Livestock Watering
FACTSHEET

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USING GRAVITY ENERGY TO PUMP LIVESTOCK WATER

This factsheet looks at the various gravity energy options to move water in the low volumes usually required for livestock use. These options are discussed in general with reference to Factsheets containing specific details.

Introduction

Livestock water pumping options are selected with pump-driving energy as the limiting factor, especially remote systems. Where grid-supplied electricity is not available, gravity is usually the first energy option to consider. Like most livestock water pumping systems, the site plays a big part in the energy choice. For a gravity option to be viable, the site terrain must be favorable.

Favorable sites for gravity energy use are in one of two categories: where the water supply is either at:

- a higher elevation than required and can be **piped down** in a *Gravity Flow Pipeline*, or
- a lower elevation than required and can be **pumped up** if:
  - there is sufficient depth/width and velocity in the water supply to drive a *Stream-Powered Pump*, or
  - there is sufficient volume and elevation fall in the water supply to drive a *Hydraulic Ram Pump*

Gravity-Flow Pipeline

Piping water from a supply site down to a watering trough is the simplest system as no equipment, etc. is required, other than a water intake and pipe. Although relatively simple, these systems **must** be installed using proper techniques to be successful. All gravity-flow pipelines require the following:

- ***an intake*** that is screened from debris and submerged sufficient to ensure no air enters the pipeline
- ***a properly sized pipe diameter***, considering
  - the pipeline length, and
  - the elevation difference (the energy available to move water), and
  - the water flow required,
  - together with the pipeline material while ensuring that the pipe diameter(s) match the *hydraulic grade line*
- ***the pipeline placement***, having
  - sufficient grade in first 30m (100 ft) that doesn't trap air (air release?)
  - air release at significant high points
  - drains at significant low points

For details, refer to Factsheet #590.304-5 ***Understanding Gravity-Flow Pipelines***.

Stream-Powered Pump

These pumps use the energy in flowing water (i.e., flow that's a result of gravity) to lift water above the supply. One example is the *Sling Pump* that rotates as the flowing water passes through the drive blades. It can deliver a volume and lift of water well suited for many livestock requirements. It is portable so multiple sites are possible with minimum setup. To operate, the pump requires:

- a minimum water depth of 40cm (16inch) to properly submerge the drive portion
- a minimum water velocity of 60cm per second (2ft per second) to achieve rated output

Depending on the size chosen, the Sling Pump can deliver from 3,500L per day at 25m, to 15,000L per day at 7.6m.

The Water Wheel Pump is another example of using the energy in a flowing stream.

For details on both these pumps, refer to Factsheet #590.305-8 ***Using Stream-Powered Pumps to Pump Livestock Water***.

Hydraulic Ram Pump

Ram pumps date back to the 1790's and early 1800's and utilizes the water hammer effect. It creates a pressure rise (water hammer) in a falling column of water by alternately opening and closing the column to free flow. Each time the water flow is shut off (quickly) the resulting pressure rise is used to pump a small volume of water. To operate, a Ram Pump requires:

- a drive water volume approximately 10–15 times the volume pumped
- a specific length and fall of the drive pipe

Depending on the size chosen and water supply conditions, a Ram Pump can deliver from a few thousand litres per day to tens of thousands of litres per day at lifts of 100m (300ft) or more. For details, refer to Factsheet #590.305-9 ***Using A Hydraulic Ram to Pump Livestock Water***.

Glockemann Pump. A modification of the Ram Pump is a recent design from Australia, called the *Glockemann Pump*. Whereas a traditional ram pumps a portion of its drive water, the *Glockemann* can pump that way or it can pump separately as a direct intake from the water supply. The pump design uses the same drive principle, but has a diaphragm driving a piston pump. With a piston diameter change it can pump a wide variety of lifts and volumes. Maximum lifts are much higher than traditional rams, up as high as 200m (650ft).

For details, refer to Factsheet #590.305-10 ***Using A Modified Hydraulic Ram to Pump Livestock Water***.

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