



Freeze Protection for Livestock Watering Systems

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Contents

Winterizing a summer use-only system	1
Winter use of a livestock water system	1
Suggestions for keeping water open	1
References	3
Further resources	3

Using a livestock watering system in the winter is problematic but possible. Freezing temperatures pose two main challenges: winterizing a summer use-only system and freeze-proofing a system intended for winter use.

Winterizing a summer use-only system

The first part of winterizing a summer use-only system is turning off the system at the pump controller.

For a system with a submersible pump, water in the supply pipe in the well must have a way to drain below the freeze level. One method to ensure drainage is to drill a 1/16-inch hole in the supply pipe 7 to 10 feet below ground. This will allow water to drain out of the pipe above that level when the pump is not running. The system will lose a small amount of water during pumping. Another method is to install a frost-free hydrant on top of the well. At the end of the pumping season, and long before freezing weather occurs, turn off the pump and close the hydrant. Any aboveground piping must be drained.

For a system with a surface pump, any aboveground piping that will be exposed to freezing temperatures must be completely drained. The pump and suction line must also be completely drained. The pump should be covered.

Winter use of a livestock water system

If you plan to use a watering system when pipes and water troughs can freeze, you will need to plan ahead. If you use a solar-powered system, keep in mind the solar panels stop generating power at night, when temperatures are lowest. Also, solar electric technology is good for pumping water but not very good for electric resistance heating. You have several options to prevent freeze-up,



Solar-powered livestock watering system at Sauerbier Ranch near Sheridan, Mont. Photo by Mike Morris, NCAT.

including using heat from the earth or sun, insulating components or continuously circulating water.

When you install the system, you will need to reduce the chances of freeze-up of components that may be in contact with water. You will need to bury piping below the frost line. If the system includes a well, install a pitless adapter. Any aboveground sections of piping should be insulated and arranged to drain at night or when it's cloudy and water is not being pumped. Frost-free hydrants may not work in this situation. If the handle is left up and the solar-pumped water stops running, because of lack of sunlight at night or because it's cloudy, the hydrant will freeze.

Suggestions for keeping water open

There are several ways to keep watering tanks open and storage tanks from freezing. Each livestock watering situation is

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different, so you will need to create a solution for your site, weather and terrain. Below are some ideas:

1. Pump water into a large enclosed storage tank at a higher elevation. You should insulate the tank in some way, bury it or mound dirt around it. If the tank is exposed, paint it black to absorb the sun's heat during the day. From the storage tank, run a buried line to supply the watering tanks by gravity and control this flow with a float valve. You may want to use a thermostatically controlled float valve that opens when temperatures drop below a certain point. You can position some of these valves to direct water around the outside of the watering tank to keep water open for stock. You can also pump water into the storage tank during the day so that it will continuously trickle into the watering tank at night and on cloudy days. The watering tank will need an overflow drain-field.
2. If a storage tank is not an option, you can use a solar pumping system to fill the watering tank directly during the day. Make a small hole that allows the tank to drain slowly at night to keep water moving.
3. You can use large heavy equipment tires as watering tanks. These help keep water open since they are black and absorb heat from the sun. They are also flexible enough not to crack if freezing occurs. These tires are often free and are very tough and can take abuse from animals.
4. Much of the heat loss from a watering tank occurs at the surface of the water. You can reduce this heat loss considerably by placing an insulated cover over a large part of the surface area of the tank. Provide openings around the edge where animals can drink. You can also insulate the sides of watering tanks with insulation material, sawdust or wood chips. Partially burying a watering tank, or berming it with earth, takes advantage of the ground's warmth to prevent freezing.
5. Another way to make use of underground warmth is to install a culvert with a sealed

bottom under the tank. You can circulate water from the culvert into the tank with a separate low-wattage solar-powered pump. This system requires a battery bank to allow for night use. You will need to put the batteries in a non-freezing area, perhaps on a platform above the water level in the culvert.

6. You can use a special in-tank propane heater to keep water from freezing.
7. Innovative producers have experimented with building solar-heated air or water collectors on their tanks. A system such as this uses the sun's heat to keep the tank from freezing.
8. Another way to use propane is to run a quarter-inch copper tube from the regulator into the water tank and crack the propane valve open slightly, just enough to allow small bubbles to flow from the tube. The bubbling action will keep water open at the spot it emerges from the tube. A propane tank will last over a month if used in this manner. The livestock waterer can be placed in a location where the propane can be easily dispersed by the wind to prevent an accumulation of propane gas. A propane bubbler can be constructed for about \$90 from materials acquired at a hardware store. If you have an old propane bottle, you can have it filled and save about half of the cost.

Materials list

Item:	Approximate cost:
20-pound propane tank	\$60 to \$90, new
Regulator	\$10 to \$15
Adaptor fittings (2)	\$5
Copper tubing, ¼ inch	length cut as necessary

Adaptor fittings

These fittings go on each side of the regulator and connect the bottle valve to the regulator and the regulator to the tubing. The fitting from the bottle valve to the adaptor will have a large, reverse-thread

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male gas fitting on one side (to match the internal threads on the bottle valve) and a tattered pipe thread fitting on the other side. The pipe thread will be a male thread, ¼ or ⅜ inches in nominal pipe size. The adaptor fitting that connects the regulator to the tubing will be a ¼- or ⅜-inch male pipe thread on one side, which corresponds to the female threads in the regulator. The regulator will have an arrow pointing in the direction of flow stamped onto the regulator body. On the other side of the fitting will be a ¼- or ⅜-inch compression fitting to connect to the tubing (depending on the size of tubing you choose).

It is recommended that you construct a protective device to cover the tank and shield the tubing, and to keep livestock

from trampling and damaging the bottle, regulator or tubing.

Energy-free livestock waterers

A variation on water systems is to use an insulated livestock waterer in the manner suggested by the government of Alberta's Agriculture and Food program. This program has tested low-input, energy-free livestock water delivery and heating technology that relies on geothermal heat to keep water open during cold weather, as low as -15 degrees Fahrenheit (AFMRC, 1994). For a report on the construction, use and maintenance of the energy-free system, see the publication *Energy Free Water Fountains* from Alberta Agriculture and Food at [www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/eng3133/\\$file/706.pdf?OpenElement](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/eng3133/$file/706.pdf?OpenElement).

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Alberta Agriculture and Rural Development, Alberta Farm Machinery Research Centre (AFMRC). 1994. *Energy Free Water Fountains*. [www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/eng3133](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/eng3133)

Further resources

Alberta Agriculture and Rural Development. 1991. *Field Study of Electrically Heated and Energy Free Automated Livestock Water Fountains*. [www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/eng3134](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/eng3134)

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Build it Solar. *Build it Solar, a Renewable Energy Site for Do-it-yourselfers*. www.builditsolar.com/Projects/WaterHeating/water_heating.htm#Animals

Web site includes resources for heating water for animals, including solar-heated tanks.

MiraFount Livestock Water Systems
www.miraco.com/default.aspx

Manufacturer of energy-free livestock watering systems.

Murdoch's Ranch & Home Supply
www.murdochs.com

Source of MiraFount Livestock Water Systems.

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