



The previous chapter gave brief descriptions of the three methods used to heat water in pressure washers: oil burners, gas burners, and electric heaters. We'll devote quite a few chapters to more detail on the first of these, the oil burners. Gas and electric heat will be discussed after oil heat.

Even if you're relatively new at servicing pressure washers, you've probably already had some exposure to the oil burners, at least for the brand(s) of machine that your company sells. Therefore it's assumed here that you are at least somewhat

# OIL HEAT, PT.1



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familiar with components such as fuel filters, fuel pumps, solenoid valves, fuel nozzles, electrodes, transformers, burner motors, and fan wheels.

Over the years, much has been written on pressure washer oil burners and their components. What follows is a collection of some useful information on how they work (or don't work). Let's start the story at the business end of the burner gun (or head).

## Fuel Nozzles

Oil burner fuel nozzles are given designations, much like wash nozzles, but there are three parameters used to describe fuel nozzles versus two parameters for wash nozzles. A wash nozzle is usually specified by its effective orifice size (such as #6) and the width of its flat fan pattern (such as 25 degrees). The three fuel nozzle parameters are described below.

### PARAMETER 1:

#### Orifice Size

Fuel nozzle orifice size is given as a flow rating in gallons per hour (GPH) of fuel oil at 100 psi fuel pressure. (The size number of a wash nozzle is its flow rating in

gpm at 4000 psi.) When servicing a burner, keep in mind that the GPH rating stamped on a fuel nozzle is for operation at 100 psi. Raising the fuel pressure increases the fuel flow rate. The accompanying fuel nozzle chart illustrates this effect for some common nozzle sizes.

If you take a look at the layout of this chart, you'll see that it's no different from the way a wash nozzle chart is made up. The "nozzle rating" column down the left side corresponds to the "tip size" down the left side of the wash nozzle chart. The fuel pressures across the top correspond to the water pressures across the top of a wash nozzle chart. And, the GPH numbers within the chart correspond to the gpm numbers within a wash nozzle chart; nothing strange here.

Readers who are technically inclined may notice that the pressure-flow relationship is the same as for the wash nozzle chart: flow is proportional to the square root of pressure or, conversely, pressure is proportional to the square of flow.

The difference between the two situations is this: the water system is usually a CONSTANT FLOW system where the choice of nozzles determines the pressure. The burner system is a CONSTANT PRESSURE system (due to pressure regulation within the fuel pump) where the choice of nozzle determines the flow. In practical terms, the chart tells us that, for a given nozzle, a 20 percent change in fuel pressure results in about a 10 percent change in fuel flow rate.

**PARAMETER 2:**

**Spray Pattern Width**

Spray pattern width is given as an angular width of the pattern. However, the pattern is a circular cone, not a flat fan like that produced by wash nozzles. The wider the angle, the more the flame is directed toward the sides of the combustion chamber. The narrower the angle, the more the flame is directed toward the far end of the combustion chamber.

The pressure washer designer has to pick a nozzle angle to match the

flame pattern to the size and shape of the combustion chamber. For example, many American coils/chambers have a length-to-diameter proportion such that they use 80 degree nozzles. On the other hand, many European coils/chambers are longer relative to their diameters and use 60 degree nozzles.

**PARAMETER 3:**

**Pattern Type**

Although burner nozzles all have a cone-shaped pattern, there are several variations in common use. Probably the most popular variation is the hollow cone, where almost all of the fuel is sprayed in a circular pattern just around the edge of the cone. Almost no fuel is sprayed in the center area. There are no industry standards for designating spray patterns; some common designations for hollow patterns are A, H, and NS.

A second pattern in use is the solid cone, where the fuel is sprayed in a solid circular pattern, filling the inside of the cone as well as the edges. Some common designations for a solid pattern are B, P, and S.

Another category of pattern in use is semi-solid or special, where the fuel sprays in various special patterns within the cone. Some common designations for a semi-solid or special pattern are W, AR, and Q.

**Key Concepts**

Oil burner fuel nozzles have many similarities to wash nozzles. A wash nozzle is used in a constant flow system, but a burner nozzle is used in a constant pressure system.

Burner nozzles have three designating parameters:

- Orifice size;
- Spray pattern width;
- Spray pattern type.

The oil burner itself is commonly designed to work with a particular nozzle pattern. For example, in a burner designed for hollow cone nozzles, the air delivery system actually blows a hollow cone of air into the combustion chamber; very little air blows into the space directly in front of the nozzle.

On the other hand, in a burner designed for solid cone nozzles, the air delivery system actually blows a solid cone of air into the combustion chamber; most of the air blows into the space directly in front of the nozzle.

In other words, the pattern of air blowing into the combustion chamber is commonly matched to the pattern of fuel being sprayed into the combustion chamber. More about fuel nozzles in the next chapter. *CT*

**Some Common Fuel Nozzles**

| Nozzle Rating | Approx. GPH at indicated fuel pressures |         |         |         |
|---------------|---|---------|---------|---------|
|               | 100 psi                                 | 120 psi | 145 psi | 160 psi |
| 1.00          | 1.0                                     | 1.1     | 1.2     | 1.3     |
| 1.20          | 1.2                                     | 1.3     | 1.4     | 1.5     |
| 1.35          | 1.4                                     | 1.5     | 1.6     | 1.7     |
| 1.50          | 1.5                                     | 1.6     | 1.8     | 1.9     |
| 1.65          | 1.7                                     | 1.8     | 2.0     | 2.1     |
| 1.75          | 1.8                                     | 1.9     | 2.1     | 2.2     |
| 2.00          | 2.0                                     | 2.2     | 2.4     | 2.5     |
| 2.25          | 2.3                                     | 2.5     | 2.7     | 2.9     |
| 2.50          | 2.5                                     | 2.7     | 3.0     | 3.2     |
| 2.75          | 2.8                                     | 3.0     | 3.3     | 3.5     |
| 3.00          | 3.0                                     | 3.3     | 3.6     | 3.8     |

For a detailed fuel nozzle chart, visit [home.mchsi.com/~gweidner/site](http://home.mchsi.com/~gweidner/site) and scroll to the "Oil-Fired" reference section.