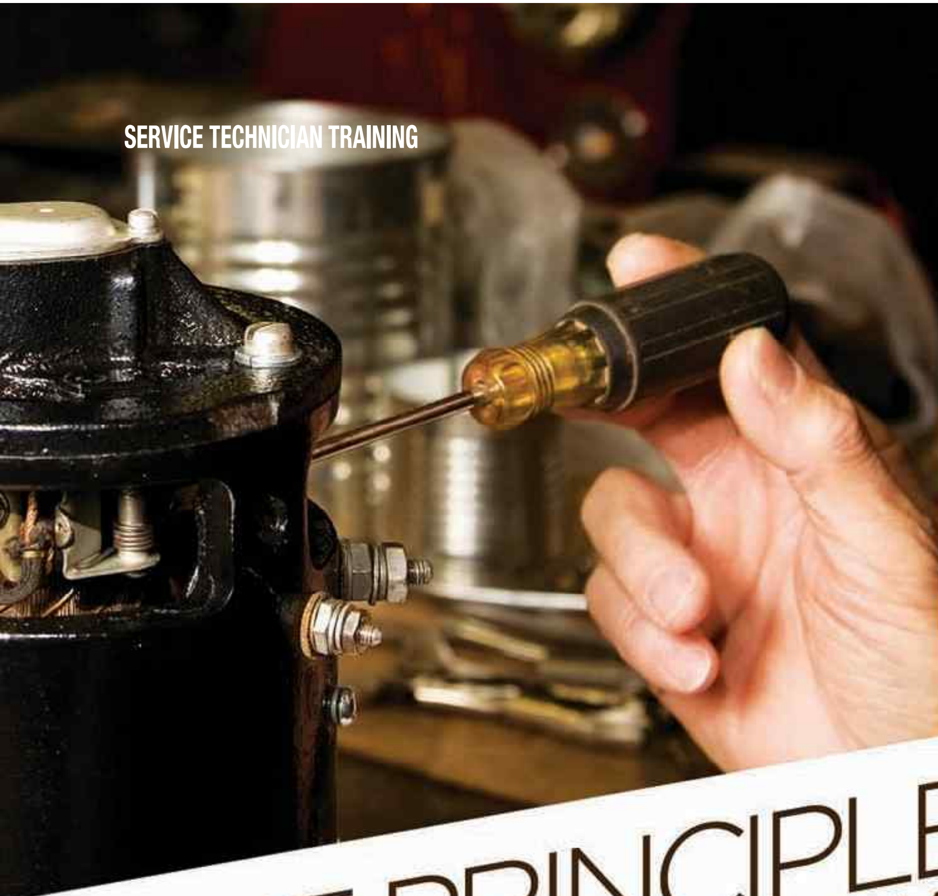


THE PRINCIPLES OF PRESSURE WASHER DESIGN, PART ONE

by Gary Weidner

In order to be a real pro at servicing pressure washers (and get the most enjoyment from your work), you've got to understand how they work. As teacher used to say, those of you who already know this part, please bear with us for awhile.

What Is a Pressure Washer?

It's a device that adds energy to water so that the water can do work.

Basic Theory of Operation

Consider the ordinary garden hose shown in the **Figure 1** sketch. As you know from experience, maximum water flow (say 4 gpm) occurs when the nozzle is wide open.

As the nozzle is closed, the flow rate decreases. This is essentially a constant pressure system.

Now take the nozzle off the garden hose and connect the hose to a pressure washer pump as shown in the **Figure 2** sketch. The pressure washer pump is being driven at some particular speed by a motor or engine. It is a fixed displacement pump such as a piston or plunger pump. This means that, within the limits of its design, for a given rpm the pump will move a specific number of gallons per minute—no more, no less.

Let us say that the pump delivers 4 gpm. Unlike the garden hose setup of **Figure 1**, the pressure washer pump will still deliver 4 gpm even if 5 gpm is available from the spigot. Or, if the water output from the spigot is kind of skimpy, it will literally suck on the spigot if need be in an effort to get the 4 gpm it wants.

Likewise, connecting a hose and nozzle to the pump outlet will not change the 4 gpm being delivered. It will, however, change the pressure of the water being

discharged. The smaller the nozzle orifice, the harder the pump will have to push (higher pressure) to keep the same 4 gpm flowing. This is a constant flow system. It's what our industry generally uses to make pressure washers. The more we restrict the output flow, the more horsepower will be required from the motor or engine in order for the pump to maintain the constant flow.

Notice the overpressure relief valve in **Figure 2**. Should the nozzle become plugged, the constant flow from the pump must go somewhere. Rather than let the pump push until who-knows-what blows, we put in an intentional "weak link," i.e. the relief valve.

The Trigger Gun

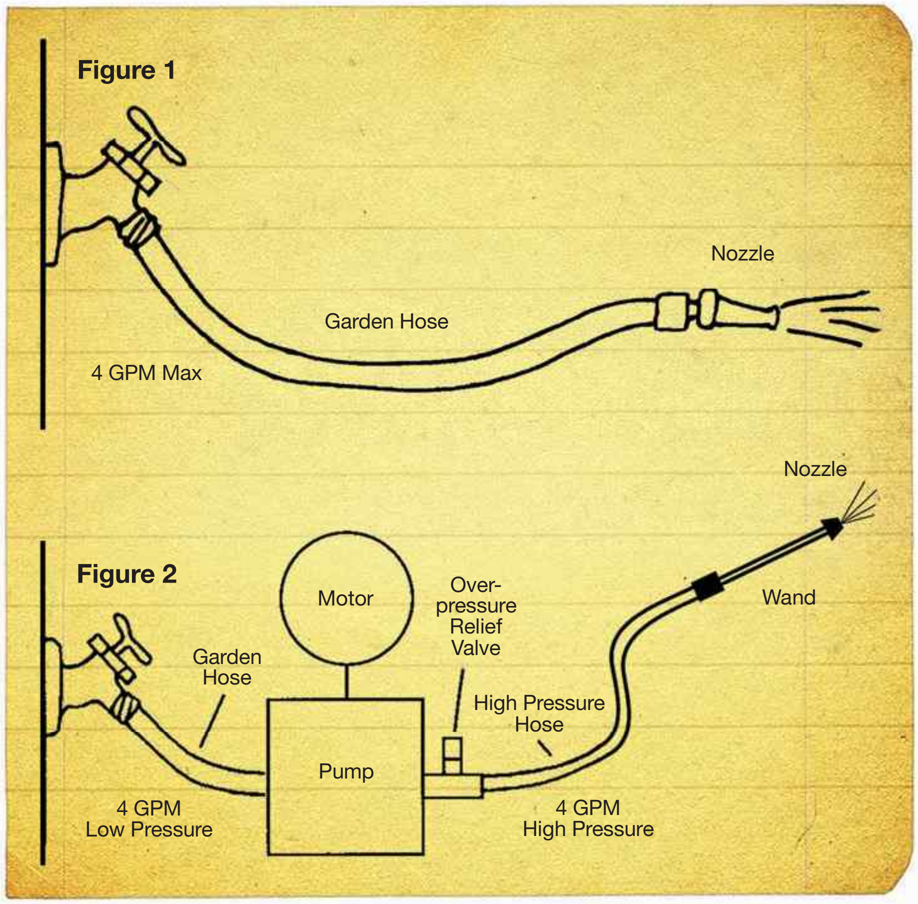
Anyone who uses the rudimentary pressure washer of **Figure 2** will notice the inconvenience of the "straight-through" discharge wand. So, the first feature we'll add is a trigger operated wash gun. However, remember that if we shut off the discharge from the high pressure hose, the pump will insist on trying until something gives to move 4 gpm down the discharge hose. (The pressure will rise higher and higher as the pump tries to push 4 gpm down the closed line.)

In order to use a trigger gun, we're faced with two choices: when the gun is "off" we must either stop the pump or do something else with the water coming out of the pump (divert the flow). Both approaches are used in our industry.

Stop the Pump

Here too there are two choices: either disengage the pump from its driver or stop the motor/engine that is driving the pump. We can disengage the pump drive on command by means of an electric clutch, like the clutch on an automotive air conditioner compressor. Or, we can stop the electric drive motor on command. (It's not practical to constantly stop and start an engine.)

Well and good—when we shut off the trigger gun a command disengages or stops the pump drive. Where does this "command" come from? Tune in next month! *CT*



Do You Know What This Is?

The photo shows a nut splitter. If you don't already have one of these in your set of tools, consider getting one from your automotive tool supplier. Once in a while, it may be the tool that can bail you out of a jam.

The nut splitter in the photo is about seven inches long, and the "handle" is offset at an angle so that the "C" can lay down flat and close to a surface. The chisel jaw on the left rotates to any angle needed. The round jaw on the right is driven toward the chisel jaw by the large hex-head screw at the end of the handle, which transmits force along the inside of the handle to the round jaw by means of a string of ball bearings.

Here's where the nut splitter bails you out. Let's say you have to remove a rusted-on nut on an old machine. A nut that's REALLY rusted on–atom bomb-proof. In spite of your best and most careful efforts, the nut has gotten totally buggered up after lots of trying to budge it. Solution: get out your nut splitter and position its jaws across what remains of two opposite flats of the stuck nut. Tighten the handle screw (this takes some muscle) until you hear the "pop" of the rusted nut splitting.

Sometimes the rusted nut will split into two halves and fall off. Other times, only the side facing the chisel jaw will split, but that's not a problem, because the cracked-open nut almost always turns off reasonably easily.