

UNIUYO MULTIFLUIDICS BENCH

(i) Brief Description

As a consequence of lack of adequate laboratory equipment in the Faculty of Engineering, University of Uyo, it became necessary to start thinking of using locally available materials to design laboratory equipment and systems that would provide the training needs of our students.

One of the equipment so designed is the 'Uniuyo MultiFluidics Bench'.

The Multi Fluidics Bench provides pressurised water supply to a number of experimental units used to demonstrate various aspects of hydraulics theories. It is designed with space economy in mind and it is modular in nature.

The Bench comprises self priming motorised pumps, sets of tanks with varying capacities ranging from 10 litres to 50 litres and corresponding reservoirs. The various types of tanks include reservoirs and measuring tanks.

The tanks are placed with due consideration for head pressures.

Photographs of the various views of the bench appear in plates 1 through 4, herewith attached.

The modular nature of the bench allows simultaneous experiments using Hydraulics principle to be carried out. Up to twelve experiments can be carried out at the same time.

Water from the mains supply is filled in the sump/reservoir and is transmitted through the pumps to outlets that service experimental units through appropriate connections.

The water that discharges from an experimental unit is collected in the volumetric measuring tank which is placed beneath the table top but above the sump tanks. A discharge tube that runs from top to bottom of the volumetric tank acts to still the discharge and reduce turbulence. A remote site glass tube/scale is connected to a tapping in the base of the volumetric tank and gives an instantaneous indication of the water level in the volumetric tank. During experimentation, water discharges from the volumetric tank through a control gate valve into the sump.

An overflow in the volumetric tank returns water to the sump as the need arises. The pumps are fed through fused 13 amp plug tops on a single phase supply.

(ii) Products Derivable from the Project

The multipurpose nature of the Fluidics Bench provides possibilities of carrying out the following experiments amongst others, using experimental units to be attached to the bench:

- (a) Losses in Bends Studies
This enables the student to study the losses due to bends and fittings in a flow channel.
- (b) Flow Metre Demonstration
To study the characteristics of different flow meters
- (c) Osborne Reynolds Apparatus
To study laminar, transition and turbulent flow patterns.

- (g) Its modular nature also allows for ease of packaging and transportation.
- (h) The Fluidics Bench is currently being used for teaching of students in the Faculty.
- (j) Research work is currently on, to establish new areas of application of the Fluidics Bench.
- (k) Efforts to develop the accessories for the various experiments are being undertaken.

(vi) Additional Work

The additional work required is finishing and packaging.


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- (d) **Flow visualisation channel experiment**
To study the effect of open channel flow on flow characteristics.
- (e) **Pipe Friction Apparatus**
To determine the effect of friction head along flow lines.
- (f) **Orifice and Jet Apparatus**
To find the coefficient of velocity for various orifices.
- (g) **Impact of Jet Apparatus**
To investigate the validity of theoretical expressions for the force exerted by a jet on targets of various shapes.
- (h) **Bernoulli's Apparatus**
To investigate the validity of Bernoulli's theorem as applied to flow of water in various ducts.
- (j) **Matacentric Height Apparatus**
To determine the stability of floating bodies.
- (k) **Basic Weirs**
To determine the characteristics of flow over different weirs / notches, obstructions and objects in a flow stream.
- (l) **Hydrostatic Pressure Apparatus**
To determine the centre of pressure (a) on a partially submerged plane surface and (b) of a plane surface immersed in water and to compare experimental parameters with theoretical ones.
- (m) **Dead Weight Pressure Gauge**
For the calibration of a burden type pressure gauge.
- (n) **Other applications are possible**

(iii) **Raw Material Availability**

The MultiFluidics Bench and accessories can be fabricated using locally available raw materials. These include steels, plastics glass, wood etc.

(iv) **Capacity for Local Manufacturing / fabrication / Equipment Requirement**

The MultiFluidics Bench could be fabricated using Lathe Machine, Milling Machine, Cutting Tools, Welding Machines and some joining techniques. These equipment are commonly available.

(v) **Additional Information**

- (a) The MultiFluidics Bench has the potential, flexibility and adaptability for use in place of the conventional Hydraulics Bench.
- (b) The cost of producing the bench is less than the cost of acquiring the conventional Hydraulics Bench and therefore more affordable.
- (c) The modular nature of the bench gives room for flexibility in installation and experiment selection.
- (d) The bench is portable and can be used in a small space within and outside a laboratory environment.
- (e) The bench can be used by filling water manually in the absence of water mains and therefore can be operated effectively in a local environment.
- (f) The modular nature of the bench allows a small capacity generator to be used to operate the equipment in the absence of electricity.

UNIUYO MULTIFLUIDICS BENCH



PLATE 1: SIDE/FRONT VIEW



PLATE 2: FRONT VIEW

UNIUYO MULTIFLUIDICS BENCH



PLATE 3: BACK VIEW

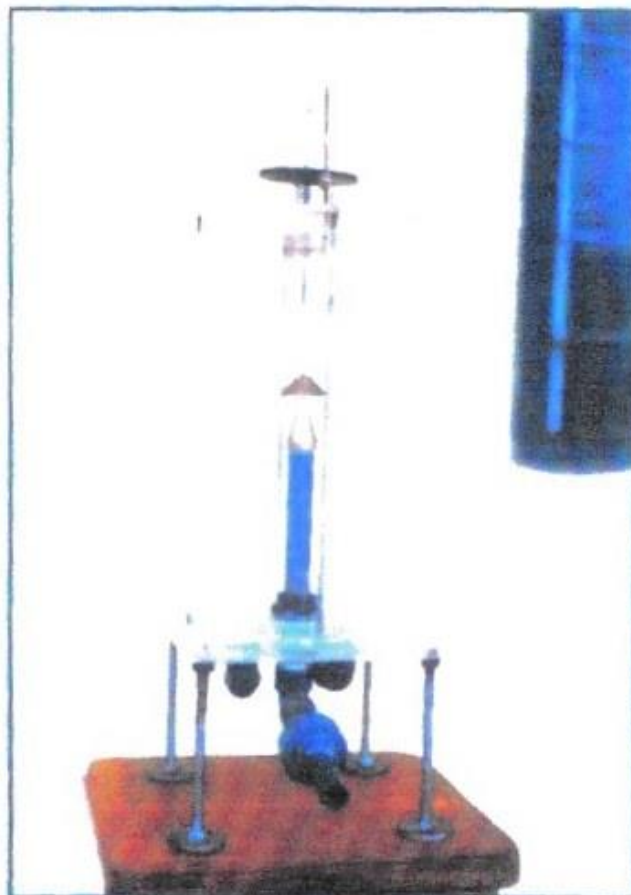


PLATE 4: IMPACT JET APPARATUS