



FREEZE PROTECTION FOR SOLAR-POWERED LIVESTOCK WATERING SYSTEMS

LIVESTOCK TECHNICAL NOTE

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Winter use of a solar pumping system is problematic but possible. Even in areas with mild climates, owners of these systems must cope with shorter daylight hours and extended periods of overcast skies that can drastically reduce power output. 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 thing to do is turn 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 well 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 SOLAR PUMPING SYSTEM

If you plan to use a solar watering system during times of the year when pipes and water troughs can freeze, you'll need to plan ahead. 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, including using heat from the earth or sun, insulating com-

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ponents, or continuously circulating water.

When you install the system, you'll need to reduce the chances of freeze-up of components that may be in contact with water. You'll 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 so that they drain at night or when it's cloudy and no water is being pumped. Frost-free hydrants may not work in this situation. If the handle is left up and the solar-pumped water stops running, either because it's night or because it's cloudy, the hydrant will freeze.



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 small-wattage solar-powered pump. This system requires a battery bank to allow for night use. You'll need to put the batteries in a non-freezing area, perhaps on a platform above the water level in the culvert. A Canadian company has come up with a system of this kind, complete with an insulated tank cover.

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.

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HTML
<http://www.attra.ncat.org/attra-pub/freeze.html>
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SUGGESTIONS FOR KEEPING WATER OPEN

There are several ways to keep watering tanks open and storage tanks from freezing. Each livestock watering situation is unique, so you'll need to tailor a solution to 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 up 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 so that they 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 the 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 for the taking and they