Επιμέλεια Π.Π.Π

Δεδομένα: $Q^{\text{εκαθρού}}_{max} = 20\ m^3/sec$

$H_\eta = 80\ m$

$Q^{\text{εκαθρού}}_{min} = 4\ m^3/sec$

Ζητούνται: α) Αριθμός κ τύπος στροβίλων β) η γ) H_s δ) D_3

Λύση: α) 2 μονάδες Francis ώστε

$Q^{\text{μονάδα}}_{max} = 10\ m^3/sec \rightsquigarrow Q^{\text{μον.}}_{min} = 0{,}4\, Q^{\text{μον}}_{max} = 4\ m^3/sec$

β) $n_s \le \frac{20.000}{H+20} + 30 = \frac{20.000}{80+20} + 30 = \underline{230}$

$n_s = \frac{n\sqrt{N}}{H^{5/4}}$

$N = \frac{\gamma H Q}{102}\eta_\varepsilon = 9{,}81\, Q H \eta_\varepsilon = 9{,}81 \cdot 10 \cdot 80 \cdot 0{,}89 =$

$= 6985\ KW$

$n \le \frac{n_s H^{5/4}}{\sqrt{N}} = \frac{230 \times 80^{5/4}}{\sqrt{6985}} = 658{,}4$

$n = \underline{600\ rpm}$

γ) $\sigma_{cr} = 7{,}54 \times 10^{-5}\, n_s^{1.41}$

$n_s = 230\,\frac{600}{658{,}4} = 209{,}53$

$\sigma_{cr} = 7{,}54 \times 10^{-5} \times 209{,}53^{1.41} = 0{,}14136$

$\sigma_{plant} > \sigma_{cr}$

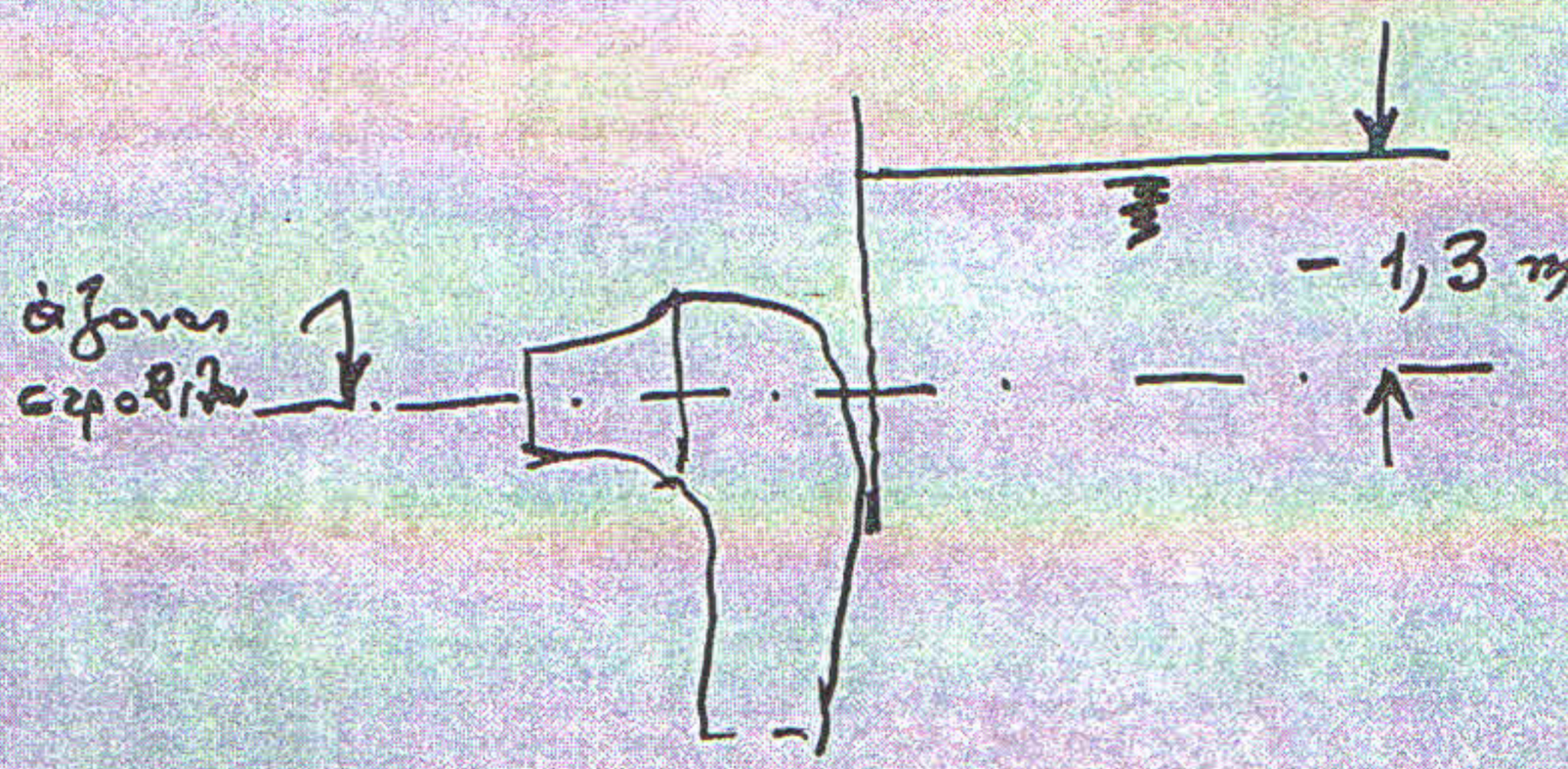
$\frac{H_B - H_v - H_s}{H(=80m)} > 0{,}14136$

$H_B - H_v \sim 10\ m$

$$10 - H_s > 0,14136 \times 80 = 11,3$$

$$H_s < 10 - 11,3$$

$$H_s < \underline{-1,3\ m}$$



8) Από Fig. 6 $K_\psi = 0,84$ (συμπίωση Δ. Καρρίερη)

για $\eta_s = 209,53$

$$D_3 = \frac{84,5\ K_\psi \sqrt{H_n}}{\eta_6} =$$

$$= \frac{84,5 \times 0,84 \sqrt{80}}{600} = \underline{1,058\ m}$$

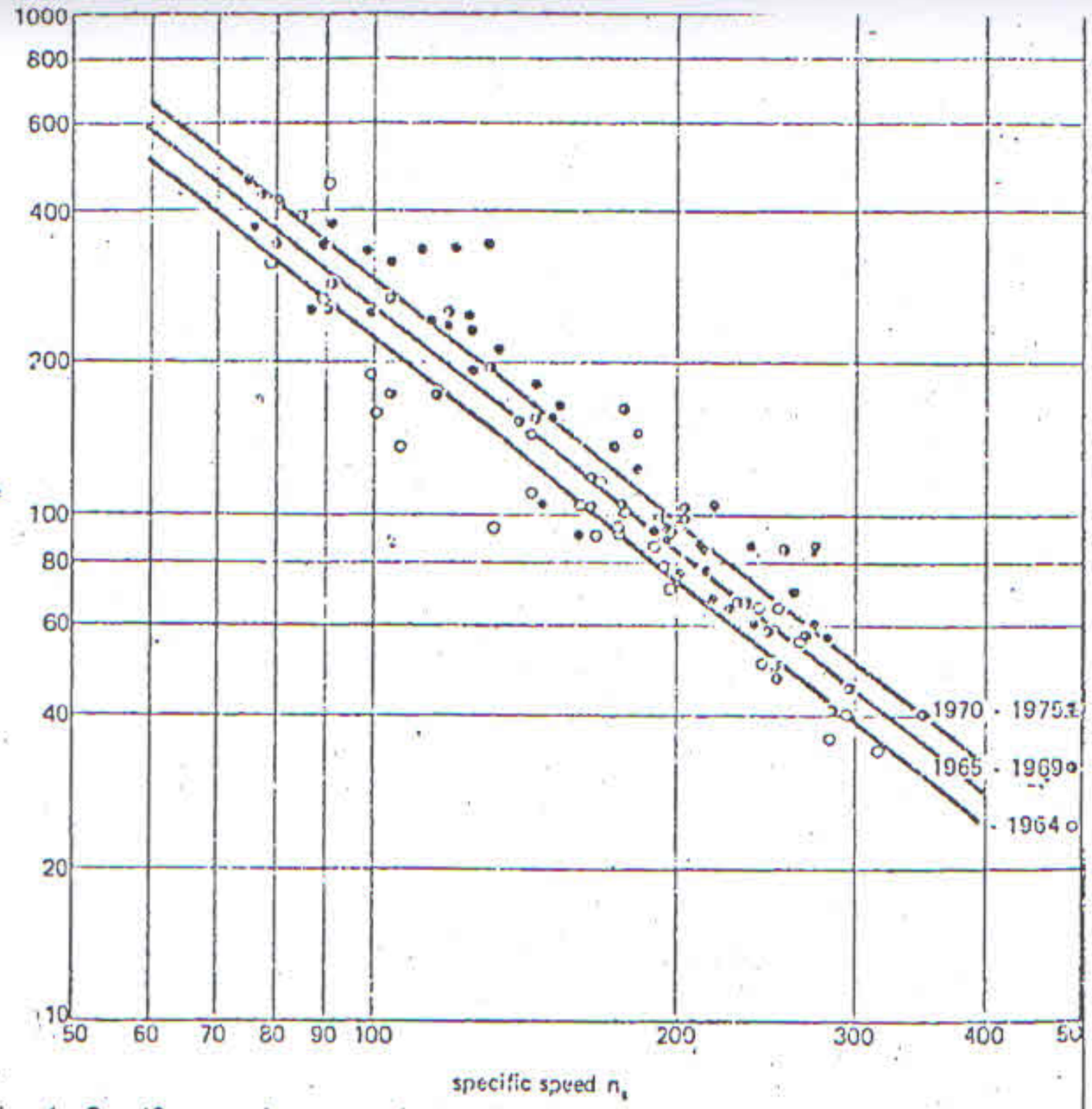


Fig. 1. Specific speed versus design head. The curves indicate that over a perio extending from some time before 1964 to the present there has been a trend to increas the value of the specific speed for a given head.

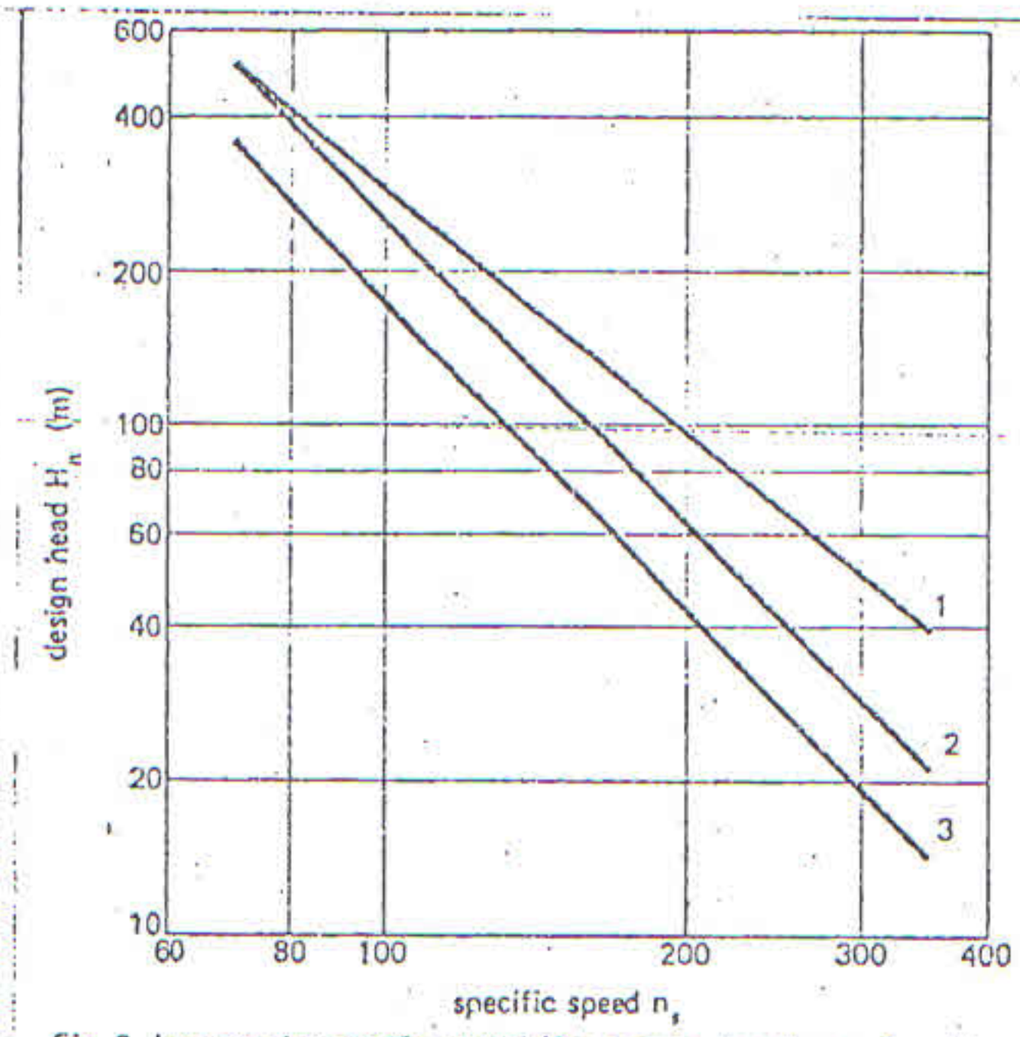
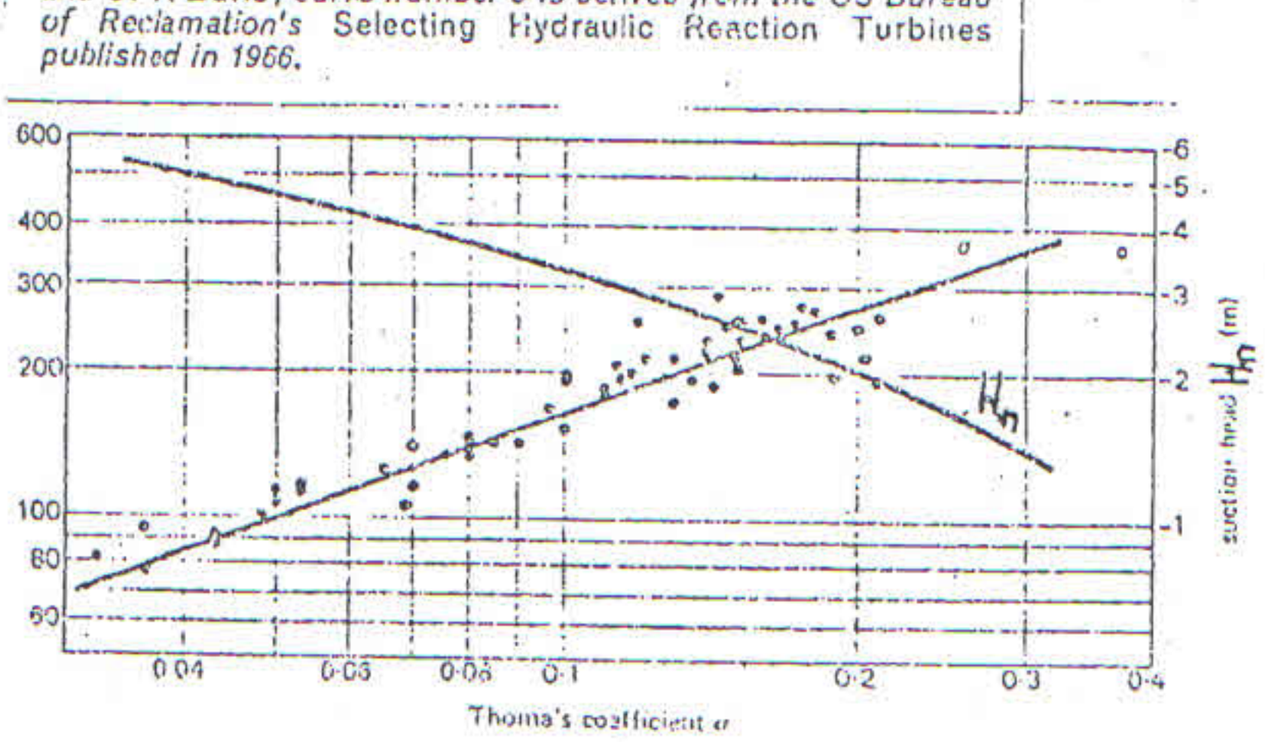


Fig. 2. Increase in specific speed (for a given head) as a function of the period of design. The relationship denoted by (1) is derived from Fig. 1; curve number 2 is derived from Handbook of Applied Hydraulics *published in 1969 and written by Sorensen, K. E. and C. V. Davis; curve number 3 is derived from the US Bureau of Reclamation's* Selecting Hydraulic Reaction Turbines *published in 1966.*



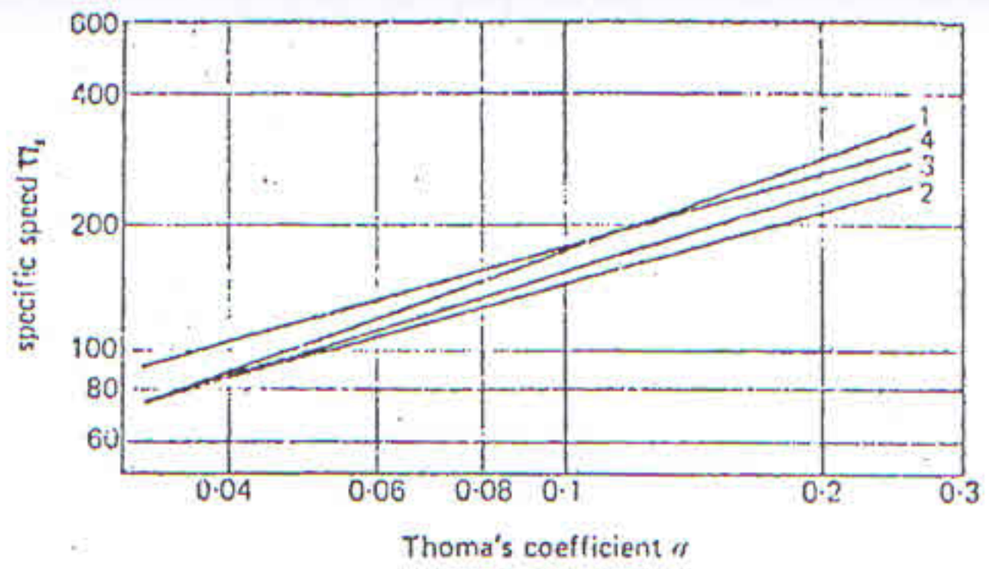


Fig. 4. Cavitation (Thoma's) coefficient decrease as a function of the period of design. The curve denoted by (1) is derived from Fig. 3; curves 2 and 3 are derived from the same sources as curves 2 and 3 in Fig. 2; curve 4 is derived from Turbines hydrauliques et leur regulation *published in 1966 and written by L. Vivier.*

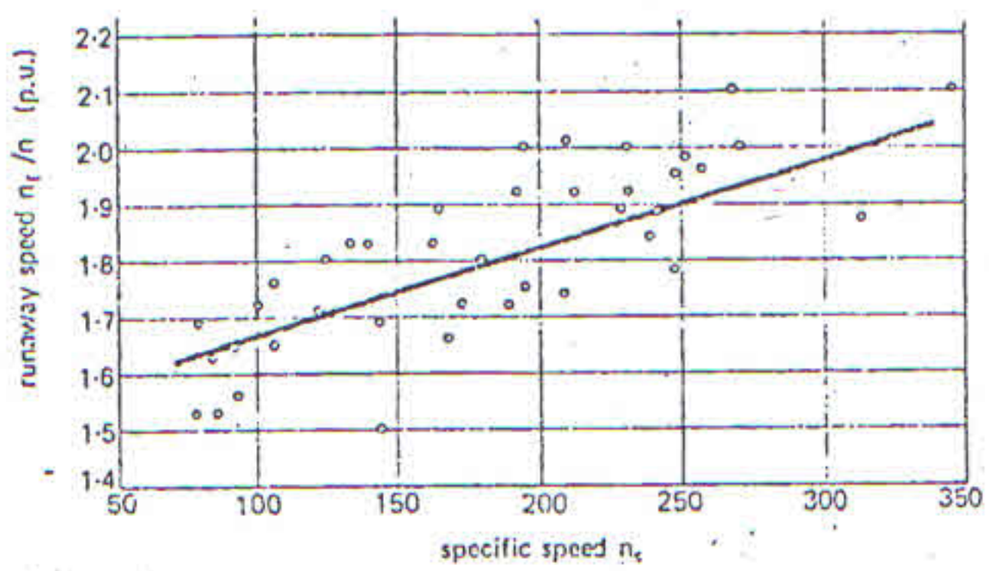
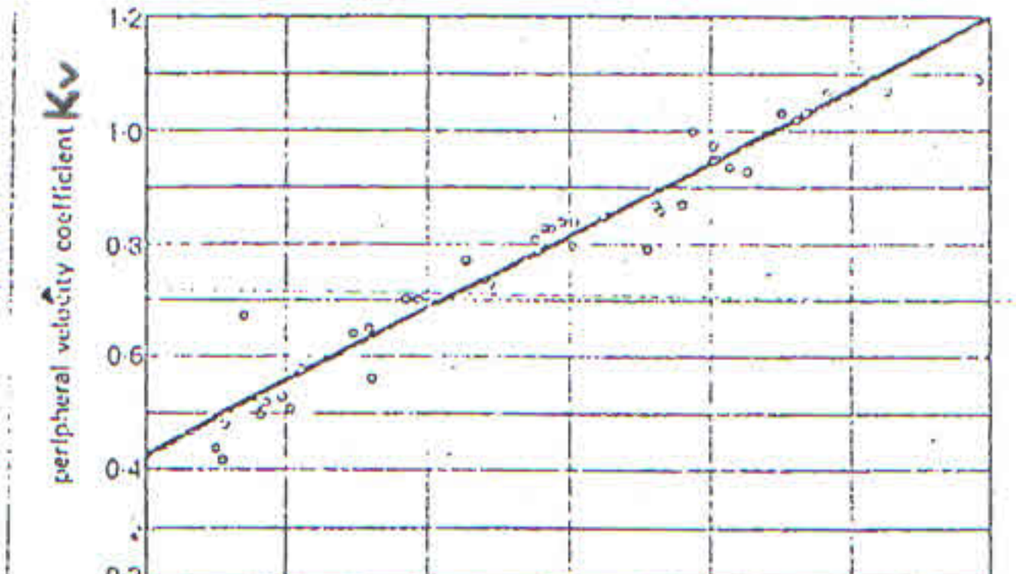


Fig. 5. Ratio between runaway and rated speed versus specific speed. The design of the associated generator depends on the rated speed n.



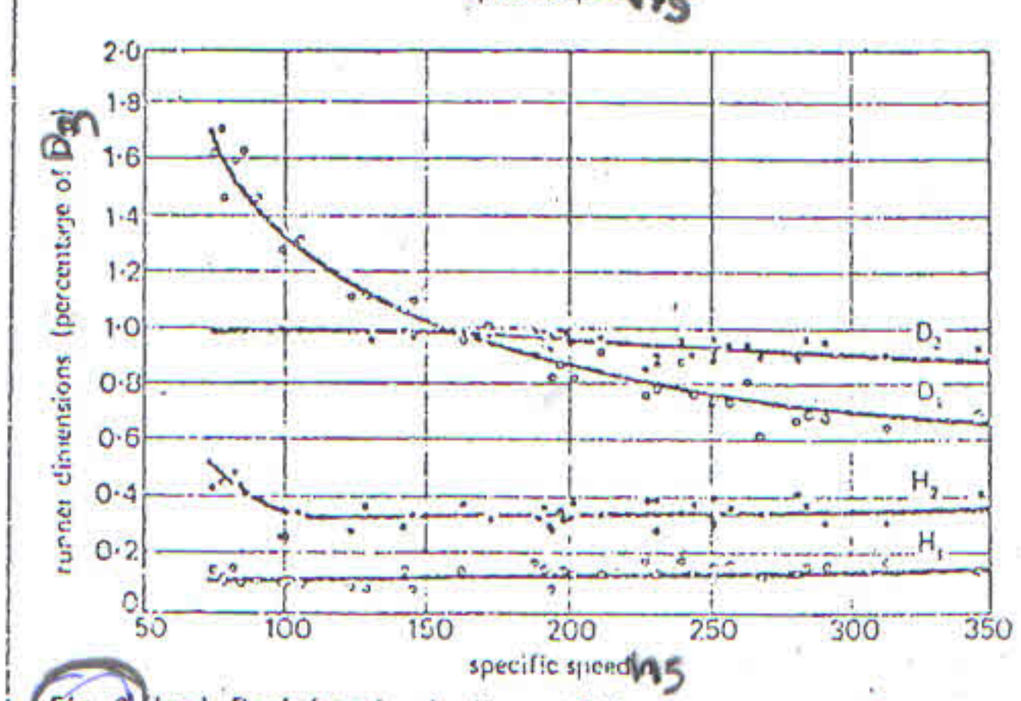


Fig. 6 (top). Peripheral velocity coefficient versus specific speed, and (bottom) main runner dimensions versus specific speed.

Fig. 3. Cavitation (Thoma's) coefficient and suction head versus specific speed. The rate of change of suction head against specific speed is shown for the period 1970 to 1975, and is seen to vary between —1 to —5m in the range considered.