SHOPPING FOR
Portable Compressors

A catalog of features and specifications to look for when choosing a job-site air compressor

by Clayton DeKorne

There's a huge number of small compressors on the market. That's because portable air compressors are used for everything from running jackhammers and sand blasters to air wrenches and paint guns. They're used by nearly every industrial trade, as well as by homeowners.

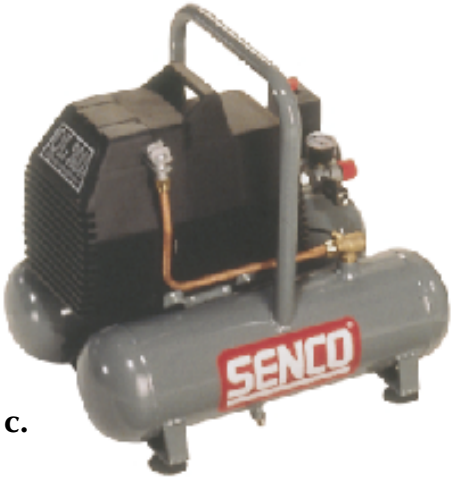
However, in our industry — residential construction — most compressors are enlisted into active duty for running nail guns on site. With this in mind, I will focus here on directing builders and remodelers towards the features and specifications to look for on smaller hand-carry models (those with 1 1/2- to 4-gallon tanks and electric motors in the 3/4- to 2-hp range), and on typical wheelbarrow models (those with 8-gallon tanks and 1 1/2- to 5-hp electric motors or 4- to 8-hp gas-powered engines).

Compressor Pumps

A compressor is a very simple machine. It's essentially a piston under power that pushes air into a tank. Simple valves — no more than flaps that open or close in one direction — allow air into the cylinder on the piston's downstroke. As the piston returns on the upstroke, this trapped air is forced into a storage tank. Each piston stroke sends another gulp of air into the tank until the tank reaches a maximum operating pressure (about 120 psi on portables). At this maximum, a pressure switch turns the pump off.

a.

b.



c.

d.

Tank configurations. Portable compressors come in a variety of different configurations. Single tank designs include the pancake (a) with a single oval-shaped tank, and the more conventional shop-style design (b). Twin-tank models come with horizontal tanks or a vertical stack (c & d). These are differences of convenience, not of performance.

The faster the piston moves, the faster pressure builds. The time from when a compressor kicks on to when it reaches maximum operating pressure and cuts out is the *recovery time*.

As the pressure in the tank builds, the piston must have enough force to push against the increasing backpressure. Piston rings provide a seal to prevent air from blowing back through the cylinder. But as a compressor wears, this seal breaks down, and it takes longer and longer for pressure to build in the tank.

For job-site compressors, the recovery time can be from 10 to 30 seconds. Any machine that takes longer than this is underpowered or in need of a rebuild.

Single-stage vs. two-stage. Nearly all hand-carry portable compressors made for running nailers (those with a maximum operating pressure set at around 120 psi) have simple single-stage air pumps, with a single cylinder and piston as described above. Some larger wheelbarrow models (as well as many shop-sized stationary rigs) have a twin-piston pump, known as a two-stage compressor. This type of pump pushes air from a large cylinder into a smaller cylinder, where it is further compressed by a second, smaller piston. Between the two cylinders (compression stages) the air passes through an *intercooler* — a pipe with cooling fins. Compressing air causes it to heat up and expand, so the cooler the air, the more easily it is compressed.

Two-stage compressors are used whenever a system needs operating pressures above 150 psi. While this is excessive in a portable, a two-stage pump will be able to compress air in large storage tanks with quicker recovery times. If you need lots of air for running many framing or roofing nailers at once, opt for a two-stage pump.

Oil-less vs. oil-bath. Less than a decade ago, almost all job-site compressors were built with oil-bath pumps. As the piston crank in these pumps turns through a pool of oil, the oil splashes up on the cylinder walls. The bottom-most ring on the piston is corrugated to capture this oil and spread

it around. This not only lubricates the piston, but provides an airtight seal around the upper two piston rings.

Oil-bath compressor pumps are typically built with cast-iron cylinder heads that can be machined to close tolerances. As long as the pump is topped off with oil (and kept near level so the piston properly splashes in its bath), an oil-bath model will provide years of trouble-free service. It's not uncommon for a well-maintained oil-bath compressor to run 8 to 10 years before needing an overhaul, even with continuous use.

In the last decade, oil-less compressors have taken a foothold in the compressor market. These pumps have a piston ring impregnated with Teflon (or similar type of material). This "self-lubricating" piston rides against an aluminum cylinder. Oil-less pumps don't have a crank shaft. The piston rides on an eccentric wheel that comes straight off the motor shaft. And the piston arm doesn't have a wrist pin. Instead, the arm rises through the cylinder at an angle, so the piston wobbles from side to side as it pumps. By design, oil-less pumps are built to looser tolerances than oil-bath pumps, and need to be rebuilt more often. Most are rated for about 2,000 hours of operation.

Oil-less compressors can be rebuilt fairly easily, using kits provided by the manufacturer. The first time I did it, it took me about 40 minutes. Once I knew what I was doing, I got it down to about 20 minutes. Each time, the parts cost about $45. Rebuilding an oil-bath unit, however, is a job for a tool repair shop. It's a messy job, on account of all the oil, and in most cases, the cylinders will need honing. It's a 1- to 2-hour job at a cost of $25 to $35 per hour. New rings will cost about $25 to $30 per cylinder and new bearings about $35.

In general, I think that if you're running a larger compressor frequently, you're better off with a conventional oil-bath design. Just remember to keep it topped off with oil. For finish carpenters running hand-carry models, however, I'd recommend an oil-less model for a variety of reasons. In general, oil-less compressors don't need such powerful motors. Most hand-carry electrics with oil-less pumps are rated well below 15 amps, so there's little chance for blowing a breaker. Most important, there's never a worry of spilling oil on raw wood, and the unit can be tipped any which way to fit into a crowded van or truck.

There are a couple of small advantages to running larger oil-less models. Without oil to thicken at low temperatures, you'll have less trouble in cold climates. Oil-less wheelbarrows also tend to be more streamlined, without the bulk of the pulley and belt drive.

Sizing Compressors

An air gun consumes small gulps of air with each nail it fires. These small gulps add up fast when banging down sheathing, or while running several nailers at once. If the compressor can't keep up with the nailer, you get "stair stepping" — the nails will stick up progressively higher like the steps on a stair. To avoid this, you need the right size compressor.

Air delivery. The capacity of a compressor is rated in a couple of ways — as *air displacement* and as *air delivery*. Air displacement (also called cubic feet displaced) measures the size of the piston. However, this spec is only useful to design engineers. For sizing up your compressor needs, look to air delivery. Air delivery (also called performance cfm of free air) describes the amount of usable air that a compressor can produce. Air delivery numbers are always given at a specific psi, since it's harder to force air into a pressurized tank than into an empty one.

To measure your air delivery requirements, you need to know how much air your nailer uses. These specs are available from the gun manufacturer. Framing nailers typically use around .15 cfm per nail. Running straight off the pump, you can drive about 17 nails per minute with a 2.5 cfm compressor. (2.5 divided by .15 = 17). Obviously, this isn't enough for nailing off sheathing. However, in practice, a 2.5 cfm pump with a 4-gallon storage tank will allow you to shoot about 50 nails per minute without stair stepping. The extra air comes from the tank reserve.

Belt tensioner. Hitachi's EC16 electric wheelbarrow compressor includes an automatic belt tensioner — a spring-activated device that takes up the slack in the belt as it loosens over time from vibrations.

Strength in Numbers: Using Coupled Compressors

Often, the best ideas are the simplest ones. Not long ago, I was nailing off a plywood deck and the air compressor I was using couldn't keep up. I'd blow through a clip of nails, then have to wait a minute while the compressor recharged.

When we broke for lunch, we talked about what size compressor we needed to keep pace. I looked in my van and realized that I had also brought my pancake compressor. Everybody seemed to agree that the additional storage tank would provide more reserve air, but I wondered out loud why I couldn't hook the two compressors together.

The consensus seemed to be that it couldn't be done. Some spoke up about "dangerous backpressure"; others cited "incompatible regulator settings." But the more I thought about it, the better the idea sounded. So I rooted around in my "first-aid air kit" (the one with a dozen or so fittings for emergency repairs), and cobbled together what the crew now calls the "double dongle" fitting — a short connector with two male ends (Figure A). I plugged the double dongle into the female coupling on an air hose, and connected the male coupling on this same hose to my other compressor. This compressor has a tee fitting that allows me to run two guns at once (Figure B). I then plugged a hose leading to my framing gun into the open end of the tee fitting.

I set the regulator on the first compressor (nearest in line to the framing gun) to cut in at 80 psi (this compressor had a pressure switch set to cut off at 120 psi). And I set the other regulator to cut in at about 66 psi (this one was rigged to cut out at 110 psi). I fired up the first compressor, letting it come up to pressure and shut off, then switched on the second compressor. It, too, came smoothly up to pressure, and shut off. So far so good, and the raised eyebrows from the crew made me think I might be on to something.

Next, I went out on the deck, and started blasting away. As I got towards the end of a clip of nails, the first compressor kicked in. I kept nailing. Soon the second compressor kicked on. Line pressure stayed consistent. I found I was able to nail as fast as I needed without forced breaks.

Daisy chain. The author connects these two portables together to get the performance of a larger compressor.

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A. Coupling. At the first compressor in the daisy chain, the author uses this fitting to connect a hose leading to the next compressor.

B. T-fitting. The hose leading from the first compressor and the hose leading to the nailer join at this T-fitting.

In general, a compressor rated at 2.5 to 3 cfm at 100 psi can run one framing nailer. If you're running two framers, opt for a pump that delivers 4 to 6 cfm at 100 psi. For three framers, step up to an air delivery of 6 to 8 cfm at 100 psi. Or, you might try a daisy-chain technique (see "Strength in Numbers").

Wheelbarrow Features

Larger wheelbarrow models can be powered by heavy-duty capacitor-start/capacitor-run electric motors, or gas engines. Typically, those with gas engines provide the greatest output.

Gas engines. Compressor manufacturers have been using small block four-cycle gas engines to drive portable compressor pumps for years. The side-valve Briggs used to be one of the most common engines used on wheelbarrow models, but in recent years it has been nudged out by the Honda overhead valve engine (OHV). An OHV engine has its intake and exhaust valves directly over the piston, allowing for faster intake and exhaust, and overall, more efficient combustion. By contrast, the design of a side-valve engine has inherent problems. Intake and exhaust are pulled out of ports on opposite sides of the combustion chamber, so you end up with a cold spot near the intake and a hot spot near the exhaust. This temperature difference can distort the cylinder bore, which might eventually cause the piston to seize. To avoid this, engine makers must shrink the piston relative to the cylinder, reducing ring tolerances. This creates a less efficient engine that must have a bigger displacement for a given power requirement.

On any gas-powered compressor, look for these engine features:

- **Automatic decompression**, which automatically opens the exhaust valve to relieve the pressure created in the cylinder by the compression stroke. This makes the engine turn over easier, thus it starts easier.
- **Low-oil shutdown**, which automatically shuts off the engine when the oil drops below a safe level.

Belt drives. Most wheelbarrow portables, whether gas or electric, are belt-driven. The engine or motor turns a large flywheel that drives a smaller flywheel on the compressor pump. The flywheels and belt are typically enclosed by a cage to keep fingers and material from getting snagged when the compressor kicks on. Belts typically loosen as the intense engine vibration rattles loose the bolts that secure the engine and pump to the deck plate. Over time, thin-gauge deck plates and corrosion compromise the connection, causing frequent slippage and a finicky belt drive. Some models have an automatic belt tensioner — a spring mechanism that takes up the slack in the belt as it loosens. While these tensioners may be helpful in the short-term, the best way to avoid problems is to evaluate the construction of the deck plate. Models such as Rol-Airs and the Emglo Master Series are notably rugged. Better still are the Thomas models that feature direct-drive, oil-less compressor pumps. This design eliminates the flywheels and belt drives altogether, resulting in a streamlined rig with no need for future adjustment.

Integrated controls. The latest Bostitch portable features an integrated control panel that places the gauges and regulator control on top where they can be easily accessed.

Better by Design

A bright paint job can make any compressor look compelling. But if you have a chance to inspect a machine before you buy, you can tell a lot about its quality. There are several tangible differences in the construction of different compressors. Look for these top-quality features to distinguish the better models.

Gauges. Integrated "control panels" are a growing and welcome trend on newer models, such as the Emglo Master Series and latest Bostitch (see photo above). Here, the hose connects, regulator controls, and gauges have all been brought together in a tight panel. In general, all fittings and gauges should be "inside" the compressor – not hanging out past the contours of the machine where they can catch on your pant leg when you brush by it, or worse, catch on a door jamb when the unit is wheeled or carried into the building. Look for gauges that point upwards, so you can read them from above. You shouldn't have to get down on your knees just to read a pressure gauge.

Drain valves. Again Emglo's Master Series sets a new standard with super-nice "soft-seat" drain valves that can be tightened and loosened by hand.

Streamlined design. All Thomas compressors feature oil-less compressor pumps. On wheelbarrow models, such as the Thomas T2820, the pumps run directly off the motor, eliminating the bulk of flywheel and belt drives.

Pay attention to where the drain valves are located. Valves should not be hanging out where they can do damage or be damaged. The valves on twin-tank designs should be oriented in the same direction, so you only have to tip the unit one way when draining the condensate at the end of the day.

Also, look for "spud" fittings where any pipe or fitting connects to the tanks. A spud is a short threaded pipe that's welded to the tank wall. It's a much stronger connection. Cheaper compressors have fittings that simply tap into the tank wall, providing at best just a few threads for the connection. This connection will hold pressure when new, but can be easily damaged. A piece of lumber that falls onto the compressor, or a pipe that snags on the side of the truck when lifting it into the bed could easily jar the tap connection loose.

Regulators. Cheap all-plastic regulators have shown up in recent years on lower-end compressors. While nearly all now have plastic knobs, better models have a painted all-metal housing. All regulator knobs should have a locking ring to prevent vibration from slowly changing your air settings.

Hardware. Look for brass and copper "hardware" (fittings and pipes between pump and tank). Copper discharge pipes and intercooler lines discharge heat better than steel or aluminum tubing. The best models use a flexible braided tubing that can't be crushed, kinked, or bent if the compressor takes a spill while unloading it, or when materials are thrown on top of it in the truck (unavoidable situations in the life of a job-site compressor). Brass fittings, though softer than steel, won't corrode as easily.

Air filters. Since an air compressor pumps air from its immediate surroundings, it needs a good air filter. Look for accordion-fold paper filters, such as you find on cars and trucks. Simple foam filters should be cleaned frequently; otherwise you'll considerably shorten the life of the pump.

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Sources of Supply

Airy Sales Corp.
14535 Valley View Ave. #M
Santa Fe Springs, CA 90670
562/926-6192

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920/349-3281

Campbell-Hausfeld
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800/334-3693

Coleman-Powermate
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Kearney, NE 68848
800/445-1805

Devilbiss Air Power Co.
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800/888-2468

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Deerfield, NH 03037
603/463-8311

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