41. VLOM pumps

What is a VLOM pump?

A **VLOM** pump is one which can be operated and sustained using **V**illage **L**evel **O**peration and **M**aintenance.

The term **VLOMM** is also used, meaning **V**illage **L**evel **O**peration and **M**anagement of **M**aintenance.

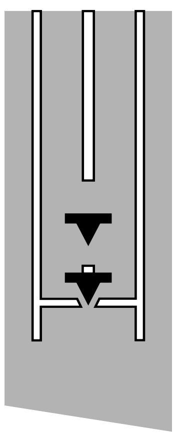
This addition emphasizes the role of users as the *managers of maintenance* – they may choose to use someone from *outside* the village to assist with more complicated repairs. Not all maintenance and repair needs to be done by the villagers for a pump to be classed as a VLOM pump.

Why are VLOM pumps needed?

Many handpump projects have failed because of:

- the absence of a sustainable system of handpump maintenance and repair;
- the installation of pumps which were not suitable for the heavy usage they received;
- the use of pump components which were damaged by corrosive groundwater; and
- a lack of community involvement in important aspects of the project planning.

HOW MOST HANDPUMP CYLINDERS WORK



In most handpump cylinders a piston is alternately raised and lowered by a rod (or a string of rods joined together) which is connected to a handle, or sometimes to a flywheel and crank. These pumps are called **reciprocating handpumps.** The figure above illustrates how most cylinders work.

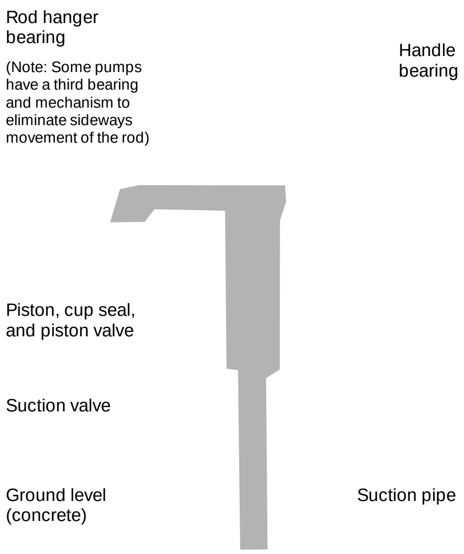
VLOM pumps

There are three types of reciprocating handpump.

One of the basic aims of a VLOM handpump is to make all the main wearing parts easy to reach and replace, and to reduce the wear and tear on the pump by good design. The main wearing parts of a reciprocating handpump are:

- The piston seal, which rubs against the inside face of the cylinder.
- The piston valve and suction valve (or foot valve), which are constantly opening and closing.
- The bearings in the pump-head, which are subjected to constantly changing loads.

Suction pumps

Traditional design	Rower design
	

The cylinder of a suction pump is usually above ground level.

Main advantages

- Easy access to wearing parts because they are usually all above the ground.
- Fast delivery of water because of the large piston diameter (traditional designs), or long piston stroke (rower design).

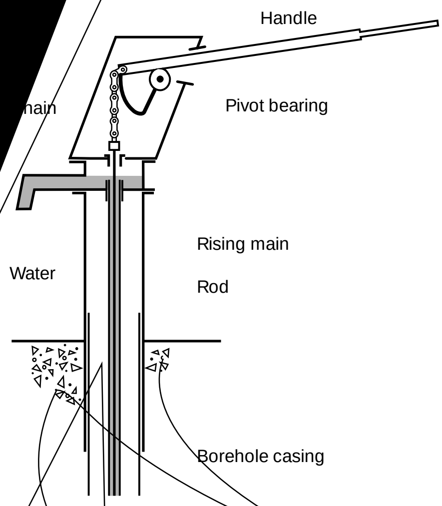
Main disadvantages

- Only suitable for pumping lifts of up to about 7m.
- May need to be ‘primed’ by adding water to the cylinder if the suction valve leaks overnight.
- Villagers will often use polluted water to prime the pump, thereby contaminating it.
- Pump designs are often not suitable for use by more than about 50 people per day unless frequent repairs and replacements are carried out.

Deep-well pumps

[redacted]tional design

[redacted] Most pump-head lever handles [redacted]milar principle to the handle [redacted]he traditional suction pump. Some [redacted]e just one pivot and a chain (or belt) [redacted]drant system, such as in the India Mk [redacted]n below.



Rising main and cylinder: Traditionally, the rising main is of galvanized steel pipe with a smaller diameter than the piston. The string of pipes and operating rods have to be lifted so that the rod joints (a) and pipe joints (b) can be unscrewed section by section to reach the cylinder (c). This operation needs strong people with appropriate lifting and clamping tools, or a mechanized lifting system. Some manufacturers now supply, therefore, lightweight, thin-walled stainless-steel pipes joined with 'rope threads', or plastic pipes with special threaded collars to reduce the weight which needs to be lifted. Rubber 'O' rings can be used to make such joints watertight.

GWL: Groundwater level

Open-top cylinder design

Cylinder: Recent deep-well pump designs have 'open top cylinders' (OTC). These allow the piston (d) to be pulled up through the rising main (e) which is of the same or, preferably, a slightly larger, diameter than that of the cylinder. With these pumps, the piston can be pulled to the surface by pulling out the string of rods.

Rods: Most rod strings are joined by threaded couplings, but some pumps use special rod joints (f) which can be easily disassembled without tools.

GWL: Groundwater level

<table>
<tr><th rowspan="2">Direct action pumps</th><th colspan="2">Deep-well pumps</th></tr>
<tr><th>Traditional design</th><th>Open-top cylinder design</th></tr>
<tr><td>Main advantages
• Easy access to piston (and sometimes the foot valve), which can be pulled through the rising main.
• Relatively cheap, and easy to manufacture.

Main disadvantages
• Lack of lever handle makes it difficult to operate at pumping lifts much above 12m.
• Pump design is often not rugged enough for use by more than about 50 people per day unless it is frequently repaired.</td><td>Main advantages
• Pump is suitable for a wide range of pumping lifts.
• Design can be strong enough to cope with intensive use.

Main disadvantages
• It is difficult to get access to the piston and foot valve.</td><td>Main advantages
• Easy access to piston, and often to the foot valve.
• Use of solvent-cemented plastic rising main is feasible.
• Same advantages as for traditional design.

Main disadvantages
• Large diameter rising main (to allow piston extraction) can be expensive.</td></tr>
</table>

Other good features to look for in VLOM pumps:

Corrosion resistance by using:
- stainless steel rods (with deep-well pumps);
- plastic pipe 'rods' (with direct action pumps);
- brass, plastic, and/or rubber for valves and pistons; and
- plastic or stainless steel for the rising main.

Reduction of both production costs and number of different spare parts required by using:
- identical designs for the piston valve and foot valve;
- identical body for piston and foot-valve housing; and
- identical bearings for the rod hanger and handle (can be moulded from engineering plastics).

Few tools necessary for normal maintenance work.
Easily replaceable bearings.
Facility to use 'T' bar end to lever handles to reduce sideways forces on bearings. Handle ideally of adjustable length to suit leverage required.
Theft-resistant parts and 'captive nuts' where possible, so that they cannot be dropped or lost.

Important notes about sustainable maintenance:

Affordability and availability of spares
It is vital that there is a reliable distribution system of essential, affordable spares. Standardizing on one particular pump in a region, or country, can make this, and local technical support for repairs, more feasible.

In-country manufacture
Standardization on one pump in any country can also make the in-country production of a handpump, or at least the spares it commonly requires, a more attractive proposition because of the resulting high level of demand.

Quality control
To give good performance, handpumps and spares need to be produced by manufacturers who carry out stringent quality-control checks.

Vergnet diaphragm pump

This is a deep-well pump which works without rods; instead it uses hydraulic pressure from a small cylinder just under the baseplate of the pump to cause the alternate expansion and contraction of a cylindrical diaphragm in a larger cylinder at the bottom of the borehole. Models for operation by foot or by hand (lever or 'direct action') are available. The reinforced rubber diaphragm can only usually be manufactured in countries with a high level of industrial development.

Special VLOM features:

- Main wearing parts (in the upper cylinder) are easily accessible.
- When necessary, the main cylinder can reached by pulling it up using the two flexible plastic pipes attached.

Further reading

Colin, J., *VLOM for Rural Water Supply: Lessons from experience,* WELL, London, 1999. (http://www.lboro.ac.uk/well)

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