

SCHOOL OF NUCLEAR ENGINEERING

Purdue University

West Lafayette, IN-47907

NUCL 355

Experiment #4

Flow Around Submerged Objects – Visualization

Objective:

The objectives of this experiment are to observe the features of two-dimensional flow patterns around several objects using bubble streaklines and to compare the drag forces on the objects qualitatively.

References:

White, Fluid Mechanics, 3rd ed., 3.4, 7.1, 7.2, 7.6, and the film, Flow Visualization.

Preparation: Read the reference material and these instructions, then perform the experiment with your assigned group.

Experimental Apparatus:

Fully assembled experimental apparatus are showed in Fig.2. The apparatus consist of:

1. Tank
2. Pipe
3. Valve
4. Cylinder
5. Flow homogenizer
6. Pump
7. Light
8. Flat plates

Performing the Experiment:

1. Observe and Sketch:
 - a. Flow between paralleled plates
 - b. Flow on the boundary layer

2. Observe and sketch the flow pattern around each of the following objects:
 - a. flat plate normal to the flow
 - b. flat plate at zero and small positive angle of attack
 - c. Cylinders
3. Measure the width of each object and of the wake behind each object.
4. Prepare a sketch of the flow pattern on a separate sheet for each model. Label each sheet with a figure number and title.
5. Using suitable notes and arrows, indicate on each sketch:
 - a. The stagnation point
 - b. The point of separation
 - c. Regions of maximum speed
 - d. Zones of highly turbulent, recirculating wake flow
6. Prepare a table with results of your measurements. In the table, list the cylinders and the flat in order of decreasing drag force.
7. Based in your measurements of the wake width, estimate the drag of the flat plate and the cylinder as a percentage of the drag of the flat plate normal to the flow. Evaluate and tabulate the ratio of wake width to object width.

Experimental Uncertainty:

No estimates of experimental uncertainty are required for this experiment.

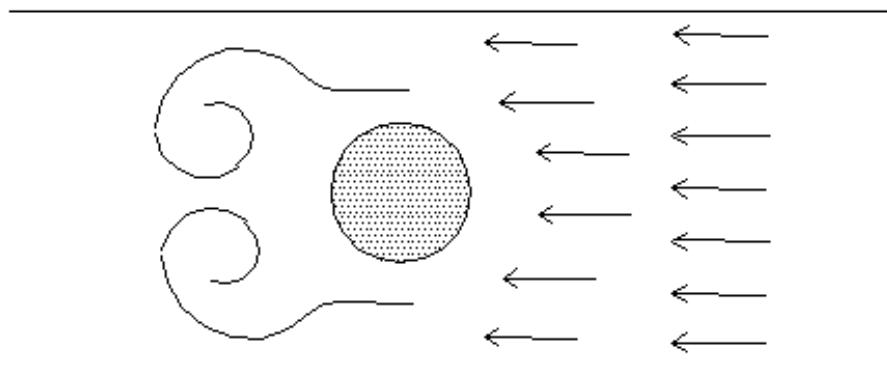


Figure 1 Cylinder In Flow Stream

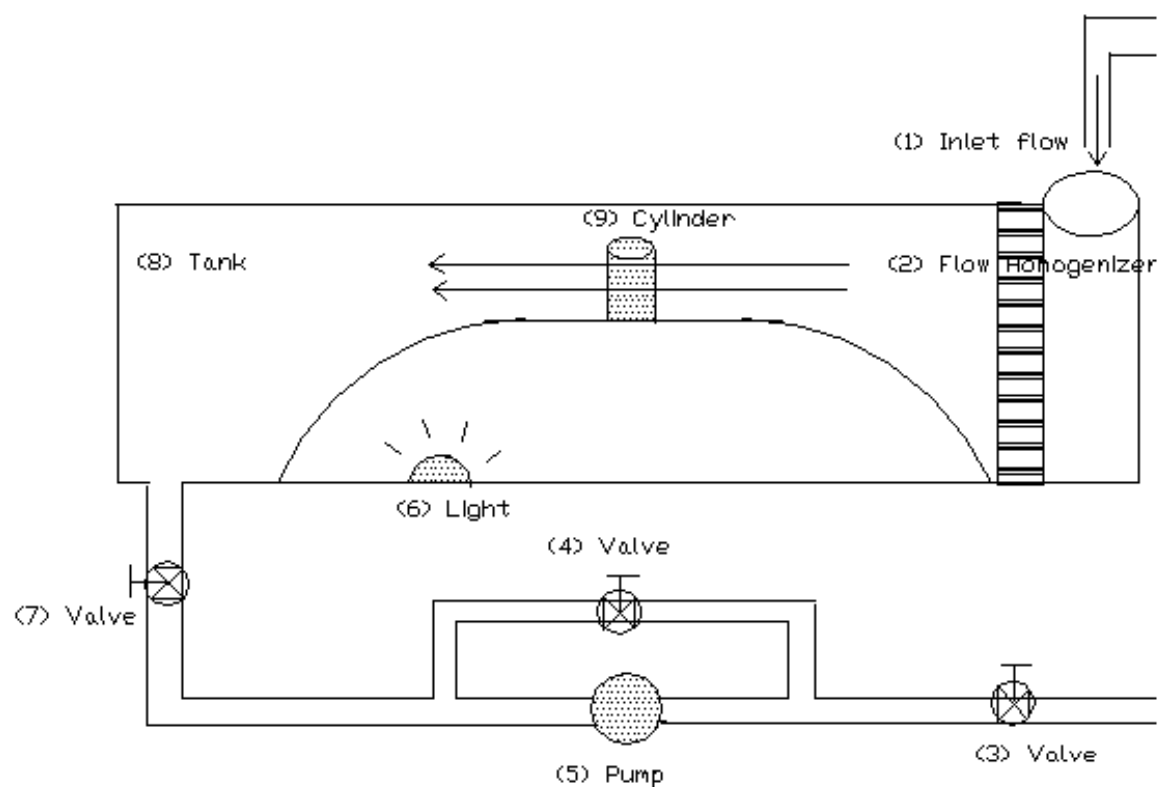


Figure 2 Flow Pattern Experiment