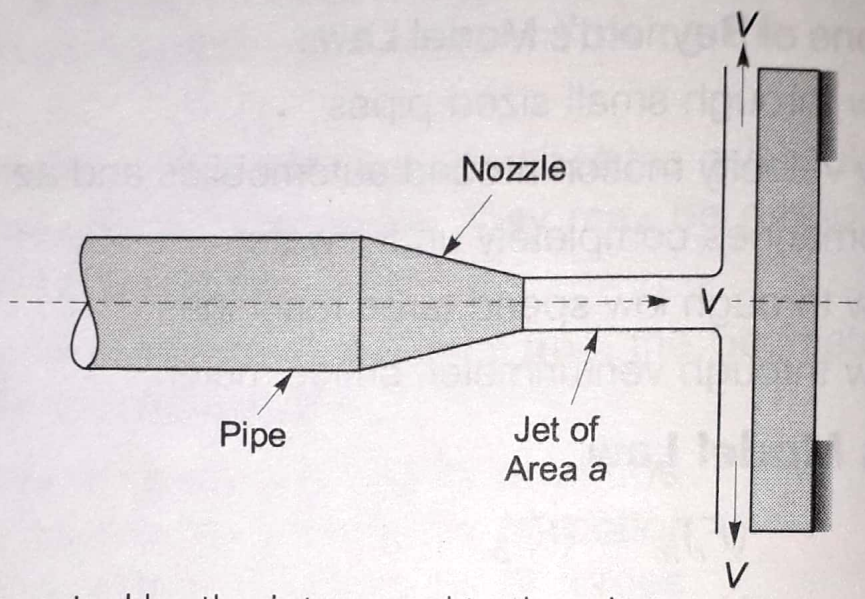
Impact of jet means the force exerted by a jet on a plate which may be stationary or moving. This force is obtained from **impulse-momentum** equation.

1. Force Excreted by Jet on a Stationary Plate

- **Plate is vertical to the jet**

  Jet Strikes normal to the flat stationary plate.



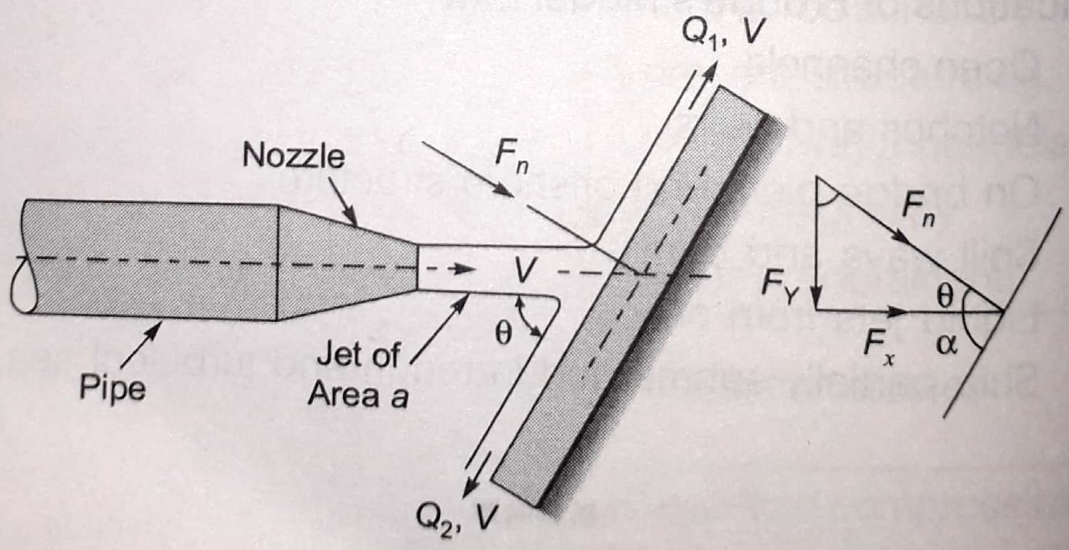
Force exerted by the jet normal to the plate

$$F_n = \rho\, a\, V^2; \quad a = \text{area of jet}$$

$$V = \text{velocity of jet}$$

- **Plate is inclined to the jet**

  Jet strikes on an inclined stationary plate.



Force exerted by the jet normal to the plate

$$F_n = \rho\, a\, V^2.\sin\theta$$

$$Q_1 = \frac{Q}{2}(1+\cos\theta); \qquad Q_2 = \frac{Q}{2}(1-\cos\theta)$$

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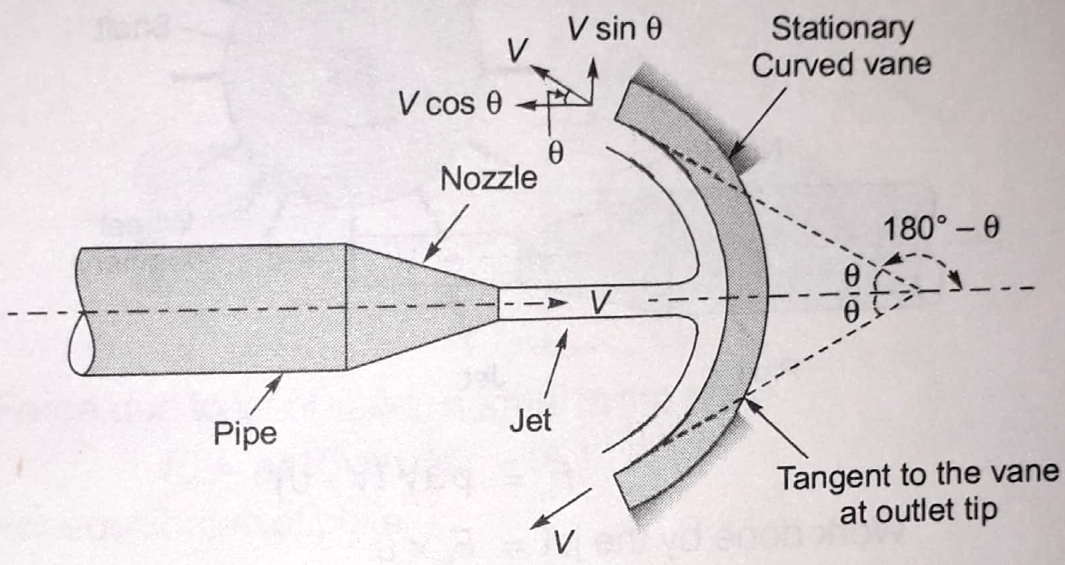
$$\frac{Q_1}{Q_2} = \frac{1+\cos\theta}{1-\cos\theta}$$

$$F_x = \rho a V^2 \sin^2\theta$$

$$F_Y = \rho a V^2 \sin\theta \cos\theta = \frac{\rho a V^2}{2}\sin 2\theta$$

- **Plate is curved**

  Jet striking on a symmetrical stationary curved plate



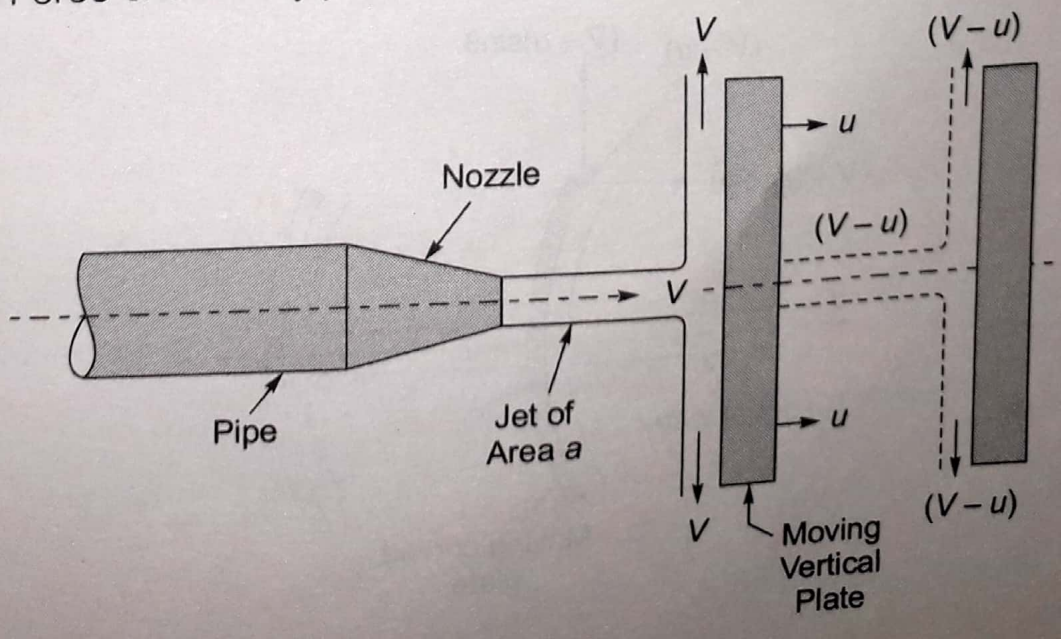
$$F_n = \rho a V^2 (1+\cos\theta)$$

- Force exerted by a jet in its direction of flow on a curved vane is **always greater** than that exerted on a flat plate
- Angle of deflection = $(180 - \theta°)$

2. Force Exerted by Jet On a Moving Plate

- **Plate is vertical to the jet**

  Force exerted by jet on moving flat plate normal to jet



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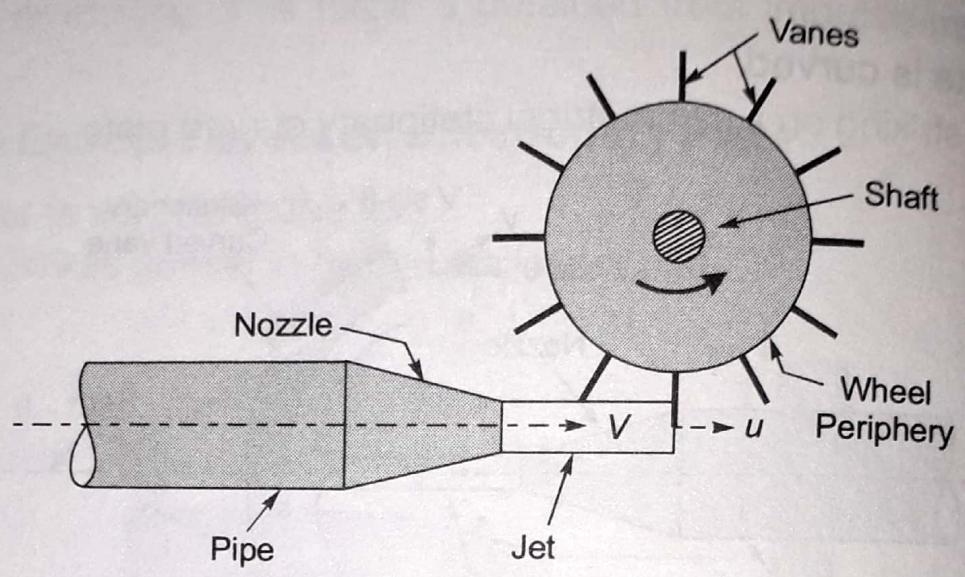
u = plate velocity

$F_n = \rho a(V-u)^2$

Work done per second $(W) = F_n \times u = \rho a[V-u]^2 \times u$

- **Plate mounted on the periphery of wheel**

Jet strikes on series of flat plat mounted on the periphery of wheel.



$$F_n = \rho a V(V-u)$$

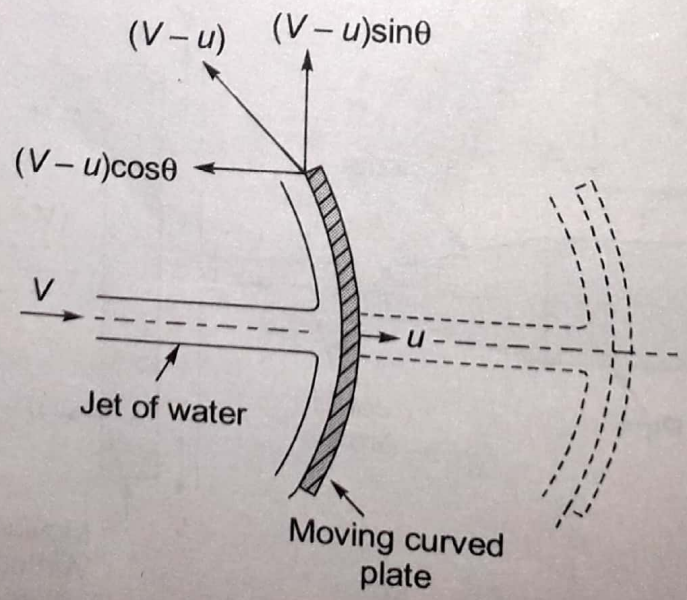
Work done by the jet $= F_n \times u$

$$W = \rho a V(V-u)u$$

Efficiency of the work done on wheel, $\eta = \dfrac{2u(V-u)}{V^2}$

- When peripheral velocity will be half of the velocity of jet i.e. $u = \dfrac{V}{2}$ then efficiency will be maximum i.e. η_{max} **= 50%**

- **Curve plate when the plate is moving in the direction of jet**



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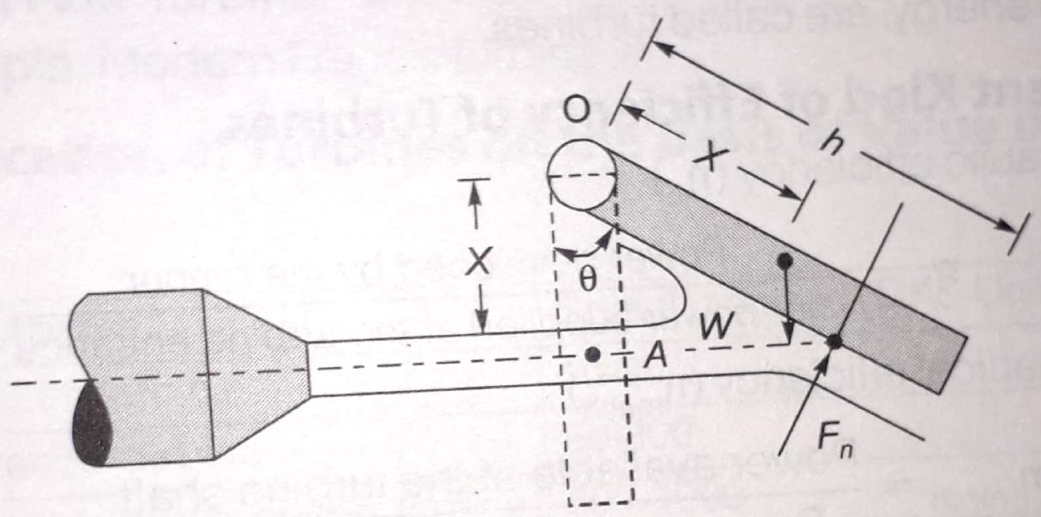
Force excreted by the jet of water on the curved plate in the direction of the jet.

$$F = \rho a(V-u)^2(1+\cos\theta)$$

Work done by the jet on the plate per second

$$W = \rho a(V-u)^2 \times u[1+\cos\theta]$$

3. Force Exerted By a Jet on a Hinged Plate



- Force due to jet of water, normal to the plate

$$F_n = \rho a V^2 \sin(90° - \theta)$$

- For equilibrium of plate

$$\sin\theta = \frac{\rho a V^2}{W}$$

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