Choosing a Compressor

The way you work and the tools you use determine your air-supply needs

BY ROLAND JOHNSON

In my custom woodworking shop, the first tool that gets powered up in the morning is the air compressor. It is also the last to be switched off after I have blown the day's dust off me with an air gun. In between I use air power for nailing, sanding, spraying, grinding and even vacuum-pressing.

Many woodworkers are skeptical about air-powered tools and the accompanying compressor. Their only encounter may have been at the local service station, where the mechanic uses a screaming air-powered wrench to put the nuts back on a wheel of a car with gorilla-strength torque, while a huge compressor clatters away in the corner.

This experience may have led to the belief that to use any air tool other than a brad nailer requires a compressor with at least a 6-hp pump and a 60-gal. or 80-gal. tank. If you are a full-time woodworker planning to do a lot of air-powered sanding or to finish large projects with a high-pressure spray gun, then you will need one of these larger compressors. But if you are a weekend hobbyist, and you select your air tools carefully, a small or medium-size compressor may fit the bill.

The parts of a compressor

Before deciding how big and how powerful a compressor to buy, it is helpful to understand how a compressor works and what variations are on the market. Most compressors have an

HOW MUCH AIR DO YOU NEED?

Different tools require different volumes of air. Decide what kinds of tools you'll use, research the air consumption of individual models and then select a compressor that can supply that demand.

SMALL COMPRESSORS

Designed to be carried around construction sites, these machines supply enough air to power two framing nailers simultaneously. Some small compressors can supply almost the same volume of air (cfm) as midsize machines. However, their small tank size makes them unsuitable for high-consumption air tools, and running small compressors constantly may wear them out prematurely.

MIDSIZE COMPRESSORS

Typically set on wheels but too heavy to lift, these machines can be moved around the shop and connected to tools with a flexible hose. The tanks are mounted horizontally, for stability, or vertically, which is increasingly popular because the machines occupy less floor space. These machines can supply enough air to satisfy the needs of most amateur one-man shops that use low-air consumption sanders, nailers and sprayers.

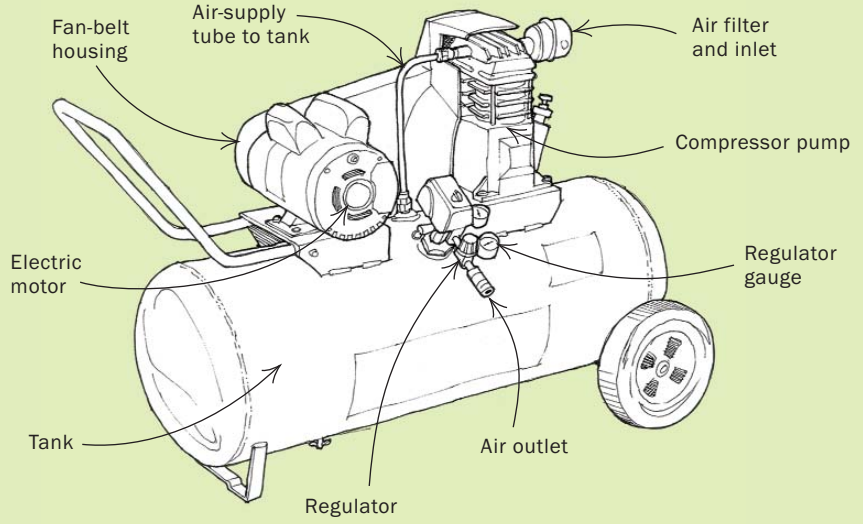
Photos: Mark Schofield

electric motor that powers a pump. Air is compressed by the pump to its maximum output pressure and is stored in a tank. Some compressors have rotary-screw pumps or rotary-vane pumps, but most machines have piston pumps, and I'll focus on these.

Single-stage and double-stage pumps— A single-stage pump compresses air with a single stroke of the piston. A two-stage pump compresses air partway with one piston; the air then is delivered to another cylinder where it is fully compressed.

A two-stage pump offers a number of advantages over a single-stage pump: Higher pressures can be achieved with less horsepower than with a single-stage pump. The same-size storage tank can hold 30% more air when compressed to 175 psi than it does at 125 psi. This means that the pump will not have to run as often to replenish the tank, prolonging the life of the pump. Because a two-

Compressor parts and terminology



CFM (cubic feet per minute) The unit of measure representing the volume of air.

CFM delivered The actual volume a compressor produces.

Duty cycle The amount of time a compressor can run in relation to the time that it needs to rest, usually measured over a 30-minute time span. For example, a compressor rated at 30% duty cycle can operate for nine minutes at full load, then rest for 21 minutes without creating excessive wear.

PSI (pounds per square inch) The unit of measure for air pressure.

Single-stage pump Air is compressed by a single stroke of the pump's piston before going into the storage tank.

Two-stage pump Air is compressed from initial intake pressure to final maximum-output pressure in two stages. A large piston compresses the volume of air, and a second piston, half the size of the first piston, compresses the air a second time before it is sent to the storage tank.

LARGE COMPRESSORS

The advantage of large compressors is that they can run continuously, known as a 100% duty cycle (see the glossary at right). They can power high-pressure spray guns, high-consumption sanders or several less power-hungry tools at once. Most machines in this category require a 240-volt power supply, and because they are stationary, they probably will need permanent plumbing to supply air in all but the smallest shop.

Drawing: Jim Richey

WHAT YOU GET FOR YOUR MONEY

For about $500, you can buy a 60-gal. compressor, which provides an air supply that will satisfy most tools an amateur woodworker would use. For four times the money, an industrial-quality, 80-gal. machine provides a 100% duty cycle (see the glossary on p. 51) to run high air-consumption tools all day.

Blowing hot and cold. *The Ingersoll-Rand cools the hot air from the pump before it enters the tank. This reduces condensation inside the tank.*

One less chore. *Tanks should be drained after each day's use to avoid rusting. Some high-end machines drain automatically.*

stage pump runs slower, it is considerably quieter than a single-stage pump of a similar size and lubrication. A two-stage pump also runs cooler, resulting in less condensation when the warm air reaches the cold steel of the storage tank.

Oil-lubed vs. oilless pumps—In many ways compressor pumps are similar to internal combustion engines: Both require some means to reduce friction among the moving parts. An oil-lubed pump has a crankcase containing oil to lubricate the crankshaft and the rod bearings. An oilless pump has sealed bearings on all of the reciprocating parts and Teflon-impregnated piston rings to reduce friction against the cylinder walls.

The oilless model has the advantage of eliminating the possibility of contaminating the compressed air with oil. It also requires less maintenance, usually costs less and doesn't require a level surface to lubricate correctly. According to one manufacturer, oilless compressors now account for more than 75% of the compressors sold in the United States. Manufacturers now claim that the life expectancy is similar to that of oil-lubed models, and that the pumps can be rebuilt just as easily. About the only drawback of oilless models is that they're louder than oil-lubed pumps.

Tank sizes and configuration—Storage tanks are oriented either horizontally or vertically. Vertical tanks have small footprints: I replaced my 40-gal. horizontal-tank compressor with an 80-gal. vertical model and gained floor space in the shop.

Another advantage of a vertical tank is that the condensation in the tank accumulates at the bottom, farther from the air outlet than it would be in a horizontal tank. That means there's less chance of water getting into the delivery system. It also is easier to drain the water completely from a vertical tank. A horizontal tank can be placed on a shelf or stashed under a workbench, but leave enough space around the pump for adequate cooling airflow.

The bigger the tank, the less condensation you are likely to have. Hot air from the compressor entering a large tank has more room to mix with the existing cool air before it encounters the cold walls of the tank. Another advantage of a larger tank is that the compressor will not have to run as often, keeping the pump cooler.

Same size, different appetites. *These are all 6-in. random-orbit sanders, but their rated air consumption ranges from 8 cfm to 24 cfm. Unless you are buying a large-capacity compressor, pick your tools carefully to make sure you have enough air to power them.*

Compressors fall into three ranges

For this article I obtained a variety of compressors ranging from 2 hp to 6.5 hp, with tanks ranging in size from 4 gal. to 80 gal. The pumps included oil-lubed and oilless versions, one- and two-cylinder pumps, and single- and two-stage pumps. The idea was not to perform a traditional tool-comparison test but to understand the capabilities of each group of compressors,

whether design differences affected performance, and what tools would work with each size of compressor.

Small compressors: portability comes at a price—In some ways the only thing small about these compressors is their tank capacity. The small and midsize Craftsman compressors illustrate this point: The midsize unit has a 3.5-hp pump, a 25-gal. tank and yields 5.1 cfm of air at 90 psi; the small unit has a 3-hp pump, a 4-gal. tank and yields 5.7 cfm of air at 90 psi.

However, small compressors are not meant for use with sanders or spray equipment. These machines are not designed to run constantly, and doing so will heat them excessively, shortening their lifespan.

Midsize compressors: all you need for occasional use—Like their smaller brethren, these compressors would have to run constantly to supply a sander, so I asked an engineer who works for one of the manufacturers whether this would damage the machines. He said that the workload demanded by most amateur woodworkers would not cause the pump to run more than 50% of the time. Large machines can run 100% of the time, known as the duty cycle (see the glossary on p. 51), but small and midsize machines should not exceed 50% duty cycle.

If you are going to push these compressors, you may want to purchase a two-stage pump or a slower-running single-stage machine, which are considerably quieter and should last longer.

Large compressors have air to spare—The two large-capacity machines I looked at represent both ends of the spectrum. The headline horsepower of both machines demonstrates that a better measure of their true power is the amp rating. The Campbell Hausfeld's 6.5-hp motor is rated at 15 amps, while the 5-hp Ingersoll-Rand's motor is rated at 28 amps. The former can produce 10.2 cfm of air at 90 psi, while the latter pumps 17.1 cfm of air at 90 psi.

As with most tools, you get what you pay for. But before you decide which compressor to buy in any size category, it pays to think about what air tools you'll need and how intensively you'll use them. □

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Maintaining a compressor

Compressors tend to be pretty forgiving machines, but a little basic maintenance will keep a compressor running trouble free for years.

Water is a real killer of compressors: Left standing in a compressor tank, water can rust the tank to the point that the walls become dangerously thin or develop pinhole leaks. Excess water in the tank also is more apt to find its way into the delivery system, contaminating spray equipment and finishes and causing problems with pneumatic tools. Water never should be left in a tank that is exposed to freezing conditions.

Drain the water. *Heated compressed air condenses moisture on the cool tank walls. To avoid rust inside the tank, water should be drained by releasing the valve until only air comes out. Vertical tanks are easier to empty because the drain is on the bottom.*

REGULAR OIL CHANGES

Under normal conditions, change the oil at least twice a year on oil-lubed compressors. There are two conditions that demand more frequent oil changes: If the compressor sees severe duty, excessive heat can cause the oil to break down, inhibiting its lubricating ability. The by-products of this breakdown are acids that can cause premature wear of reciprocating parts. The second condition for more frequent oil changes is if the compressor is used in damp areas or in places where the temperatures fluctuate drastically, like in an occasionally heated shop in northern climes. Condensation can occur in the crankcase, inhibiting the oil's lubricating ability and even causing rust in the crankcase if the unit sits idle for long periods of time.

Check the oil. *Although they don't burn oil, oil-lubed compressors gradually transfer some oil into the air tank. Check the oil level regularly.*

COMPRESSORS NEED TO BREATHE

Change or clean the intake-air filter regularly. The often dusty conditions in a shop can quickly plug intake filters, resulting in a loss of efficiency and increased pump heat. Some companies offer retrofit kits with larger air filters that help a lot in dusty conditions.

Check the air filter. *Most compressors have an air filter made from pleated paper that is easily accessible for checking and changing. Some models have foam filters.*