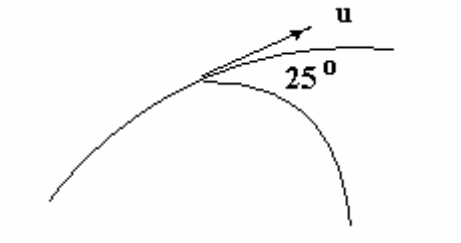
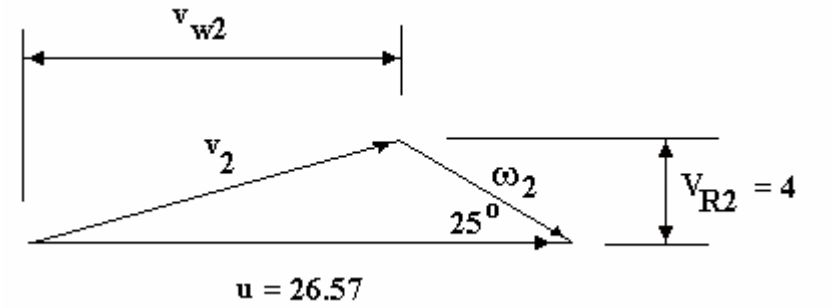
D203 FLUID MECHANICS

Q9 1997

ρ=1000 kg/m^3 Q = 0.11 m^3/s N = 1450 rev/min D_o = 350 mm t_o = 25 mm



$u_2 = \pi$ N D/60 = π x 1450 x 0.35/60 = 26.57 m/s
V_{R2} = Q/(πDt) = 0.11/(π x 0.35 x 0.025) = 4 m/s



V_{w2} = 26.57 – 4 cot(25^o) = 18 m/s
$V_2^2 = 4^2 + 18^2$ V_2 = 18.44 m/s

Manometric head = $h_m = u_2 v_{w2}/g$ = 48.75 m

Kinetic head = $V_2^2/2g$ = 17.33 m

Loss = 65% x 17.33 = 11.26 m
Δh = 48.75 – 11.26 = 37.49 m
Shaft Power = m g h_m + Mechanical Losses

M = 110 kg/s

Mech Loss = 0.18 x 26.57^2/g = 12.95 m

Shaft Power = 110 x 9.81 x (48.75 + 12.95) = 66584 W