WEDC Developing knowledge and capacity in water and sanitation

POSTER 53

The Pulsa pump

The Pulsa pump has a large diameter piston and cylinder at the surface which is hydraulically connected, via a water-filled polyethylene pipe, to a stainless steel cylinder below the water level. A force can be applied to the piston by a lever. This lever can be operated by two hands and one foot (with a foot pedal attachment) and it can be operated by two people simultaneously.

How it works

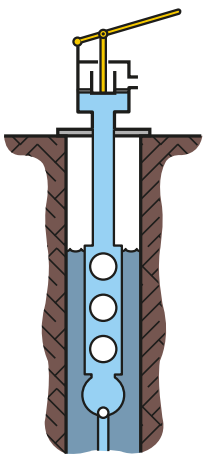
The submerged cylinder near the bottom of the borehole has a foot valve, but instead of a piston it contains up to eight elastomeric balls. These balls are compressed by the hydraulic pressure which is transmitted to them if the piston at the surface is pushed down. At the same time the polyethylene pipe also expands.

To allow for this the manufacturer recommends using specified numbers of balls for ranges of depths to the groundwater table. When the operator stops applying a downward force on the handle/ foot-pedal, the force on the piston is suddenly reduced and the water pressure applied to the balls in the cylinder therefore also reduces. This allows the balls to expand again, and their increased volume (and the contraction of the diameter of the rising main) displaces water which flows back up the pipe, causing the piston to lift again.

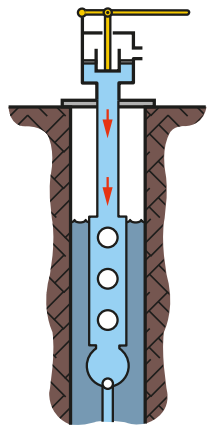
If at the top of its stroke the piston is manually lifted above a seal, the inertia of the rising column of water causes some of it to continue to rise above its original level and spill out of the piston cylinder into the pumphead from where it flows to the pump spout. At the same time as the top of the water column flows out of the upper cylinder, the reduced pressure in the submerged cylinder causes the foot valve to open, and some additional water is drawn in from the borehole.

The water column can now be compressed by again pushing down on the handle and the pumping cycle can be repeated.

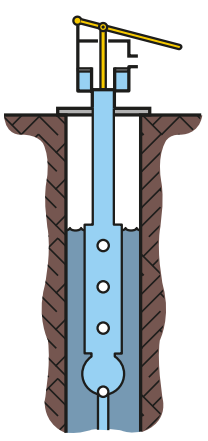
The dynamic nature of the oscillating water column means that the pump operates best at a particular frequency of strokes which needs to be determined at each installation.



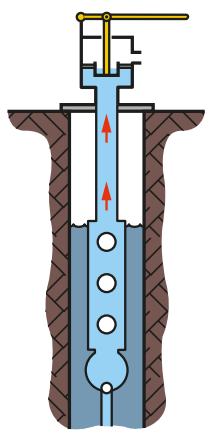
1. Start of cycle. Piston against seal. Water still. Elements at rest. Foot valve closed.



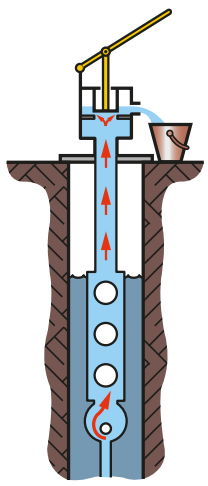
2. Piston descent. Seal blocks water at top. Water pushed down and elements compressed progressively. Foot valve closed.



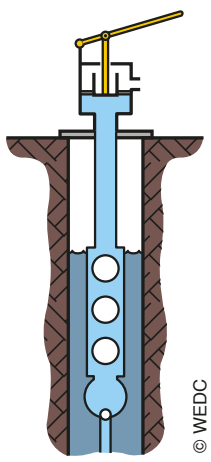
3. Lower dead point. Elements at maximum compression. Water still. Foot valve closed.



4. Piston returns. Pressure gets lower, elements expand. Energy passes to water. Foot valve still closed.



5. Upper dead point. Piston released from seal. Water continues upward course. Elements return to original volume. Foot valve open due to reduced pressure in pipe.



6. End of cycle Piston returns to rest position in contact with seal.

For further information visit:
http://wedc-knowledge.lboro.ac.uk/

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