

Research Paper on Hydraulic Ram Pump

AKSHAY KHERDE¹, ANKUSH KADASKAR², EKANSH DHOBLE³, MITHUN GAWAL⁴, TUSHAR BAWANKAR⁵, TUSHAR CHAVAN⁶, NAVNEET SINGH⁷

^{1, 2, 3, 4, 5, 6, 7} G. H. Raisonni Academy of Engineering and Technology, Nagpur

Abstract- A hydraulic ram pump is based on non-conventional source of energy and it is renewable energy source. It does not require electricity, does not require any motor, any battery, any generator, etc. for their operation. It works on water pressure and initial air pressure. Potential energy of water is converted into kinetic energy and then this kinetic energy is rather converted into pressure energy. Water is not easily available in hilly region and it is difficult to bring water from long distances. To bring water to this region easily it requires electricity or other external sources which pumps water to a certain height. This project is a modification of commercially available hydraulic ram pumps which does not require any external source of energy to pump water. This project also be used in domestic purpose to lift water up to a height of 20 feet and make it easy to bring water from long distances without any difficulties. This project is very useful in those rural areas where there is distribution of electricity is not proper.

I. INTRODUCTION

A Hydraulic ram pump or HYDRAM is an automatic device that uses the potential energy of flowing water such as stream of water or river to pump part of water to a height above that of the source with the continuous flow of water. A HYDRAM operates continuously without using another external source of energy. Pumps are amongst the oldest period of machine. They were used in ancient Egypt, China, India, Greece and Rome. Today pumps are the second most commonly used kind of industrial equipment after the electric motors all around the globe.

A hydraulic ram pump or HYDRAM is a cyclic water pump powered by hydropower. It functions as a hydraulic transformer that takes in water at one “hydraulic head (pressure)” and flow rate, and output water at a higher hydraulic head and lower flow rate. The device uses the water hammer effect to develop

pressure that allows a portion of the input water that powers the pump to be lifted to a point higher than where the water is originally started from the point of its origin.

The hydraulic ram pump is sometimes used in remote areas, where there is both a source of low-head hydropower and a need for pumping water to a destination higher in elevation than the source. In this situation, the hydraulic ram pump is often useful, since it requires no external source of energy other than the kinetic energy of flowing water. A hydram is a structurally simple unit consisting of two moving parts. These are the impulse valve (or waste valve) and the delivery (check) valve. The unit also includes an air chamber and an air valve. The operation of a hydram is intermittent due to the cyclic opening and closing of the waste and delivery valves. The closure of the waste valve creates a high pressure rise in the drive pipe. An air chamber is required to transform the high intermittent pumped flows into a continuous stream of flow. The air valves allow air into the hydram to replace the air absorbed by the water due to the high pressure and mixing in the air chamber. Recognising that the hydraulic ram pump can be a viable and appropriate renewable energy water pumping technology in developing countries, it has been used for over two centuries in many parts of the world due to their simplicity and reliability made them commercially successful, in the days before electrical power and the internal combustion engine become widely available. As technology advanced and become increasingly reliant on sources of energy derived from fossil fuels, the hydraulic ram pump was neglected. It was felt to have no relevance in an age of national electricity grids and large-scale water supplies. Big had become beautiful and small-scale Hydraulic Ram Pump technology was unfashionable. In recent years an increased interest in renewable energy devices and an awareness of the technological needs of a particular market in developing countries have prompted a reappraisal of hydraulic ram pump. In hilly areas with

springs and reliable pumping device is large. Although there are some examples of successful ram pumps installation in developing countries, their use to date has merely scratched the surface of their potential. The main reason for this being lack of widespread local knowledge in the design and manufacture of hydam. Hence, the widespread use of hydam will only occur if there is a local manufacturer to deliver quickly; give assistance in system design, installation and provide an after-sales service.

II. WORKING PRINCIPLE

A simplified Hydraulic Ram Pump initially, the take a look at valve is opened and the delivery valve is closed. The water inside the power pipe starts to flow under the pressure of gravity and selections up pace and kinetic energy until the growing drag force closes the waste valve. The momentum of the water flow inside the deliver pipe against take a look at valve causes a water hammer that raises the pressure within the pump, open the transport valve and force some water to flow into the transport pipe. Because this water is being compelled uphill via the delivery pipe rather than its miles falling downhill from the source, the float slows; while the drift reverses; the delivery test valve closes.

- STAGE 1

In a simplified Hydraulic Ram Pump initially, the inlet valve is open and the delivery valve is closed. Water enters from inlet valve that's open, and passes in the direction of the non-go back valve which is closed. Therefore, water comes out from the waste valve.

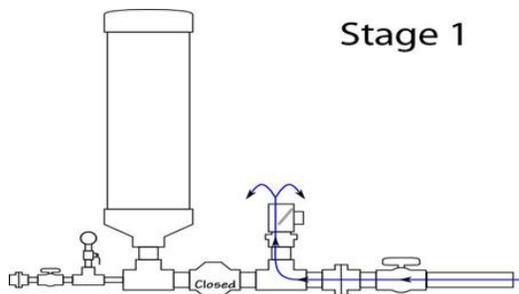


Figure 1:- Working Mode Stage 1

- STAGE 2

Now the water enters in air chamber from the non-return valve, because of water pressure, the diaphragm

which is placed inside the air chamber moves upwards. Initially, air is present in the air chamber; the motion of the diaphragm moving upwards compresses the air. Because of compression the pressure of air rises which forces the diaphragm to move downwards. Hence, because of air pressure, water pressure rises in the air chamber. The water is incompressible fluid; therefore it starts to find the way to move out of the chamber.

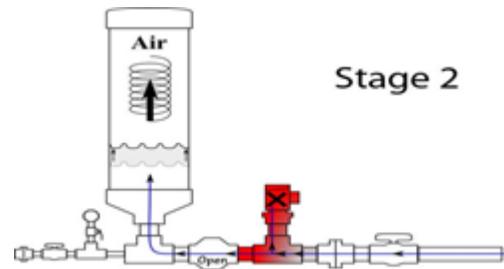


Figure 2:- Working Mode Stage 2

- STAGE 3

As the delivery valve is opened, the pressurized water present in the air chamber gets discharged to a certain height.

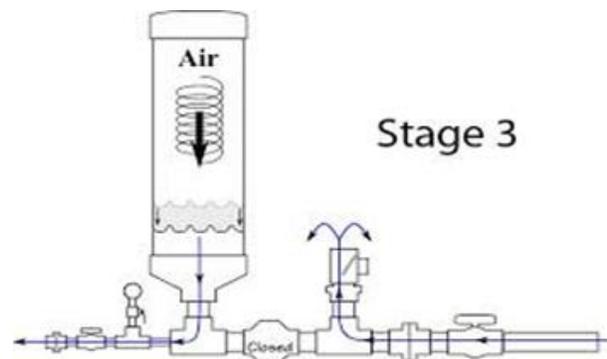


Figure 3:- Working Mode Stage 3

III. FUTURE SCOPE

Invention of Hydraulic Ram Pump/ HYDRAM in future:-

The present study is centered towards the development of a hydraulic ram pump that would conveniently alleviate the problem of water supply to the mass populace living on mountains and hilly areas.

Ideally, different combinations of the supply and delivery heads and flows, stroke length and weight of the impulse valve, length to diameter ratio of the drive

pipe, volume of the air chamber and size of the snifter valve, etc. were tried to come up with an optimum size of a Hydraulic Ram Pump / HYDRAM presented in this study.

IV. RESULTS & DISCUSSION

- Hydraulic Ram Pump is used in farming process for watering plants.
- It is used to lift water from low surface areas to higher surface areas.
- These are also used to bring water to people living in mountains or hilly regions.
- Hydraulic Ram Pumps are also used in irrigation sectors.
- In local areas it is used to store water in tanks.

CONCLUSION

After brief explanation of project we conclude following terms about our project. Due to small in size it can implement in any place. It does not require any external source of energy like electricity, etc. Due to its low manufacturing as well as maintenance cost, a common man can easily afford it.

Project has many practical implementations and uses. As the energy sources like petroleum gas, fuel, etc. are depleting day by day, we had design this Hydraulic Ram Pump which does not need any external sources of energy.

We are further trying to work on this pump which would be more versatile and can pump with a great efficiency.

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