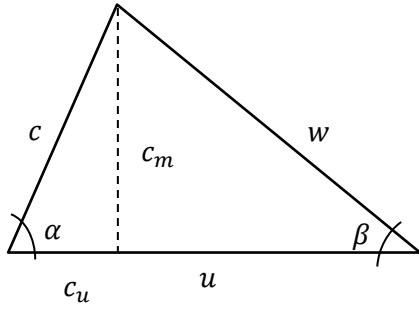


Triángulos de velocidades



$$c_u = c \cos \alpha$$

$$c_m = c \sin \alpha$$

$$c = \sqrt{c_u^2 + c_m^2}$$

$$c_u = u - \frac{c_m}{\tan \beta}$$

$$w = c \frac{\sin \alpha}{\sin \beta}$$

$$\eta_i = \frac{P_i}{P}$$

$$\eta_m = \frac{P_a}{P_i}$$

$$\eta_{tot} = \eta_i \eta_m = \eta_h \eta_v \eta_m = \frac{P_a}{P}$$

Altura neta y útil

$$H = H_u + H_{r-int}$$

$$H = \frac{P_E - P_S}{\rho g} + z_E - z_S + \frac{v_E^2 - v_S^2}{2g}$$

$$H = H_b - H_{ra} - H_{ri}$$

Pérdidas, potencias y rendimientos

$$P = Q \rho g H$$

$$P_a = M \omega = 0.1047 n M$$

$$\eta_h = \frac{H_u}{H} = \frac{u_1 c_{1u} - u_2 c_{2u}}{gH}$$

$$\eta_v = \frac{Q - q_e - q_i}{Q}$$