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Design and Development of a Manual PVC Pressure Water Pump for Lake Water without Electricity

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Abstract: In rural and remote areas, access to water without electricity is a critical issue. This paper presents the design and fabrication of a manual PVC water pump which works on the principle of piston-cylinder arrangement with flap-type non-return valves. The system uses PVC pipe, elbows, T-joints, cocks, and rubber seals for cost-effective construction. The pump operates manually, creating suction and pressure for continuous water flow from a lake or pond without the need for electricity. Experimental trials indicate that the pump can lift water up to 1.5–2 meters with an average discharge of 4–6 liters per minute, making it suitable for domestic and small-scale irrigation applications. The design is simple, portable, low-cost, and can be fabricated using locally available materials.
Keywords: *Manual Water Pump, PVC Pump, Non-Return Valve, Piston Cylinder, Rural Water Supply, Low-Cost Pump*

I.INTRODUCTION:

Water pumping in rural areas is usually dependent on electricity or diesel engines, which increases cost and environmental impact. Many villages near lakes or ponds need a simple, eco-friendly water lifting device. This project introduces a PVC-based manual pressure pump that works without electricity. It uses the reciprocating principle of piston-cylinder mechanism along with non-return valves (NRVs) to ensure unidirectional flow. The system is low-cost, easy to maintain, and can be fabricated by rural communities themselves.

Advantages :-

1. Works without electricity or fuel.
2. Very low cost compared to motor pumps.
3. Lightweight and portable.
4. Easy to fabricate with PVC pipes and local materials.
5. Simple maintenance, anyone can repair it.
6. Environment friendly, no carbon emission.

Disadvantages :-

1. Limited suction lift (up to 6–7 meters theoretically, but practically 1.5–2 m).
2. Flow rate depends on human effort and stroke speed.
3. Not suitable for large-scale irrigation.
4. Continuous manual effort required → tiring for long usage.

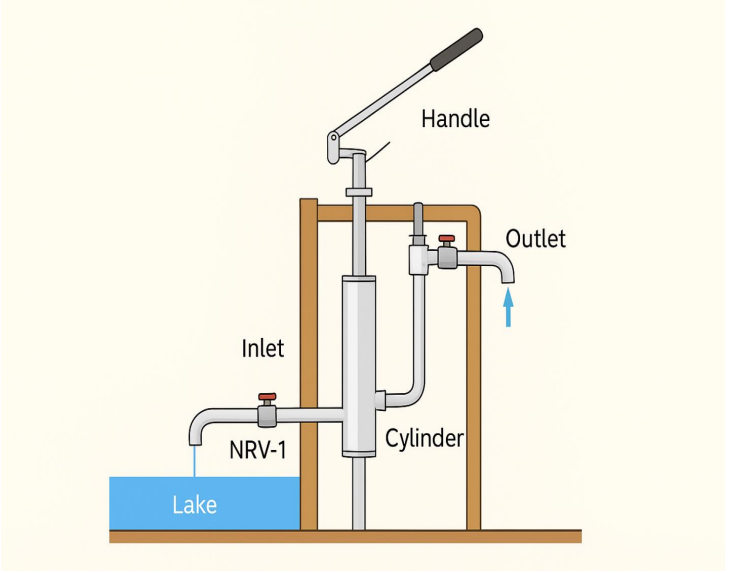
Application :-

1. Domestic water supply (filling tanks, washing, cleaning).
2. Small-scale irrigation in farms and gardens.
3. Cattle drinking water supply.
4. Emergency water pumping during power cuts.
5. Water lifting for construction or rural community use.

Hows It Work :-

- The pump consists of a **PVC cylinder** with a piston and handle arrangement.
- **Inlet pipe** is connected from the lake/bucket through a **non-return valve (NRV-1)**.
- **Outlet pipe** is connected at the top of the cylinder through another **non-return valve (NRV-2)**.
- When the handle is pulled UP → piston moves upward → suction is created → NRV-1 opens → water enters the cylinder.
- When the handle is pushed DOWN → piston moves downward → NRV-1 closes → NRV-2 opens → water is discharged through outlet pipe.
- Continuous strokes create a continuous water flow.

Project Conceptual Image :-



II.CONCLUSION:-

The manual PVC pressure pump is a simple, low-cost and eco-friendly solution for pumping water from lakes or ponds without electricity. The design is easy to fabricate and operate, making it highly suitable for rural and remote areas. Although it has limitations in suction lift and discharge, the pump can provide 4–6 liters/minute for small-scale applications. Future scope includes improvements like pedal operation, dual-cylinder design, and flywheel attachment to reduce operator fatigue and increase discharge rate.

III. REFERENCES:-

- Hand Pump (Wikipedia) – Basic principle, suction limit, piston & NRV working: https://en.wikipedia.org/wiki/Hand_pump
- Research Paper – *Design, Construction and Testing of a Hand Operated Water Pump*: https://www.researchgate.net/publication/337464712_Design_Construction_and_Testing_of_a_Hand_Operated_Water_Pump_for_Small_Scale_Farmers_in_Nigeria
- Treadle Pump (Wikipedia) – Human-powered irrigation pump: https://en.wikipedia.org/wiki/Treadle_pump