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Vacuum Pumps for CNC Router Tables

The heart of any cnc vacuum table is the cnc vacuum pump. There are several kinds available. A “Regenerative Blower” is typically a centrifugal impellor type:



A typical Regenerative Blower for use as a CNC Router Vacuum Pump...

Regenerative Blowers are capable of moving a lot of air (CFM = Cubic Feet Per

moving a lot of air (CFM = Cubic Feet Per Minute), but they won't pull as strong a vacuum. The strength of the vacuum is measured in inches of mercury, often abbreviated as "Hg". -30 Hg is 0 pressure—a perfect vacuum. -15 Hg is about half normal air pressure. At sea level, air pressure is 14.7 pounds per square inch, so -15Hg would be about 7.4 pounds per square inch. A typical regenerative blower might generate say 4 to 5 lbs per square inch (8 to 10Hg) versus one of the other types that can generate the full 14.7 lbs per square inch. As you can see, given the same CFM capacity, these other vacuum pump types can clamp the work significantly harder. Or, looked at another way, they can apply the same force to much smaller parts.

Another way to think about it is the amount of vacuum (Hg) determines how hard the part is held down while the CFM capacity is used to deal with leaks. You either need enough CFM for all the leaks or you need to spend more time

or you need to spend more time controlling the leaks.

Other types of vacuum pump include rotary vane and liquid ring pumps, which can pull a stronger vacuum, but to get the large volume of air will cost more:



Rotary vane oil-less vacuum pump...





Liquid-ring vacuum pump...

The strength of the vacuum determines how much of the air pressure is actually going to work to hold down your workpieces. Less vacuum means less pressure. But you have to trade that off against the CFM capacity. If you are leaking a lot of the vacuum, more CFM capacity is needed to keep the vacuum low enough to do its job.

Vacuum Tables face a trade off between the amount of vacuum they can pull with their vacuum pump, leakage (which is working to reduce the vacuum), and the surface area of the part that the vacuum can act on. Big flat parts don't need as much vacuum as small parts. The less powerful your vacuum pump, the more time you'll spend trying to stop leakage so

powerful vacuum pump, and more time you'll spend trying to stop leakage so that enough vacuum is left for the parts. The smaller the surface area on the parts, the more vacuum is needed to keep them solidly in place.

How large a vacuum pump do I need for my CNC Router table?

The bigger the table, the more pump. A rule of thumb is 25 HP on 4' x 8' table and 40 HP on 5' x 10'. That rule of thumb leaves aside the issue of how much vacuum the pump can pull—a regenerative blower in that range is a lot cheaper than a rotary vane type. Are there tables with lower HP pumps? Absolutely! But the lower the HP, the more problems you'll have with leaks and small parts. On a 4' x 8' table, 12 HP is about the minimum for good performance.

The thing is, too small a vacuum pump means extra work every time you run the CNC Router to deal with leaks, work

around parts breaking loose, and possibly even engineering other workholding solutions. It's worth it not to skimp on your vacuum pump!

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