

# Lessons learned on pumper units/water sprayers used for prairie and oak woods prescribed fires

By Bill Kleiman

September 29, 2019

1. Know what type of pump you want. There are three general pumps on the market. There is the centrifugal pump, the piston/diaphragm pump, and the power washer pump. I will cover those below. After that I cover tanks and tenders.

## **CENTRIFUGAL PUMPS**

2. Centrifugal pumps: These are good for high volume water output but low to modest pressure. Sometimes called trash pumps because they are used to pump out flooded basements and what not and can move lots of trash before clogging. Two popular brands are the "mini Stryker" and two stage Davey. The two stage is more appropriate for fire work. A typical 5hp motor on a one, or two, stage centrifugal pump will produce maybe 150 psi at the pump at full throttle. A lot less at lower and quieter RPMs. A 4 or 5hp motor will produce less pressure. The structural fire fighters use massive motors on centrifugal pumps and get both high pressure and lots of flow. They have those massive hoses too.
3. Centrifugal pumps and simplicity: Centrifugal pumps have few parts and need minimal maintenance. They can be hard to prime, especially if the tank is low on water. They are easy to freeze protect by simply draining the pump.
4. Centrifugal pumps and hoses: The diameter and length of the hose has a major influence on what pressure you can get at the tip of the nozzle. This is due to friction and swirling of the water in the hose as it makes it way to the nozzle. 100 psi at the pump might be a lot less at the nozzle tip. For those 5hp motors on a Davey two stage pump you can use one inch or  $\frac{3}{4}$  hose. Half inch restricts the water too much.
5. Hose and reels: Each reel can hold a certain amount of hose. If you don't know contact the reel manufacturer. A current reel I have could fit 50 feet of one-inch hose, or up to 100 feet of  $\frac{3}{4}$  inch hose. I chose 75 feet of  $\frac{3}{4}$  hose for a centrifugal pump and hope for enough tip pressure and a hose reel that is not full of hose.
6. Centrifugal pumps and flow: The good part of these pumps is in a fire escape you can crank the throttle, open your variable nozzle (you did buy a variable nozzle? Maybe a 10 to 30 gallon per minute nozzle) and knock down a flame front. The downside if your tank will run dry very quickly. Ponder that if you carry 50 gallons of water and yet spray 30 gallons per minute.

## **PISTON AND PISTON WITH DIAPHRAPM PUMPS**

7. Piston pumps produce high pressure but low flow (which is good and bad). Pressure at the nozzle can be 200-500 psi. Wear safety glasses. The Hypro D-30 pump uses a piston with a diaphragm on a 5 hp motor and is very popular in the herbicide industry. It is also popular in the Midwest for prairie burning. It works as thus: A motor turns a shaft and two pistons in the pump. The pistons pump the water. If you could see the pistons moving, they would be in a blur.

Pop pop pop. Little packets of high pressure surging out of the pump into the hose. The diaphragm is used to keep the water from touching the piston and a rubber dampener to smooth the flow of the two pistons into a steady stream. When you stop spraying at the nozzle the pressurized water is immediately dumped back into the tank.

8. Piston pumps and hose: The opposite of a centrifugal pump, the length and diameter of the hose has little to do with the nozzle pressure. The Hypro D30 needs a half inch hose. Maybe it could even be a 7/16<sup>th</sup> hose. You don't want bigger than half inch hose. Use at least a 600-psi burst hose. I think I use an 800-psi hose and I always get yellow. I like Goodyear Ortac. I typically put 150 to 200 feet on the reel, or whatever the reel can hold comfortably. You get the same pressure at the nozzle tip whether you use a 50-foot hose or 500-foot hose. These seems impossible, but it is something to do with those pistons sending packets of high-pressure water down the hose.
9. Piston pumps and the nozzle: There are several good nozzles for these sprayers. The tip of the nozzle is important. I often use a JD-9 nozzle and the tip diameter is sized for the output of a Hypro D30, which is about just under 10 gallons per minute. If I unscrew that tip the water comes out at very low pressure and at 10 gallons per minute. If I take the hose off and measure right off the pump into a bucket, I still get 10 gallons per minute at very low pressure. The JD 9 nozzle will move from fan to stream, but you never will get more than 10 gpm from that nozzle or any other nozzle you put on a D30. Get it? So, you have a fire getting away from you and you wish you could triple the flow for just 30 seconds. Sorry. The good news is you will have a lot of water and you can keep spraying after the centrifugal pump ran out of water and had to go back to refill. The Turtle and the Hare.

### **PRESSURE WASHER PUMPS**

10. A pressure washer pump are those things you wash your car with. A 5hp motor can produce pressure of 500 psi and more. Wear safety glasses. We don't own one of these and I have just tried them out a few times. I believe they are a type of piston pump. You can't let them run without water as that boils the water, trips a relief valve before the pump overheats.
11. Pressure washer pumps can produce fine droplets of water in a fog spray. Think of the ones you use at the car wash. The pumps put out only 2 gpm so you can spray and spray and spray.
12. They often have a foam setting so you can switch a valve and spray foam. The car wash stations have this too.

### **TANKS**

13. Pick the right weight to put in your vehicle. A half or ¾ ton pickup truck should carry no more than 150 gallons. More weight sinks your tires in the mud, and you get stuck. Now how useful is that unit? A UTV can do about 50 gallons nicely, 70 gallons for the bigger UTVs is still pushing it. Don't push it. 100 gallon in a UTV is for special situations like UTVs with tracks. Don't exceed your weight capacity and consider that mobility is the best part of a UTV.
14. A tank should have baffles within it to keep the water from sloshing about and perhaps causing your vehicle trouble.
15. A tank should have a sump. A sump is small area on the bottom of the tank that is lower than the rest of the tank bottom. An example: Do you know how sump pumps are used in basements? There is a sump, a built depression, in the concrete floor of a basement about the

size of a 10-gallon bucket. The sump pump is down in the sump, the pit. Without the sump the pump on the floor would suck air and quit before it could get the last several inches of water off your flooded basement floor. Same for a water sprayer. If you don't have a sump on the bottom of your flat bottom tank you won't get the bottom few inches of water out of the tank. The pump will cavitate (suck air) and you will conclude you are empty, but there is water in the tank still. You get to carry that water weight with you all day long and you don't get to use it. When you go to unload the tank that water will still be there. You will try to tilt the tank and suck it out. Any flat bottom tank needs a sump. We recently were given a Kimtek 70-gallon tank and it has no sump. I may try to gasket in a sump.

16. The slip-on unit needs to be bolted or strapped with heavy duty straps. We often drill through the bed and use big wide washers to spread the load across the bed sheet metal. We try to drill through a frame member when possible. Having a fabricator do this for you is nice. If you use straps, they must be attached to something significant.
17. Tanks can be made of stainless steel, polypropylene plastic, or sometimes those lighter white opaque plastics. I suppose aluminum works.

## **TENDER**

18. How will you fill your empty tank out in that prairie you are burning? If you can't refill your tank in the field, then don't use it to wet line. It is just there for spot fires and what not. And I still think you needed a tender.
19. Bring a tender with you and park in the lot or closer to the fire line. A tender is a truck or trailer with a tank big enough to fill all your pumps at least once, if not twice. It always use a centrifugal pump. Typically, we just buy a trash pump with a 5hp motor at the local farm store. Plumb that with Banjo fittings to the tank.
20. We use a 425-gallon un-baffled tender tank. This tank swishes a lot as we drive down the road. It swishes less full of water. The truck we use is a one ton, so it handles the movement ok.
21. In that tender we have lots of other goodies we use on fires: 48-inch highway signs, various tools, a portable air tank, extra this and that. I love our tender.

End.