

# HindPhotostat



## Hind Photostat & Book Store

**Best Quality Classroom Topper Hand Written Notes to Crack GATE, IES, PSU's & Other Government Competitive/ Entrance Exams**

**MADE EASY  
CIVIL ENGINEERING  
HYDRAULIC MACHINES  
BY-KAURAV SIR**

- Theory
- Explanation
- Derivation
- Example
- Shortcuts
- Previous Years Question With Solution

Visit us:-**www.hindphotostat.com**

**Courier Facility All Over India  
(DTDC & INDIA POST)  
Mob-9311989030**



# HindPhotostat



**MADE EASY , IES MASTER , ACE ACADEMY , KRETRYX**

**ESE , GATE, PSU BEST QUALITY TOPPER HAND WRITTEN NOTES  
MINIMUM PRICE AVAILABLE @ OUR WEBSITE**

<b>1. ELECTRONICS ENGINEERING</b>	<b>2. ELECTRICAL ENGINEERING</b>
<b>3. MECHANICAL ENGINEERING</b>	<b>4. CIVIL ENGINEERING</b>
<b>5. INSTRUMENTATION ENGINEERING</b>	<b>6. COMPUTER SCIENCE</b>

**IES , GATE , PSU TEST SERIES AVAILABLE @ OUR WEBSITE**

- ❖ IES –PRELIMS & MAINS
- ❖ GATE
- **NOTE:- ALL ENGINEERING BRANCHS**

➤ **ALL PSUs PREVIOUS YEAR QUESTION PAPER @ OUR WEBSITE**

## **PUBLICATIONS BOOKS -**

**MADE EASY , IES MASTER , ACE ACADEMY , KRETRYX , GATE ACADEMY , ARIHANT , GK**

**RAKESH YADAV , KD CAMPUS , FOUNDATION , MC –GRAW HILL (TMH) , PEARSON...OTHERS**

**HEAVY DISCOUNTS BOOKS AVAILABLE @ OUR WEBSITE**

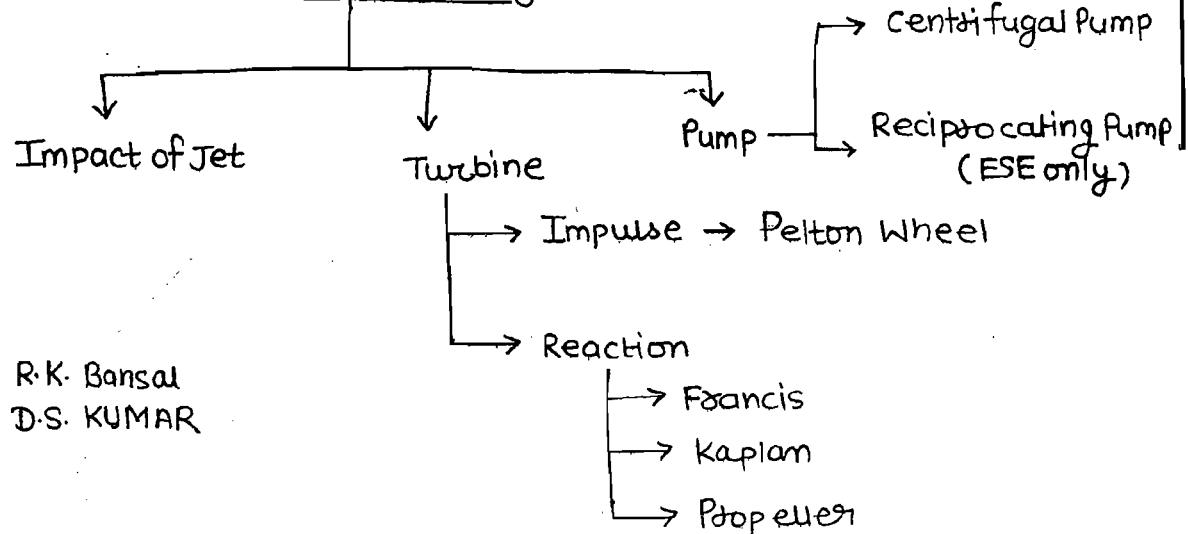
<b>F230, Lado Sarai New Delhi-110030 Phone: 9311 989 030</b>	<b>Shop No: 46 100 Futa M.G. Rd Near Made Easy Ghitorni, New Delhi-30 Phone:9711475393</b>	<b>F518 Near Kali Maa Mandir Lado Sarai New Delhi-110030 Phone: 9560 163 471</b>	<b>Shop No.7/8 Saidulajab Market Neb Sarai More, Saket, New Delhi-30</b>
--	--	--	--

**Website: [www.hindPhotostat.com](http://www.hindPhotostat.com)**

**Contact Us: 9311 989 030**

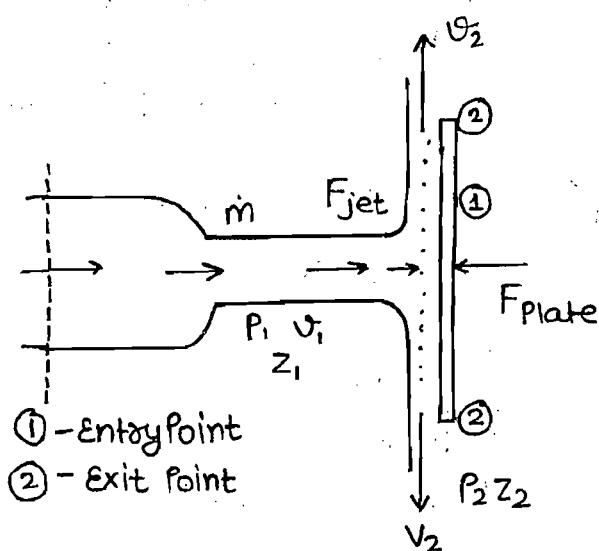
**Courier Facility All Over India  
(DTDC & INDIA POST)**

## # Fluid Machinery



Book: → R.K. Bansal  
D.S. KUMAR

## # Impact of Jet : →



Water → Reaction force  
Plate → Initial force

### Newton's II Law

$F_{Plate}$  = Rate of change in Linear Momentum of jet

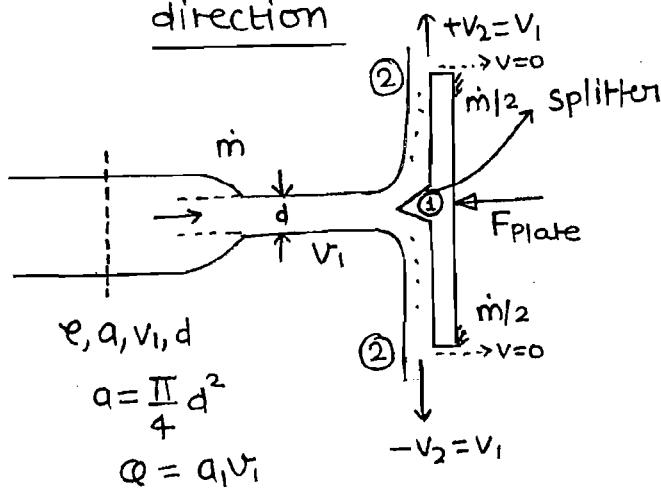
$F_{Plate} = (\text{Final} - \text{Initial})$  momentum of Water

$$F_{jet} = -F_{Plate} = \dot{m} \vec{V}_1 - \dot{m} \vec{V}_2$$

$\dot{m}$  = mass flow rate of Water which strike the Plate / body.

### Case: I

#### Jet strikes Stationary flat Plate in Normal direction



$$\frac{P_1}{\rho g} + \frac{V_1^2}{2g} + z_1 = \frac{P_2}{\rho g} + \frac{V_2^2}{2g} + z_2 + h_f$$

→ Smooth Plate ( $V_2 = V_1$ )

→ Rough Plate ( $V_2 < V_1$ )

$$\dot{m} = \rho a V_1 = \rho Q$$

$$\rightarrow F_x = F_N = \dot{m} V_1 - \left[ \frac{\dot{m}}{2} x_0 + \frac{\dot{m}}{2} x_0 \right]$$

$$P_1 = P_2 = \rho g$$

$$z_1 = z_2$$

$$\rightarrow F_x = F_N = \dot{m} V_1$$

$$= \rho a V_1^2 N$$

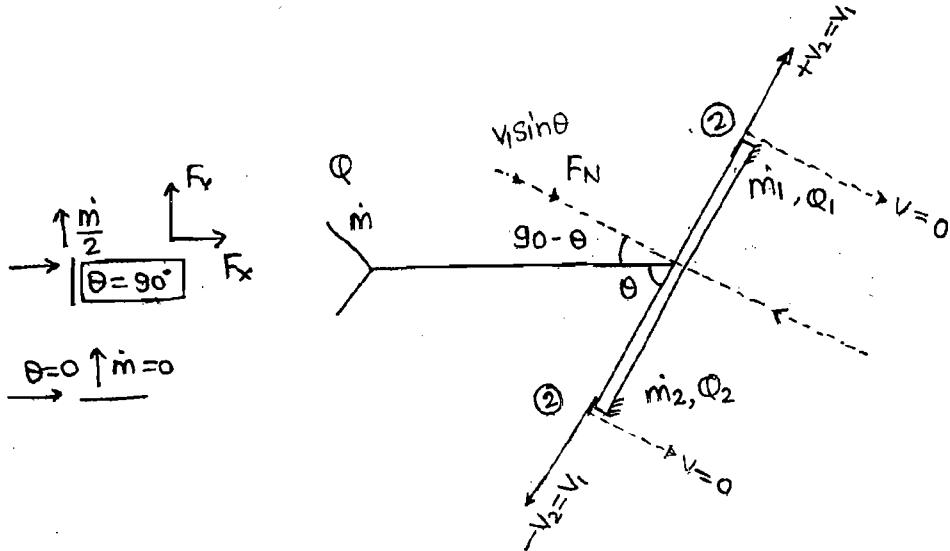
$$\rightarrow F_y = F_T = \dot{m} x_0 - \left[ \frac{\dot{m}}{2} x V_2 + \frac{\dot{m}}{2} (-V_2) \right]$$

$$F_y = F_T = 0$$

NOTE → When Jet strikes over <sup>Flat</sup> Plate then it Will apply the force only in Normal direction to Plate, there will not be any force in tangential direction to Plate.

case: II

Jet Strikes Stationary Inclined Plate



$$\dot{m} = \dot{m}_1 + \dot{m}_2 \Rightarrow \phi = \phi_1 + \phi_2 \rightarrow (1)$$

$$\dot{m} = f_a v_i = f \phi$$

$$F_N = \dot{m} v_i \sin \theta - [\dot{m}_1 x_0 + \dot{m}_2 x_0]$$

$$F_N = \dot{m} v_i \sin \theta = f a v_i^2 \sin \theta$$

$$F_x = F_N \sin \theta = f a v_i^2 \sin^2 \theta$$

$$F_y = F_N \cos \theta = f a v_i^2 \sin \theta \cdot \cos \theta$$

$$\dot{m}_1, \dot{m}_2 / \phi_1, \phi_2 = ?$$

$$\therefore F_T = 0$$

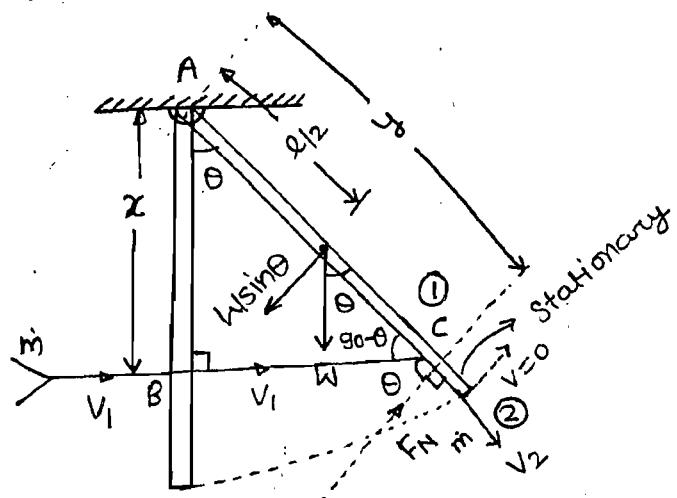
$$\rightarrow \dot{m} v_i \cos \theta - (\dot{m}_1 x_0 + \dot{m}_2 x_0) = 0$$

$$\phi \cos \theta - \phi_1 + \phi_2 = 0 \rightarrow (II)$$

$$\phi = \phi_1 + \phi_2 \rightarrow (I)$$

### Case -III

## Jet Strikes Vertical Hanging Plate



$l$  = length of Plate

$$W = \text{Weight of Plate} = Mg$$

$$\rightarrow \sum M_A = 0$$

$$\rightarrow F_y \cdot y = w \sin \theta \cdot \frac{l}{2}$$

$$\rightarrow \dot{m} = f a v_r$$

$$\rightarrow F_N = m \ddot{v}_1 \cos \theta - m \dot{x} \dot{v}_0$$

$$F_N = f_a v_1^2 \cos \theta \quad (\text{Newton})$$

ΔABC

$$\cos\theta = \frac{x}{y} \quad \Rightarrow \quad y = \frac{x}{\cos\theta}$$

$$f a v_i^2 \cos \theta \cdot \frac{x}{\cos \theta} = w \sin \theta \cdot \frac{l}{2}$$

$$\sin \theta = \frac{2 f a v_i^2}{W l} \cdot x$$