Cattle Water Themselves in Sub-Zero Weather

by Heather Smith Thomas

RIMBEY, Alberta: Lack of water in certain pastures can make it impossible to use them with cattle. Jim Anderson, Rimbey, Alberta, solved this problem with an innovative water system in which cattle pump water for themselves - water that never freezes, even at 40 below zero.

"We have two quarters of land that had no opportunity for grazing because there is no natural water and no electricity to put in a pumping system. We looked at a traditional system - what it would cost for power installation and a pressure system. It would have cost more than $6,000 for electricity. We'd also need a well, pump, building, pressure tank and heating element - and have to pay for electricity from then on," says Anderson. Utilizing the grass would not offset costs of installation. "Yet I knew there had to be a way. We've been using a diaphragm nose pump for years and our cattle are already trained to those, so I wanted to find a way to make this work in winter," he says.

A diaphragm nose pump works like a fuel pump in an engine. A rubber diaphragm 10 inches in diameter is used to bring water up the well. When a cow pushes her nose against a horizontal bar at the back of the drinking area, it flexes the diaphragm upward. One-way valves allow the vacuum to lift water into it. When the animal quits pushing, the diaphragm goes down; the one-way valves only allow water to come into the drinking area instead of going back down the pipe. The cow's pushing action on the pendulum raises and lowers the diaphragm which transfers water into the trough.

Anderson's innovation is a piston pump, like the old fashioned hand well where you work the handle up and down to lift water. "We modified it so cattle could use their nose to push a lever, similar to the way they did on the diaphragm nose pump. When they push on the lever it operates the piston pump, raising and lowering the piston in the cylinder, the same as a handle used to do. A piston pump pushes water, whereas a diaphragm pump depends on vacuum," he says.

"Like the old-fashioned hand pump, we have a three-inch cylinder, down inside the well. We capture enough geothermal heat from the ground and contain that heat all the way up to the surface, to keep the contents of the well from

Continued on p. 6

Sub-Zero Weather

Continued from p. 5

freezing," he says.

The waterer is a small enclosed trough on the top end of a culvert set vertically into the ground with two feet sticking above ground level - down to whatever depth is required to make use of ground water or the lower level of a dugout nearby. Water from the dugout is piped underground to the bottom of the culvert. A buried collection tank from a spring would work also. A regular well can be used if the water comes up to within 50 feet from the surface.

"Some ranchers use large pipes, but the typical installation is a culvert at least 24 inches in diameter, set in the ground at least 20 feet in cold climates. The two factors that determine how much geothermal heat you'll gain is how deep you go and how big a pipe you take to that depth."

"We have customers who use a 32 inch culvert. It gains more heat and allows room for multiple nose pumps on top. We recommend one nose pump per 100 cows in winter and 50 cow-calf pair per pump in summer.

We can fit two nose pumps on a 24-inch diameter culvert; it's a matter of space on the lid. If you have 300 cows and need three nose pumps, you need a larger diameter culvert just to have space for that many nose pumps," he says. The cost of dirt work and digging the hole will be similar, whether you use a 24-inch or 32 inch culvert. On a cost per head basis, the larger one makes it cheaper.

One expense is drilling a well or trenching from a dugout, pond or spring to pipe water underground to the bottom of the culvert by gravity flow but you can then use a dugout year round without electricity or breaking ice daily. Anderson recommends an insulated cement pad around the culvert to prevent groundwater contamination and keep livestock traffic from making a hole around the pump or driving the frost down to a level that might cause freezing.

Anderson has been watering 135 cows on one nose pump for ten years without any problems. "It took them a few days to figure out they had to take turns. To train cows, it works best to use a small group at first (15 to 20) since a large group won't learn fast enough," he says.

The nose pump should be the only water source until cows learn to use it. They train easily in summer since the small drain hole in the riser pipe can be closed without risk of freezing; you can wrap electrical tape around the pipe to cover the hole. With the hole closed, the riser stays full of water, and any small movement of the pendulum will bring in more water. The drain hole should be opened up again before freezing temperatures occur.

During freezing temperatures, the pipe coming up the well requires this small drain hole (five feet down) so the upper part of the pipe is empty unless a cow is drinking. After the cow has pumped water and quits drinking, water slowly drains down to this depth. Water from the drinking trough does NOT drain back but there is little left to freeze. The first cow in line gets water on the fourth stroke of the lever, and since it takes 2.5 minutes for the water to sink down to the drain hole, another cow drinking during that time only needs to push the lever once to get water.

The power it takes to push the pendulum is directly related to how deep the water is - how far you have to lift it. "Two of our nose pumps lift 10 vertical feet, another lifts 20 feet, and our fourth one is lifting 47. On the deep one, it's all I can do to push the pendulum and I weigh 190 pounds. But once cows know where the water comes from, they push it pretty hard. On the deep well, they literally slam the pendulum because they know that's what they have to do to get water."

The drinking area is slightly slanted toward the back so the animal is sipping the last of the water from the back. She readily learns to push on the horizontal bar located there as she drinks the last of the water she shoves her nose against it. "When a cow pushes the pendulum with her nose, it swings in an arc about 12 inches and produces a half liter of water. A cow will push it, then she'll drink the half liter of water and if she wants more water she has to release it and then push

Continued on p. 8

Sub-Zero Weather

Continued from p. 6

it again," he says.

The nose pump has a two-position pin for setting the lever. The forward position provides the most water per stroke while the back one gives an easier push. "When we lift water 10 feet, if the pin is in the front hole it takes 35 pounds of horizontal push to move the pendulum. The cows push away from themselves at chest height. We cut that by 40 per cent if we move the pin back to the second hole. That's one way to train cattle - making it as easy for them as possible. We advise people to start with the pin in the back hole, which has a mechanical advantage of 3 to 1 versus the front hole that's 2 to 1, so it's easier for them to learn.

"The fail point in most water systems is an electronic component. There is only one moving part in this pump - the piston that goes up and down in the cylinder. In sub zero weather it must be simple - less things to go wrong or freeze up." Below minus 25 C or minus 15 F, nose pumps should be checked to remove ice if it builds up on the sides of the hood, inhibiting movement of the lever.

Anytime you can get an animal to do something for itself; it's less work or expense for the rancher.

Cattle producers don't have much say in what cattle are worth, but we can reduce the cost of raising them. If they can feed themselves on grass, water themselves, and calve by themselves, we'll come a lot closer to making them profitable, says Anderson. ■

For more information, check out www.frostfreenosepumps.com. Heather Smith Thomas is a cattle rancher in Salmon, Idaho.