Use of hydraulic ram pumps

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There are a number of options available for livestock producers to access water directly from the environment as an alternative to mains supply. These methods include hydraulic ram pumps, pasture pumps and photovoltaic pumps.

Hydraulic ram pumps

First installed some two hundred years ago, the hydraulic ram pump is one of the oldest mechanical devices for water lifting. They don't use any electricity or diesel, but rely solely on water flow and pressure and can therefore be installed in remote locations.

There are three main types of ram pump; the traditional cast iron design, lightweight modern versions of the same design and new compact designs made of composite materials (papa pump).

Figure 1: Traditional ram pump

Figure 2: Lightweight ram pump

Figure 3: Papa pump

The hydraulic ram uses the energy from flowing water, including streams and ponds, to pump a small amount of water up to a higher elevation and into a storage tank. The pump will yield 10% of the flow as useable water, the rest will flow back to the source. For each metre of head, the pump can raise the water by 15 metres vertically, with distance being of little concern.

Once set up and working, the pump will run unattended with negligible maintenance. A small ram pump can yield around 7m3/24hrs, this is sufficient for around 60 dairy cows including washing down or up to 350 beef cattle.

Installation

Any changes to watercourses should be cleared with the Environment Agency before work is started. Up to 20m^3/day can be abstracted without the need for a licence, but the Environment Agency must be consulted regarding intended abstraction.

The pumps need to utilise fall, so they should be installed adjacent to a watercourse. A pipe runs to a buffer chamber from where a steel pipe runs to the pump in a second chamber. From here the water is pumped to a header tank at the top of the lift and a run-off pipe for exhaust water is led off back to the stream.

The chambers will require building work similar to a manhole and pipes will need to be dug into the ground. A suitable header tank at the top of the lift will provide head for supplies, although water can be taken off as it travels up to the tank. Yield will need to match requirements and the buffer tank provides additional security and head.

Impact on business

Significant savings on mains water or energy for powered private supplies can be achieved through the installation of a ram pump. The cost of a ram pump starts at £230, with prices increasing to £12,000 for a traditional cast iron pump, chambers, pipework and header tank subject to size, site and complexity. Significant savings, however, could be made from DIY installation.

Pasture pumps

Pasture pumps have been popular in Canada and Europe for some time. They are comprised of a foot, which holds around one to two litres of water, a diaphragm pump and a lever, which is operated by livestock – usually cattle. They can lift water up to around seven metres and pump to a distance of up to 50 metres. Each pump will serve up to 20 head of beef cattle or ten lactating suckler cows. Sheep struggle to operate pasture pumps, however systems are available which allow them to operate the pump by walking into a crate.

Figure 4: Aquamat pasture pump

Figure 5: Sueva pasture pump

Figure 6: Lister pasture pump

Photovoltaic pumps

In recent years, photovoltaic units (PV) have become available. They work by generating electricity from sunlight to pump water from watercourses and lakes. They operate as long as it is light, but do not need direct sunshine. They can pump to limited heads and distances and probably work best supplying a header tank which then feeds into one or more water troughs.

Figure 7: Photovoltaic pump

Boreholes

Boreholes are another source of water and these tend to be appropriate for larger volumes requiring year round supply. They are more complicated because they extract ground water, therefore a number of regulations apply regarding testing, quality and use.