

EDMONTON HEALTH

FROST FREE NOSE PUMP: CATTLE WATER THEMSELVES IN SUB-ZERO WEATHER

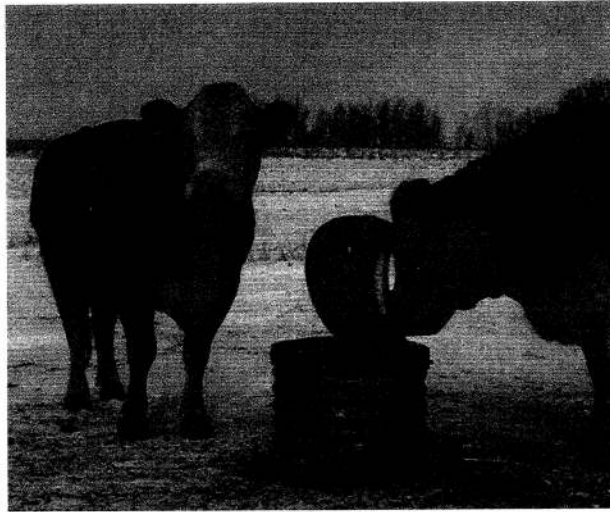
by Heather Smith Thomas

Lack of water in certain pastures can make it impossible to use them with cattle. Jim Anderson, Rimbey, Alta. (northwest of Calgary and southwest of Edmonton), 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, the same as 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 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 road culvert at least 24 inches in diameter, set

Continued on next page

in the ground at least 20 feet. 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. The bigger the pipe, the more opportunity for heat to rise, to keep the water pipe in the centre warm enough," he says.

"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 cows per pump in summer (they drink more in warm weather, and are nursing calves). 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.

The only major 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. You can use a dugout year round without electricity or breaking ice daily. Anderson recommends a 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.

TRAINING THE COWS TO USE IT - Anderson has been watering 135 cows on one nose pump for three 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. After the small group learns, add new cows gradually, and they'll learn from the others.

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

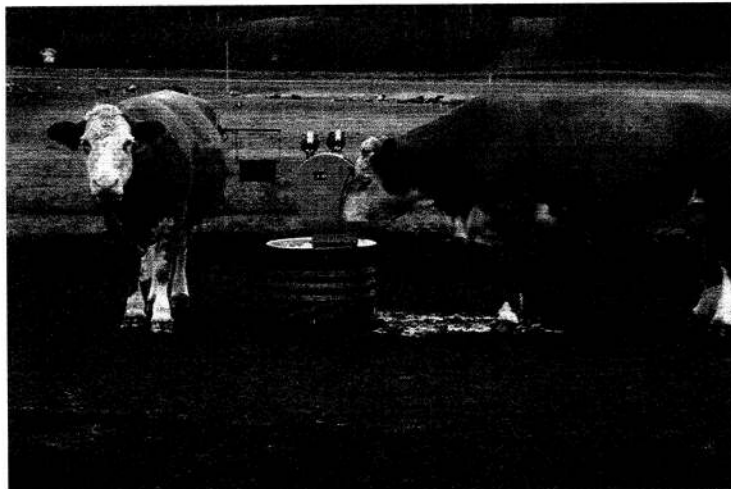
the pipe to cover the hole. With the hole closed, the riser stays full of water, and any small movement of the pendulum will bring in more water. The drain hole should be opened up again before freezing temperatures occur.

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 (no contamination of the water source), 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.

"Many people can't believe nose pumps work in winter without electricity. We've been through five winters with our cows on nose pumps and basically water them for free. The only energy involved comes from the animal who wants the water, and if she's thirsty, she's quite willing to press on it." 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 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. Pump it by hand for them at first, so they know there's water there, and they'll try it," says Anderson. The pin can be left in the second hole for a deep well, so the lever won't be so hard to push.

SIMPLE AND EFFICIENT - A big advantage of the nose pump in cold weather is that it is extremely simple, with little chance for breakdown. "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. Removing this is a quick and simple job, however.

Most of Anderson's customers have ponds or dugouts for water storage. Traditionally they had to chop holes in the ice every day of winter, and had the risk of losing cows who walk out on the ice and fall through before it's thick enough to hold them, or when the ice is melting and thinner. If cattle must depend on a deep hole in ice for water, some of the timid ones may not drink if footing is slippery. A frost-free nose pump soon pays for itself in eliminating the risk of cows falling through the ice or having some become dehydrated because they aren't brave enough to try the ice.

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.

It's very impressive to watch a cow pumping water at 40 below zero and see water come squirting into the drinking area, when there is no electricity there. "A TV station from Calgary came to do a story on it and we set up a date in January, 2003, three weeks in

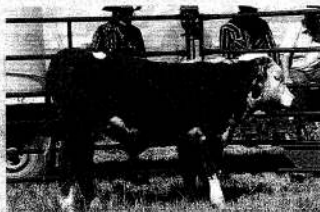
advance. We had no idea what the weather would be. That morning it was 42 below zero. It made a really impressive video!"

The Peace River Forage Association in British Columbia has purchased several frost free nose pumps to use as demonstration with cooperators there, to show alternative watering systems that are energy free, says Anderson. He also has an order for some from the Kootenai National Wildlife Refuge at Bonners Ferry, Idaho, to set up for a grazing cooperator as demonstration models. For more information, contact Anderson at 403-843-6740 or 866-843-6744 or check his web site at www.frostfreenosepumps.com.

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