Tire Tank Installation

Herschel George - K-State watershed specialist

1. **Choose size of tire and type of opening.**
   - Small circles for drinking
   - Whole tire
   - Half tire

2. **Cut tire opening.**
   - Tools
     - o Tire chalk
     - o Drill with large twist drill bit (may hit wire)
     - o Reciprocating saw with metal cutting blade with 6 to 8 tpi (teeth per inch).
     - o Special cleaning and lubricating fluid
   - Mark the desired cut line with tire chalk
   - Cut tire and remove the center

3. **Select site for tank.**
   - Needs a minimum of about 2 psi (4 ft) difference between water level in pond and top of water in full tank
   - Ideal to have overflow line that drains to daylight

4. **Plumb water lines to and from proposed site.**
   - Ideal to have 1 ½ or 2 inch waterline to and from the tank
   - Ideal to have flexible connector on both incoming and outgoing lines
   - Ideal to have Brass (or Galvanized) line coming into tank to connect to float valve
   - Plumb intake line so bottom of threads on the metal pipe is even with top of concrete line (top of bead inside the tank).
     - o Lightly thread a female connector onto the top of the pipe with a 1 ft or longer piece of pipe in it to prevent concrete from getting into the pipe or threads and to allow you to maintain as vertical as possible pipe placement. Do not glue these pieces; they will be removed when concrete is cured.
   - Plumb the drain and overflow so the top of the collar connector is installed to be just flush with the top of the concrete (top of bead inside of the tank).
     - o Lightly place a 1 ft or longer piece of spare pipe into connector, but do not glue it! This is to protect the pipe from being filled with concrete and to allow you to maintain the pipe as vertical as possible. This will be removed after the concrete in cured.

5. **Firm, tamp and fill center of tank** so there are 4 to 6 inches of space left for the concrete. There can be greater space, but it requires more concrete.

6. **Level and set tire into site.**
   - Ideal to have tire into ground at least a few inches
   - Ideal to have geotextile around the tank to extend the life of the gravel sinking into mud
   - Firm and tamp the gravel base under tank.
   - Level tank using a tube level.
   - Install reinforcing rod or wire into the space for the concrete.

7. **Install a bead of silicone** onto the center of the bead that will be in the concrete.
   - Install a bead of silicon onto the incoming and outgoing lines about 2 inches down from the top of concrete line.
   - An optional 2nd bead of silicon can be installed about 4 inches from the top of the concrete line (top of tire bead inside the tank).

8. **Mix the concrete for the tank.**

   Tire tank concrete mixture tips from Herschel George: I have been using bagged concrete mix with additions. I add a bit of Portland cement to the mixture to make it a bit richer and stronger. I also add a bit of "fiber" to the mixture. It helps to maintain the material from cracking apart. (Some tell me this is unnecessary, but for the cost it makes me feel better. Fiber adds about $5.00 to the cost of a yard of concrete.) It takes about 4 or 5 bags to do the tires I am demonstrating on today (5 ft diameter with 24 inch bead).
   - Mix the concrete mixture (with additives) for the tire.
   - Place concrete into the center through the bead opening only.
   - Work the concrete under the tire as best as you can. You may need a trowel and a sledge hammer to make the concrete move under the tire well.
   - Make sure the pipes are straight. Make sure the reinforcing rod is in place.
   - Continue poring concrete until area below the tire is full up to the top of the bead. Trowel the area. You can have a ½ inch of crown to the concrete if you desire. Check the level of the bottom of the threads and the top of the drain collar to make sure they are at the desired depths.

9. **Run water into the tire outside the concrete area** until the water softly flows across the concrete and covers the concrete by 2 inches.
   - Leave the project (with the water on the top of the concrete!).
   - Clean all tools.

10. **After the concrete cures** (ideally 3 weeks or so), install the water level valve with float.
    - Consider the refill rate of the tank when selecting a valve. Small valves cost less but may have slow flow or refill rates.
    - Tanks installed using gravity flow from a pond may have very low pressure, select the valve accordingly.
      - The valve I often show is from: Watson Manufacturing Inc., Stock Water Control Products, P.O. Box 397, Morrill, NE 69358, 1-800-292-2987, 1-308-247-2281
      - http://floatvalveusa.com/index.html
    - HG - I recommend installing a "Break-a-way" connection below the valve to protect the metal pipe threads and valve in case your neighbor's ornery cow tries to take a bath in the tank.
    - HG - I recommend, where possible, installing a winter minimum continuous flow valve to prevent freezing and an overflow line.
    - Set the float level for the desired water level.

11. **Place additional gravel** to the sides of the tank, leaving at least 1 ½ ft of tank showing above the finished gravel layer.

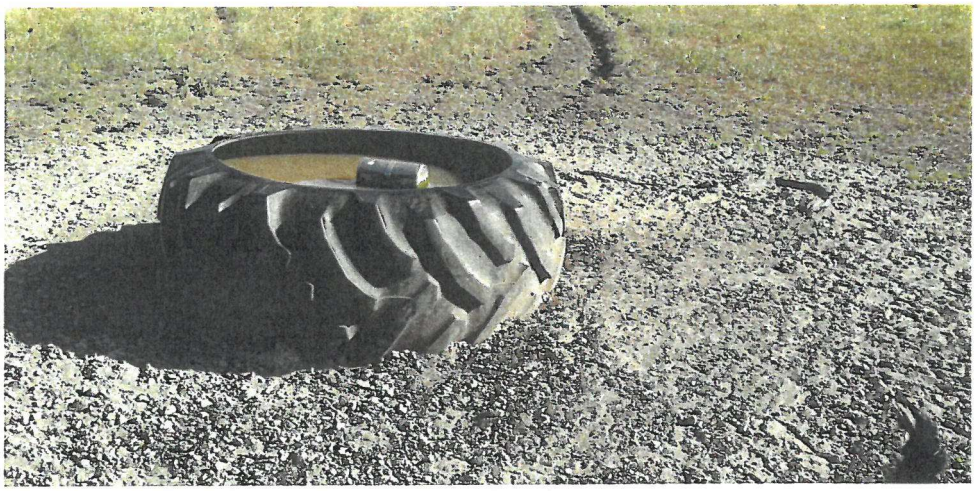
Bressner Pasture Pond cleaning and upgrades 2011-2012

During the fall of 2011, the pond in the east pasture at Bressner was cleaned with a dozer. At the time of the pond cleaning, a 6 inch primary spillway pipe (or trickle pipe) was installed in the pond along with a 2 inch livestock watering pipe.

The pond had lots of mud removed and was in a large pile on the north edge of the pond. It was decided that if it were possible, much of the mud, after settling and drying could be used on the back slope of the pond dam. It was an expensive process but much of the mud was moved.

With the growing cost of cleaning of the pond, it was decided that the pond should have an exclusion fence around it to prevent the wear and tear on the pond dam and edges by the livestock. Electric fence is used for cross fences and was decided that is should also serve as the exclusion fence.

The cleaning of the pond caused us to consider how to protect the pond in the future. The livestock water line through the pond allowed us to consider a waterer for the livestock below the pond. The site had a minimum of slope which required the pipe to be extended downhill in order to get the desired 6 foot of head at the tank site. Prior to the cattle coming to the pasture in the spring of 2012, a tire tank was installed. The used 30.5 – 32 tire was recycled for the tank. The wide tire similar to a "Rice" tire used on many combines. The tank was installed following the guidelines provided with this report. A valve and float in the tank control the tank at the desired level for the livestock. An overflow line was added to allow the site to remain dry yet allow for the minimal flow through the valve to prevent freezing the valve during the winter.



The tire tank is shown with the geotextile and gravel. Ideally, the fabric would be covered deep enough that the geotextile will never show.

The water from the pond is turbid due to the clay in the water. Typically the water will clear, over time, as the clay finally settles and no cattle will have access to disturb the pond water.

Limited Access

The site of the tire tank was further south than desirable to use with the cattle in the north pasture. Rather than allow the cattle to have access to the newly cleaned out pond, a limited access area was considered. Initially we considered a traditional site using the geotextile with gravel on the top. However, we chose to demonstrate two alternative systems for limited access. The first of the systems was to use semi-trailer treads in a pattern to allow the cattle to have access to the stream (See figure #1). The treads were not woven; rather they were simply screwed together.

Figure #1 Tire tread mat (no geotextile used).

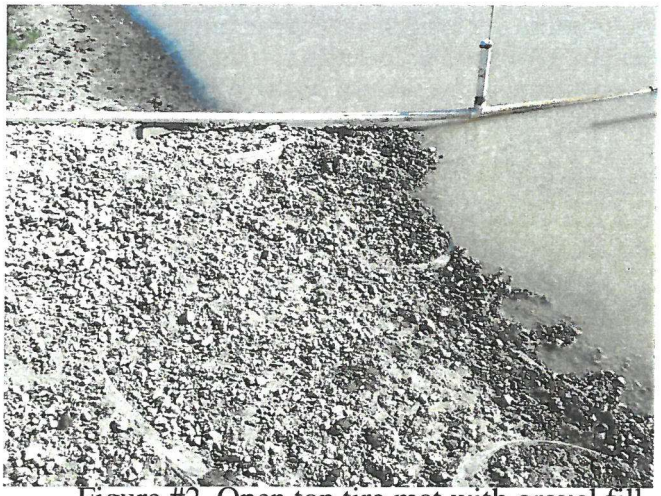


Figure #2 Open top tire mat with gravel fill on a geotextile base.

The second system was a series of semi-trailer tires with one sidewall removed. The tires were placed on the geotextile as closely as possible with the open side up. Gravel was added to the site to fill the tires. The thought process was that the tires would help prevent the gravel from working downhill off of the geotextile into the pond.

The exclusion fence around the pond was constructed with the access to the pond. A floating electric fence was used to prevent the cattle from going further into the pond than we desired.

The slope of the entrance area was about 1 foot in 4 feet which was greater than we desired, but similar to many ponds in the area.

From observing the cattle behavior, both accesses worked well.

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Solar Water Pumping

Solar water pumping is the process of pumping water with the use of power generated by sunlight. Solar pumping systems are reliable stand-alone systems that require no fuel and very little attention. Solar panels generate maximum power in full sun conditions when larger quantities of water are typically needed.

Panels-

This demonstration unit has two 85 Watt panels convert the solar energy into electrical energy. In this system it is the only energy. No batteries are attached. 25 year warranty.

Sun Tracker-

Some system uses a tracker to follow the sun to increase the solar panel efficiency. The system I have used have passive tracking, meaning they take no power from the system, it operate from the heat of the sun striking the frame members. The frame member is warmed causing the Freon inside to move from one cylinder to the other as it follows the suns heat. The tracker allows the system to pump an estimated 30-40% more water during the summer. Most likely it increases the pumping in the early parts of the morning and the late afternoon. Currently we are not using a tracker. They cost about $500-600. The trackers come with a 10 year warranty.
This system we demonstrate here uses panels with more wattage and does not use the tracker.

Controller -

This electronic "magic" box converts the variable energy from the solar panel to the constant voltage for the pump. The controller include a pump speed control circuit, a remote switch circuit, a sensor-less low water cut-off circuit, an electronic circuit breaker and indicator lights.

Pump -

This is the part that does the actual pumping of the water. It is a diaphragm pump. This means the pump works on a positive displacement process. The pump has the capacity to pump water to greater height (greater head) without much decrease in volume. Pumping to greater height does require more energy from the solar panel. This pump has the capacity to pump to 100 ft of head (43 psi).

Do I need a water storage tank?

Storing water in a cistern or tank has many advantages. It's less expensive, more trouble-free and more efficient than storing power in batteries. Since water is always a critical issue, we recommend the tank should be able to store a minimum 3 to 6 days worth of water or whatever you think your needs may be during cloudy weather or in case of a system failure.

Generally speaking, animals, plants and humans use less water on cloudy days. Conversely, the sunniest days are when we consume the most water and when the solar panels are providing the pump with the most power.

Should I use batteries in my solar pumping system?

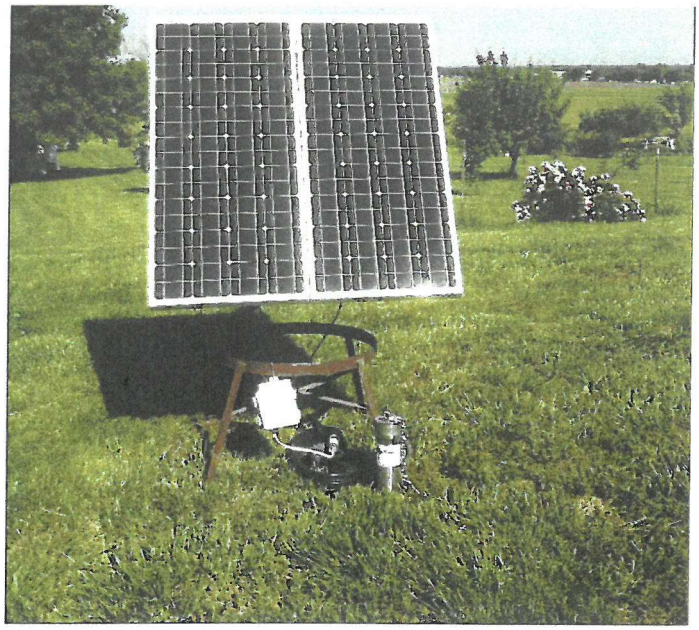
While batteries may seem like a good idea, they have a number of disadvantages in pumping systems. First, they reduce the efficiency of the overall system. Second, they are another source of problems and maintenance. Third, they add cost to the system.

Solar Pump System suppliers indicate livestock producers should "Store water and not power when possible and you will have much better performance and reliability with your solar pumping system."

Solar Pump System costs

for demonstration unit

Photovoltaic Panels	
2 - 85 watt panels Solarland 85 Watt	**$470**
Fixed Rack	
DP-TPM2 Solarland 85	**$205**
Controller	
SolarJack PCA 30-M1D	**$275**
Pump Wire	
10-2 w/grn. 100 ft x $1.55/ft	**$155**
MC4 interconnect	**$ 38**
Pump	
Sun Pumps SDS-Q-130	**$976**
Freight to Eastern Kansas about	**$155**
Prices - April 25, 2012	**$2,274**



Sunpumps: (diaphragm pump, brass and stainless steel, with brushes, design for shallow well), (air filled motor cavity), (DC power only).

Grundfos: Sqflex pumps, CU200 controller, Pole Mount ,Solar Panels, **$3152**
(Helical rotor pump, stainless steel, brushless, design for deep wells), (oil filled motor cavity for lubrication and heat dissipation), (AC or DC powered)

Bison: BSP pump, SPC Controller, Pole Mount, Solar Panels, **$2425**
(Helical rotor pump, stainless steel, brushless, design for deep wells), (oil filled motor cavity for lubrication and heat dissipation), (AC or DC powered)

How much water can a solar pump supply?

These Sunpumps can pump at the rate 4 to 5 gallon per minute in full sun for about 2000 gallon per day. The maximum head of water = 100 ft (or 43 psi), (a slower rate pump can pump up to 200 ft head (or 86 psi)).

The Grunfos and Bison pumps can pump similar gallons with the same wattage of panels, these pumps have the capability to pump 300+ ft head..

Below is a list of the dealers that I know of for the eastern Kansas area:

Sun Pumps	Safford, Arizona (Jim Allen)	800-370-8115	www.sunpumps.com
Panhandle Sales & Service	Beaver, Oklahoma (Brandy Nelson) 580-525-1919	580-646-0911	www.solarwellpumps.com
Lyman Inc.	Medicine Lodge, Kansas (Dean)	620-886-5731	
Solar Water Technologies Inc.	317 S Sindny Baker St, Kerrville, TX	800-952-7221	www.solarwater.com
Robinson Solar System	207 West Main, Canton, OK	866-519-7892	www.solarpumps.com
Mike's Pump & Well	109 S Colorado, Ellsworth, Kansas	785-472-4919	
Oak Grove Fabrications	RR1 Box 69, 15221 Schmedemann Rd , Alta Vista, KS		785-499-5311
Zeitlow Distributing Co	2060 East South Front Street, McPherson, KS 67460		620-241-4279 or 800-527-5487

Solar Pumping System options

When wishing to have a **pressurized water system**,
I have found the following item effective:
2 gal pressure tank ($40)
Pressure switch (preset at 15-30 psi. or less) ($15),
Pressure Gauge ($7),
check valve ($7)
(with all other connections and adapters ,
the system will cost about $100 total)

Any **float valve** can work.
I have found the Hudson float valve effective ($30

When wanting to store energy to be used at nights or cloudy weather, batteries are required.
This system requires 12 or 24 Volt DC.
Use 2-12 Volt Marine-type **deep cycle batteries** ($65 each).
I believe we should include a **charge regulator** when using storage batteries.
I am using a Morningstar SS-10L-24V ($65)

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K-STATE
Research and Extension

Limited Access Watering Points

Overview

Ponds and streams are common sources of livestock water in Kansas. However, allowing unlimited access can cause severe bank erosion, poor water quality and other related problems.

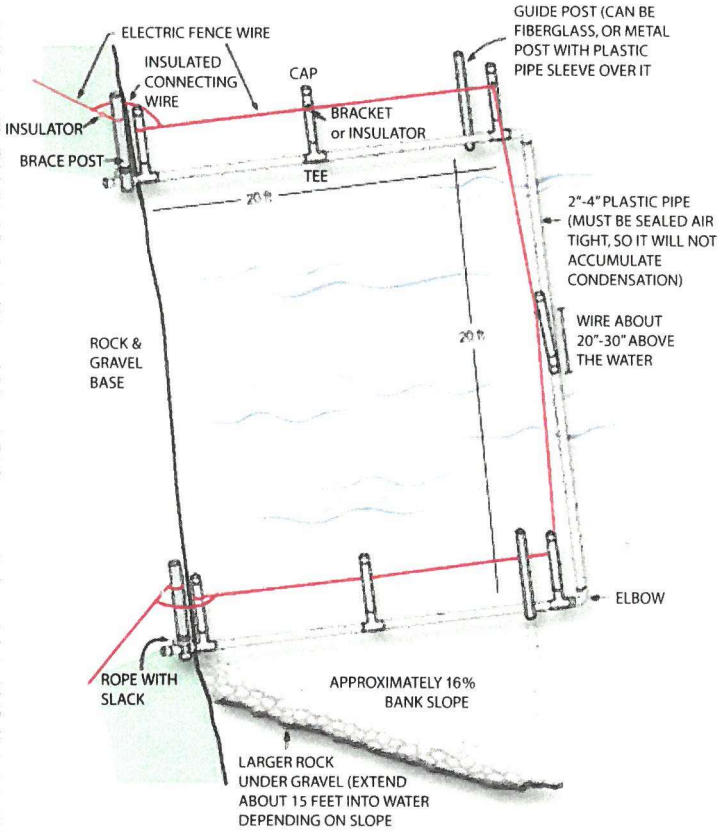
Cattle prefer clean water and avoid steep, muddy approaches to water sources whenever possible. Developing access watering points with a hardened surface and fencing is often fairly simple and solves many of these concerns.

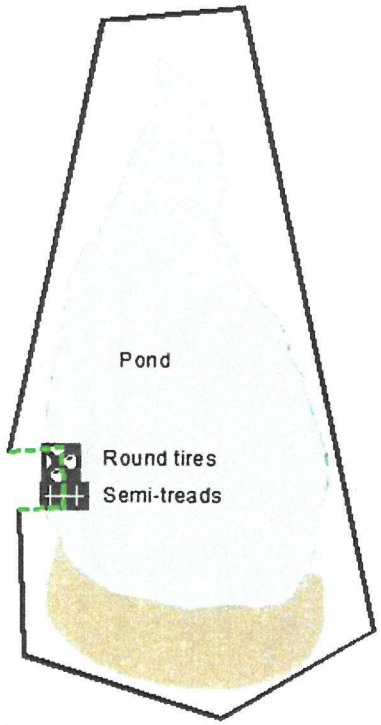
Advantages

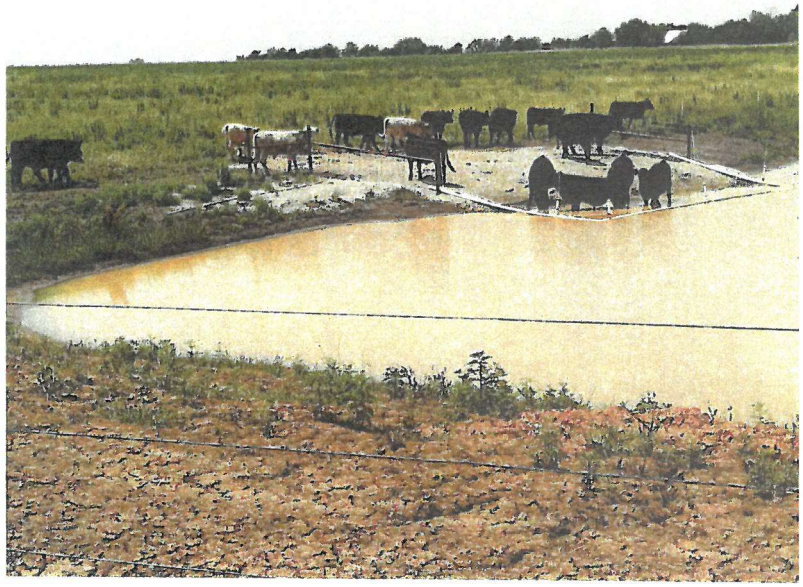
- Simple and inexpensive
- Improved livestock safety and health, less foot rot and fewer leg injuries
- Reduced bank erosion
- Less sediment and fewer nutrients entering streams and ponds
- Extended pond life
- Applicable to new and existing ponds
- Increased water intake may mean better livestock gains
- Works with "Pit ponds" and exclusion fences

Limitations

- Not adapted to large streams
- Fence maintenance required when stream floods
- Few options for location of watering point
- Few examples in Kansas







Design Considerations

To encourage animal use, an access ramp or walkway should have a maximum slope of 6:1 run to rise (17%) or a 10 degree slope. Ramps as steep as 4:1 have been used. However, a flatter slope (8:1 to 20:1) is generally better when space allows, especially when conditions are icy. The ramp surface should be compacted and non-slip (crushed rock, gravel or concrete). A 3:1 slope (or flatter) for the sides of the ramp is preferable when site conditions permit.

Width may vary (recommendations range from 4 to 80 feet) but a minimum guideline is 10 feet plus one foot for each 10 head of cattle – for example, 15 feet for 50 head. Fencing is generally desirable to exclude livestock from other parts of the pond or stream, especially if they congregate and loaf during hot days.

A floating fence made of PVC pipe can be used to restrict access to the pond reservoir at a cost of $200-300. A 16-foot stream crossing/access point for small streams, using gravel with geotextile and sand base, can be constructed for less than $500.

This practice may require permits.

Extracted from "Water and Water System Handbook", http://www.ksre.ksu.edu/library/lvstk2/s147.pdf

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