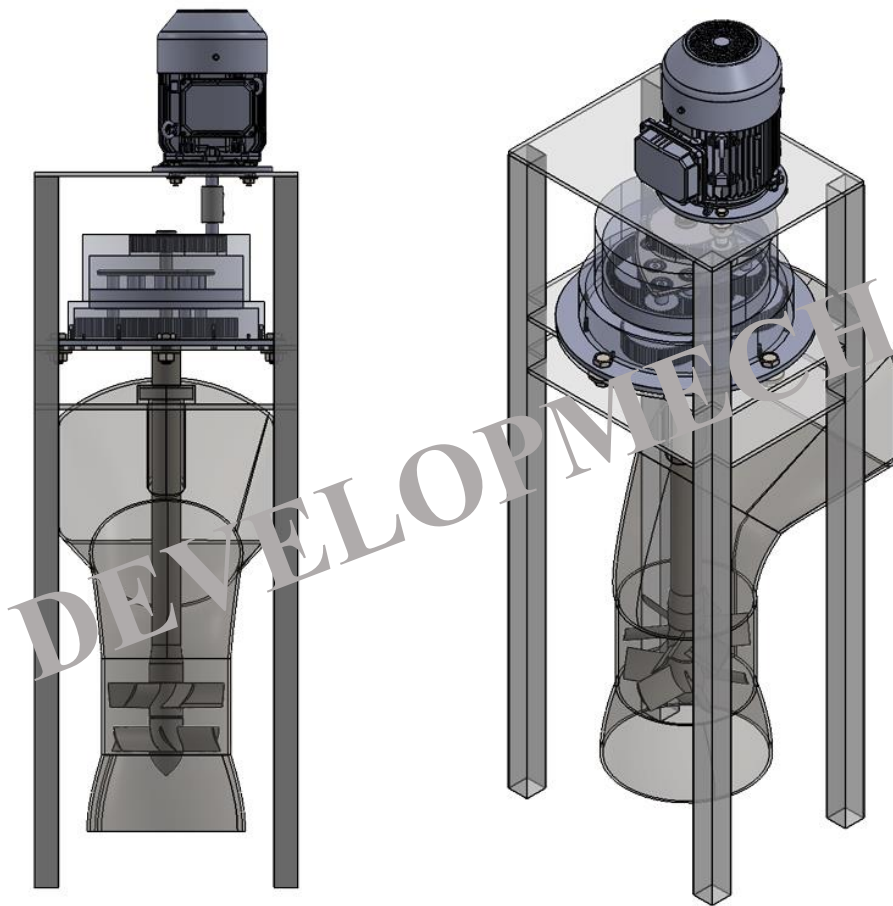


DESIGNING OF A COUNTER ROTATING KAPLAN TURBINE



Mathematical Calculations

Total Power Requirements

- $Power = \rho * g * Q * H * \eta_h$

Total Discharge

- $Q = \frac{\pi}{4} (D_e^2 - D_i^2) V_f$

Turbine Blade Profile

Angular Velocity of the Runner (ω)

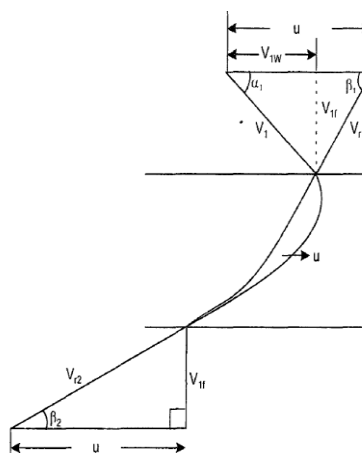
$$\omega = \frac{2\pi N}{60}$$

Blade Vector Velocity (u)

$$u = r * \omega$$

Whirl Velocity (V_{1w})

$$V_{1w} = \frac{g * H * \eta_h}{u}$$



Water entrance angle to the runner blade

$$\alpha_1 = \tan^{-1} \left(\frac{V_f}{V_{1W}} \right)$$

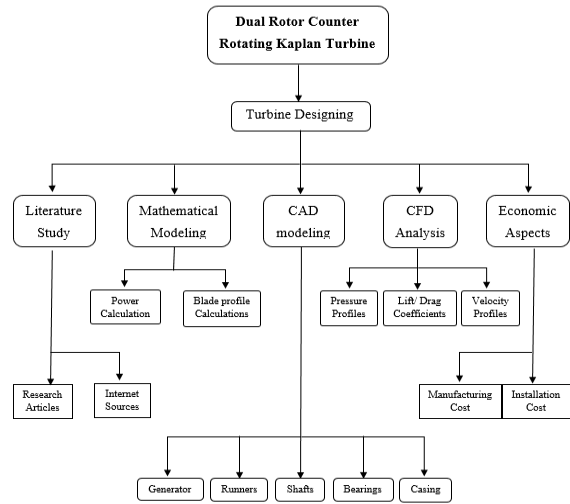
Angle of blade tip at inlet

$$\beta_1 = \tan^{-1} \left(\frac{V_f}{u - V_{1W}} \right)$$

Angle of blade tip at outlet

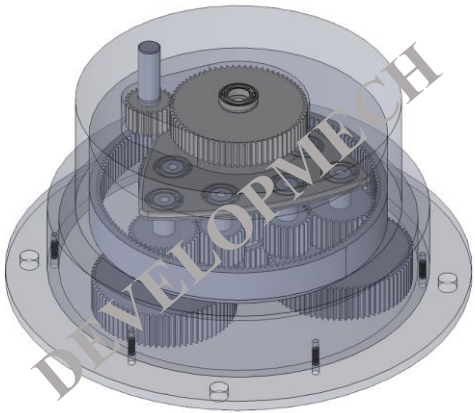
$$\beta_2 = \tan^{-1} \left(\frac{V_f}{u} \right)$$

Design Criteria Tree



Gearbox Design

Computed data:				
Actual Output Speed:	$n_G =$			rpm
Gear Ratio:	$m_G =$			
Pitch Diameter - Pinion:	$D_P =$			in
Pitch Diameter - Gear:	$D_G =$			in
Center Distance:	$C =$			in
Pitch Line Speed:	$v_t =$			ft/min
Transmitted Load:	$W_t =$			lb



Impact analysis on turbine assembly

