

FLUID MACHINE LAB MANUALS

EXPERIMENT NO 5

Aim: - To study the constructional details and working of Hydraulic Ram.

Apparatus Used: - Model of Hydraulic Ram.

Theory: - Hydraulic System: - is an arrangement to transmit forces and energy through an incompressible fluid.

They are of two types:-

1. Hydrostatic System: - In this system transmission is due to hydraulic pressure. The main elements are: -

- (a). Pumping Unit: - That acts as a power source to develop the hydraulic pressure from mechanical work- Usually it is a rotary or a reciprocating pump.
- (b). Transmission line or passage: - Through which power and energy are to be transmitted from the place of production to the place of its necessity.
- (c). Hydraulic motor: - To reconvert the hydraulic pressure into mechanical work. Again this can be of rotary or reciprocating type in the form of cylinder & piston. Piston in the cylinder is moved by the fluid pressure providing useful work. e.g. Hydraulic press, crane, lift etc.

2. Hydro Kinematics System: - In this transmission is due to change in the velocity and the direction of fluid flow. With a negligible change in the pressure of the fluid. It has two main elements: -

- (a). Pump- impeller driven by the driving shaft (centrifugal pump).
- (b). Turbine Runner to run the driven shaft: - There is circulation of oil from the pump impeller to the runner that transmits power. For e.g. Hydraulic Ram: - It is a pump which raises small quantity of water to a greater height, if large qty. of water is available at a lower height without using any external power.

Constructional details: - its main parts are: -

Supply line, Supply tank, Waste valve, Delivery valve, Valve chamber, Delivery pipe, Delivery tank, Air vessel, Non-return valve, Drain cock, Pressure gauge.

Working principle: - It works on the principle of water hammer effectors inertia force of water in a pipe line. When a flowing fluid is brought to rest suddenly a rise of pressure occurs, which can be utilized to raise a portion of water to a higher level. It does not require any external power for its operation.

It consist of a valve chamber fitted with two valves, a wattle valve & a delivery valve, both being none return valves. The delivery valve opens into an Air vessel to carry the air compressed. A delivery pipe is connected to the air vessel to carry the water to a delivery tank. A supply pipe connects the available water source to the valve chamber.

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At a particular moment assume that the delivery valve is closed and the waste valve is open. Water flows down the supply pipe in to the valve chamber and then through the waste valves into waste water tunnel. As the velocity of water in the pipe increases, the dynamic pressure on the underside of the waste valve becomes high. This closes the waste valve which was open due to its own weight. With the sudden closure of the waste valve, the velocity reduces to zero and the pressure in the valve chamber. The high pressure of water forcibly opens the delivery