

Selecting a Vacuum Pump for Stabilizing

By Curtis. O. Seebeck

I get asked which vacuum pump is best for stabilizing every day so I decided to write this article to provide guidance. Vacuum pumps are like any other tool you purchase. You can go budget at the expense of quality or go quality at the expense of budget, it just depends on your philosophy on tool purchases and how much you think you will use it.

Types of Pumps:

What type of pump do you need? There are really three main types of "pumps" commonly available, oil filled rotary vane pumps, diaphragm pumps, and vacuum generators. Each work differently and produce different levels of vacuum. The closer you can get to 100% vacuum, the more air you can remove from your material. The more air you remove, the more resin you get back in and the better your material will be stabilized! Here is a quick run down of the three common types....

Oil Filled Rotary Vane Pump

- Brands include JB Eliminator, Robinair, Harbor Freight, Jeny, and many other generic imports
- Produces the best vacuum for the money (99.9%)
- Does not require any additional equipment
- Built to run extended periods of time as required for stabilizing
- Requires oil and fairly frequent oil changes
- Can produce an oil mist when using cheap pumps or on a system that has a vacuum leak

Diaphragm Pump

- Brands include Gast, Thomas, and most lab or hospital surplus pumps
- Produce a medium vacuum, typically no better than 83.5%
- Does not use oil
- Does not give off any oil mist no matter how bad of a leak you have and is best used for vacuum chucking
- Does not require any additional equipment

Vacuum Generator

- Brands include Harbor Freight, Hold Fast, and others
- Requires an air compressor to create vacuum through a venturi
- Produces a 93.6% vacuum if you have a large enough compressor
- Noisy with an air hiss the entire time
- Transfers all the wear to your more expensive air compressor
- Can freeze up in humid conditions
- Vacuum level fluctuates as the compressor kicks in and out if you do not have a large capacity tank

The very best choice for stabilizing and the only type I can recommend is the oil filled rotary vane pump. These pumps are the type used by HVAC technicians and produce the best vacuum for the money which will help you achieve the best results. Since I only recommend oil filled rotary vane pumps, that is all that I will focus on for the remainder of this article.

Single Stage Vs. Two Stage:

When shopping for a pump you will see a number of specifications. Some are relevant for stabilizing and some are not! Typically, the first thing mentioned is the number of stages, either single stage or two stage. Two stage pumps basically have two rotors and two sets of vanes. The first stage generates a medium vacuum and the second stage processes the exhaust of the first stage to create a better vacuum. As a result, two stage pumps can produce a deeper vacuum than single stage pumps. However, the typical vacuum chamber, hoses, and fittings can not take advantage of that deeper vacuum! When you get to real deep vacuum, almost everything becomes porous. A typical vacuum chamber and hoses will be doing good to produce a 700-800 micron vacuum (more about microns later but lower is better). A typical single stage pump is capable of creating a 75 micron vacuum where a two stage pump can typically create a 25 micron vacuum. However, if your chamber and hoses leak to the point that they can only get to 700-800 microns, the difference between a 75 micron single stage and 25 micron two stage pump is moot! All else being equal, save your money and buy a single stage!

CFM (Cubic Feet per Minute):

The next specification you will see is the CFM rating. This is how many cubic feet per minute of free air the pump will move. This measurement is made at the pump with nothing attached and drops off significantly as vacuum is created. The question always come up about how many CFM you need. For stabilizing, CFM is irrelevant. Once you get a vacuum chamber down to deep vacuum, maintaining that vacuum requires virtually no CFM. Even when pulling the system down to deep vacuum, CFM plays no part since the typical fittings and vacuum hoses used on a stabilizing system only allow around 1 CFM of air flow. So, even if you have a 10 CFM pump, it is only going to be operating at 1 CFM anyways! Even if you could take advantage of the higher CFM by going with larger fittings and hoses, it would only help you get to full vacuum quicker. Instead of taking 30 seconds, it may only take 15! Add in the fact that you are going to be controlling the vacuum by slowly closing the valve on the chamber, this is not even any benefit. Higher CFM does NOT mean better vacuum and is unrelated in any way. Save your money on go with a lower CFM pump!

Motor Size:

Different pumps will have different size motors. The size of the motor makes no difference in how much vacuum the pump will produce. It is best to just ignore the size of the motor.

Maximum Vacuum:

I mentioned earlier that I would get to microns. Micron is a unit of measurement of vacuum commonly used in the US. The other typical measurement in the US is inHg or inches of mercury. Oil filled rotary vane pumps will typically show the level of vacuum they will generate in microns since that is the measurement most used in the HVAC industry, at least here in the US so that is what I will focus on. The micron scale is a very precise scale of measuring vacuum and ranges from 0 microns being perfect vacuum to 760,000 microns being no vacuum at sea level on a standard day. Therefore, the lower the micron rating, the deeper the vacuum the pump is capable of creating. Remember, however, that a typical vacuum chamber and hoses will never allow you to get lower than a 700-800 micron vacuum so this is not that important of a number. All oil filled rotary vane pumps I am aware of will produce at least a 100 micron vacuum, well lower than your chamber!

Caring for your Pump:

Assuming you take my advice and purchase an oil filled rotary vane pump, I thought I would give some tips on taking care of that new pump! If you read the owner's manual, it will tell you to

change the oil after every use. Remember, these pumps are made primarily for the HVAC industry where vacuum is used to remove moisture from HVAC lines before introducing refrigerant. In that use, it is necessary to change oil after every use to get rid of the moisture that contaminates the oil. In stabilizing applications, if you follow my directions completely, you will not be contaminating your oil with moisture since you will be drying your wood properly before stabilizing! I typically change my oil after every 4-5 uses or when it starts to look dirty or milky when viewed through the sight glass. Also make sure you **ALWAYS** start the pump with all valves open and **ALWAYS** open the valve to release vacuum to the chamber before shutting the pump down. **NEVER** shut an oil filled vacuum pump down while there is still vacuum in the chamber. It will cause oil to spit out the exhaust the next time you run it and cause premature failure of the coupler between the motor and vacuum mechanism.

Oh No, I sucked some Cactus Juice into my pump, now what?

A little tip if you happen to suck some Cactus Juice into your pump and realise it. Immediately stop the pump and drain the oil. Once the oil is drained, fill a cup with new oil and pull the hose from the fitting on your chamber. Stick the end of the hose in the oil and turn on the pump, allowing it to suck the oil through the hose and internals of the pump, flushing everything out. Once you have sucked up the oil, stop the pump and drain the oil again. Refill with fresh oil and if you caught it in time, you should be fine! If you did not catch it and the pump fails to start, if you bought a quality pump, please feel free to call me and I can walk you through tearing it down and cleaning it out!