Equipment:

- **Low Speed Wind Tunnel**

Low Speed Wind Tunnel.

Major Specifications
Open Circuit

Test Section	:	400 mm X 400 mm
Length	:	3 Meter
Contraction Ratio	:	10 : 1
Maximum Air Speed	:	20 m/s
Maximum Reynolds Number	:	5×10^5
Honeycomb	:	Square, cell size 30 X 30 mm^2
Anti Turbulence Screens	:	5 Nos.
Turbulence Level (%)	:	0.5 %

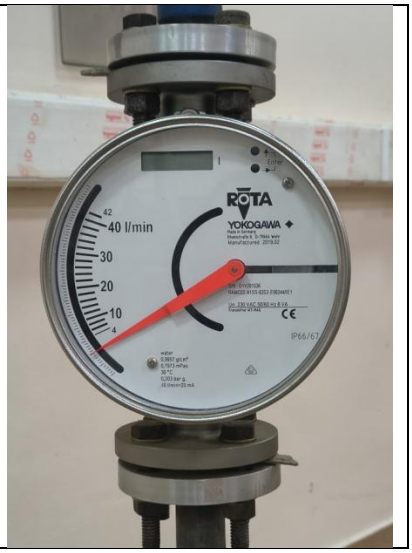
Fan & Drive System
Fan : 13 Bladed
Drive: Induction Motor rating 7.5 kW, 1430 RPM coupled with Eddy current System (maximum excitation voltage 80 V DC 200W, Full load torque 24 N–m) with variable speed 120 – 1200 RPM
Speed Control: Electronic Controller with speed regulation within 50 RPM

Supporting Equipment: Hot Wire Anemometer & Micro Manometer

- **Smoke Tunnel**

Flow Visualization demonstration

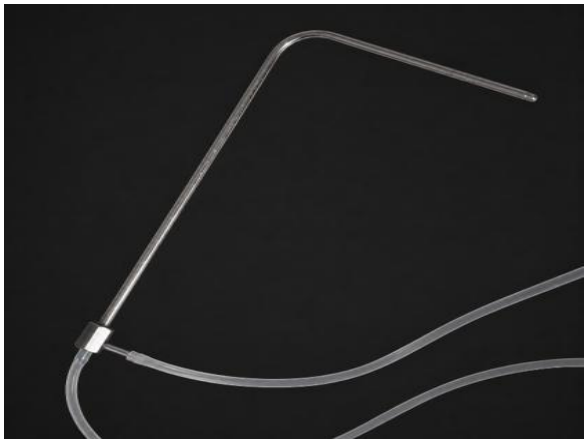
- **Flow Rate measurement using Flow Meter**

Mechanical Flow Meter for precise low flow rate measurement Make: Yokogawa Range: 4 – 42 Litre/Min.	

- **Manometry (U-tube, Micro manometer)**

Conventional U- Tube manometer for pressure difference measurements	
Micromanometer for precise pressure difference and velocity measurements Make: Furness Controls Limited Range: 19.99 & 199.99 mm H_2O	

- **Pitot Tube and Pitot static tube**

Pitot Tube	

- **Hot wire anemometry**

Hot wire anemometer (4 Channel) Make: A.A. Lab Systems Model: AN-1003	

- **Computer Aided DAQ system**

Computer Aided DAQ system Make: National Instruments Module: NI-9205	

- **Precision Pressure Sensor**

Differential Pressure Sensor (All Ranges) Make: Siemens Model: QBM2030-1U D	

- **Precision Digital Balance**

Precision Digital Balance Least count – 0.001gm Maximum – 200 gm	

- **Rotating Cup Viscometer**

Rotating Cup Viscometer Make: Fisher-MacMichael Model: 90	

Experiments:

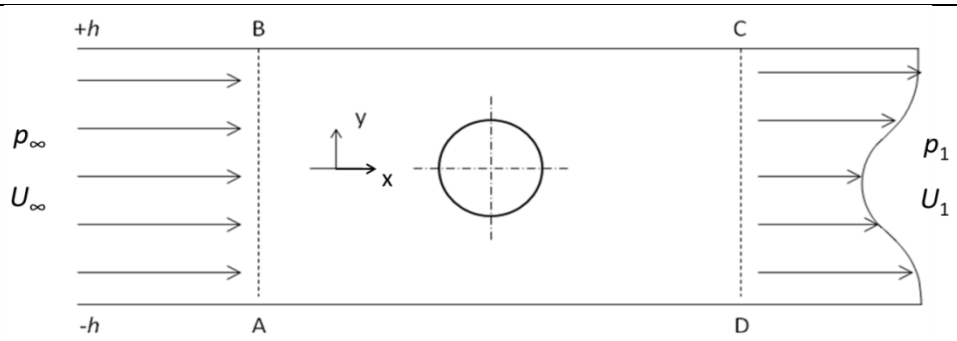
- **Jet impact on flat and curved surfaces**

Objectives: 1. Measure force acting on flat and curved surfaces as a function of jet velocity. 2. Compare measured forces with those determined by using the integral form of the momentum equation.	

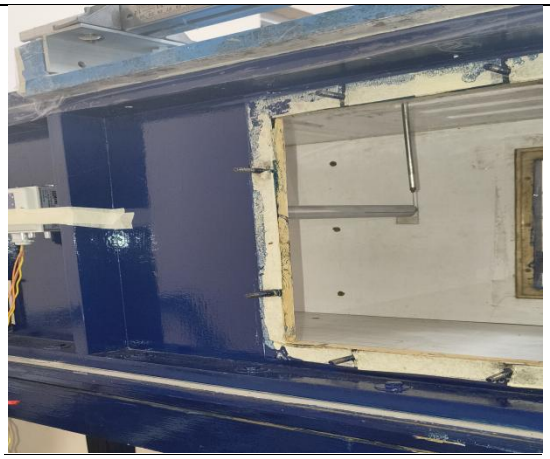
- **Measurement of drag on a circular cylinder in high Reynolds number flow**

  Objective:

  1. To measure the velocity profile in the wake of a cylinder and
  2. To calculate the drag on the cylinder by using momentum balance

Wake Survey Method (Wind Tunnel)	

Cylinder mounted in the wind tunnel and the measurement probe	



- **Energy loss measurements in subcritical and supercritical open channel flow**

Objective:

To map the surface profile of a liquid layer in an open channel flow in order to calculate energy loss as a function of the Froude number for subcritical as well as supercritical Froude number.

- **Measurement of fluid viscosity**

Oil Viscosity:
Viscosity of a liquid (oil) is measured using a) a rotating cup viscometer and b) ball drop method.

Rotating cup viscometer:
Objective:
Measuring fluid viscosity for varying depth of immersion of the rotating cylinder in oil and at different temperatures

Ball-drop experiment
Objective: To estimate oil viscosity by using Stokes law and the measured terminal velocity of a ball in the oil

	
Air Viscosity: **Objective:** To calculate the viscosity of air flowing through a tube by measuring the flow rate and the pressure drop in the fully developed region.	

- **Determination of friction factor as a function of Reynolds number in pipe flow**

Objective: 1. Measure flow rate and pressure drop for tubes with different wall roughness and diameter. 2. Express the measurement data in terms of friction factor and Reynolds number. 3. Superpose these values on Moody's chart.	

- **Studying laminar-turbulent transition for flow in a tube**

Objective: 1. Visualize dye mixing for flow in a tube under laminar, transient and turbulent conditions. 2. Carefully estimate the critical Reynolds number below which flow is laminar and above which it is turbulent.	

- **Study of a Turbulent Mixing Layer (ME – 649)**

Objective: Perform measurements using hot-wire anemometry to characterize the structure of a turbulent mixing layer.	

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