquad h_f = 0.3$

$$0.12 = \frac{\frac{96 \times 1000}{1000 \times 9.79} - h_s - 0.3 - \frac{3 \times 1000}{1000 \times 9.79}}{30}$$

$3.6 = 9.805 - h_s - 0.3 - 0.3064$

$h_s = 5.59\ m$

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$$\frac{^{3}\cancel{0.15}}{_{2}\cancel{100}} = \frac{9 - 1 - h_s}{\cancel{40}_{2}}$$

$$6 - 9 + 1 = -h_s$$

$$h_s = 2$$

$\sigma_c = 0.15$

$H_{atm} = 9$

$H_m = 40.$

$H_v = 1$

$h_s = ?$

$$\Rightarrow \quad \sigma_c = \frac{H_{atm} - h_s - \cancel{h_f}^{0} - H_v}{H_m}$$

$$0.15 = \frac{9 - h_s - 1}{40}$$

$$h_s = 2\ m$$