

BUYING THE RIGHT AIR COMPRESSOR

MANY FACTORS GO INTO SELECTING EQUIPMENT FOR SANDCARVING MACHINES

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There is a wide variety of sandcarving equipment used today, and each system has its pros and cons. It can be a challenge to choose an appropriate air compressor for self-contained sandcarving cabinets used primarily to produce artistic, one-of-a-kind, relatively low-production products using photoresist films. This guide will help you select an appropriate air compressor for the direct-pressure sandcarving machine with a standard 3/32-in. inner diameter (ID) blast nozzle.

When extremely high production is required, surface etching, or deep carving on monument stone markers, alternative sandcarving machines are recommended. These machines typically use shop facility air using larger blast nozzles and are not addressed in this article.

One commonality among virtually all sandcarving machines is the requirement of electrical power and compressed air. The typical direct-pressure machine almost always operates using 120-volt, single-phase electrical power for

the sandcarving cabinet. The air compressor uses 220-volt, single-phase electrical power which is the same as that used to power a common laundry dryer or home air conditioning unit. Therefore it is important to note that air compressors operating on 120-volt, single-phase electrical will not operate a direct-pressure machine regardless of how large the air compressor tank is in physical size.

Sandcarving machines use compressed air to accelerate the abrasive against the part surface while the photoresist



This is an example of a direct-pressure system for sandblasting.



Photoresist protects surfaces that shouldn't be sandblasted while exposing surfaces that should be.



This is an example of a pressure-pot sandblasting system.

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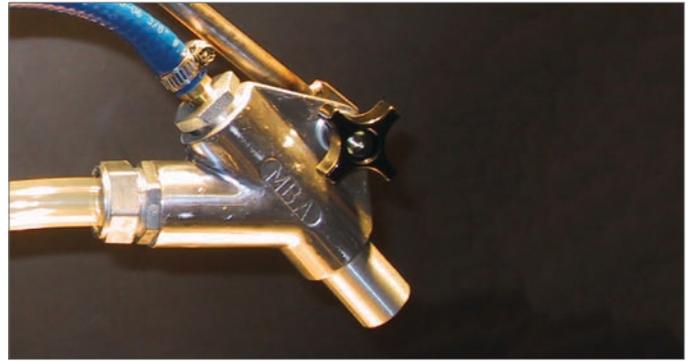
ARA members can learn more about sandblasting equipment in John and Judy McDaniel's five-part series, which began in the October issue of *Recognition Review* and concludes this month. The previous parts are available online in the member-only section of ARA. John and Judy McDaniel are teaching a hands-on sandblasting seminar at the 2013 ARA International Awards Market.

protects and allows the grit to texture the open, or brittle, areas of the photoresist film. This will require an air compressor that is not part of the blasting cabinet. Because the air compressor is not large, it is more economical to purchase the air compressor locally, taking advantage of much lower freight costs to local outlets.

As mentioned earlier, the most common sandcarving machine is a direct-pressure machine using a pressure pot to pneumatically push the abrasive out the blast nozzle. Unlike siphon machines, direct-pressure models concentrate the abrasive in a much smaller pattern which helps to produce finer detail. The direct-pressure models also create faster abrasive speed using half the blasting pressure. This lower blasting pressure helps eliminate excessive compressed air volume against the photoresist film, resulting in optimal imaging or carving of the substrate.

Almost all typical sandcarving is accomplished using the direct-pressure abrasive delivery described above. It's very important to know the machine's abrasive delivery type (direct pressure or siphon system) and nozzle size before purchasing an air compressor. A siphon system has different air compressor requirements than a direct-pressure machine.

Siphon machines use an injector gun (two hoses on the gun) to siphon and accelerate the abrasive inside the blast gun assembly. Siphon machines require double the blasting pressure



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to achieve the same abrasive speed as direct pressure models. Siphon machines have a much wider blasting pattern and are great for etching surfaces or large, open areas, commonly seen with large architectural sandcarving.

Direct-pressure sandcarving machines typically use the standard 3/32-in. nozzle, using 5-6 cubic feet of compressed air per minute during the sandcarving process. This amount of compressed air is needed when blasting substrates using 30 pounds per square inch (psi) of pressure. Note that 30-35 psi in a direct-pressure system is the most commonly used blasting pressure for almost all hand-held parts.

CRYSTAL BY DESIGN



Direct-pressure sandcarving machines typically use the standard $\frac{3}{32}$ -in. nozzle, using 5–6 cubic feet of compressed air per minute during the sandcarving process.



These are three examples of air compressor types.



Knowing the sandcarving machine controls is very important. Most typical direct-pressure machines require 90 psi for proper operation of the controls (this is not the blasting pressure). Even though an operator may be sandcarving at 30 psi, the pressure in the tank cannot fall below 90 psi. This is a common mistake when too small of an air compressor is used.

The size of the air compressor is also dependent on the nozzle size. To determine the proper air compressor size, double the CFM (cubic feet per minute of air flow) to allow for nozzle wear. As you sandcarve, your nozzle will wear, increasing the inside diameter of the nozzle. This will eventually require more compressed air, thus doubling the size of the air compressor CFM compared to the published nozzle usage. A common rookie mistake is purchasing a compressor that supplies only the CFM used by the nozzle at blasting pressure. This will result in a very short service life of the air compressor.

Often machines are listed with the ability to operate a second nozzle size, commonly $\frac{1}{8}$ -in. inner diameter (ID). Again, if this is the case, simply double the CFM usage, considering the larger nozzle size. Larger nozzles are typically used by more experienced sandcarvers.

The list below will be helpful when choosing the right air compressor based on features. If you already have “shop air” (a compressed-air system), it is likely you have all the compressed air required for sandcarving using a manually operated self-contained direct pressure sandcarving machine.

- If you see a small pressure pot attached or standing next to the machine, the machine is a direct-pressure type most commonly used for sandcarving.
- Almost all small air compressors, 30 CFM and smaller, are piston type compressors. These piston models are the most cost effective when dollars spent are compared to CFM volume produced.
- If the machine comes equipped standard with a $\frac{3}{32}$ -in. nozzle, the air usage will be just under 6 CFM at the processing blasting pressure of 30–35 psi. Always check to make sure optional larger nozzle sizes can be used. If they are available, you may want to purchase more compressed air.
- The basic rule of compressed air usage indicates you double the blast nozzle usage when sizing the air compressor. This would indicate a 5–6 CFM nozzle would require an air compressor capable of supplying about 10–12 CFM.
- Compressors normally have two CFM ratings; one is simple piston displacement and the second smaller number is the CFM rating when the air storage tank has pressure inside. Never use the larger displacement number as the volume supply number to operate the machine. Only consider the CFM rating listed at 90–100 psi when buying a new air compressor. It’s normally the number that is much harder to see.
- For any direct pressure machine indicating 5–6 CFM compressed air usage and $\frac{3}{32}$ -in. nozzle, look for

an air compressor volume supply of 10–12 CFM at 90–100 psi tank pressure. This listing will be on all new air compressors and is one of the most important things you will be looking for during your search.

- It will be impossible to find a 120-volt air compressor capable of supplying 10–12 CFM of compressed air. You will need to purchase a 220-volt, single-phase air compressor, the same level of power used with any home dryer or air conditioner.
- Cast iron compressor pumps are often the best. This is the pump that is actually making and sending the compressed air into the storage tank. Normally small air compressors are made using an aluminum piston type pump with cast iron sleeves. This type of construction is OK but solid cast iron will take more heat and abuse than aluminum and is considered best.
- Two-stage air compressors, normally using two or more pistons, pump more air than single-stage air compressors and pump to a higher tank pressure, normally 150–175 psi. This means the air compressor will cycle on and off less. Purchase the two-stage if your budget allows. Single-stage compressors are OK but turn on and off at lower tank pressures and normally pump less air volume. Make sure the low-pressure control is set just above 90 psi. It is possible to change and modify most low-pressure settings but not the high setting. Single-stage compressors that turn on at 80 and off at 120 will not operate most sandcarving machines found in the

market today but you may be able to change the low pressure to 90 psi. Ask first, buy second.

- Most small air compressors under 10 horsepower (hp) are operating at a faster pump speed to produce a larger volume of air. This faster speed creates added friction and heat on the pistons. This normally means the air compressor has a duty cycle, the amount of time needed to cool the pump for the amount of time running. The duty cycle for most air compressors is 10 minutes. If the manufacturer has used a small head with a very fast speed, most likely the duty cycle may be very low; 20% is not uncommon. This means for every 2 minutes on, it needs 8 minutes to cool. Never cheat on the duty cycle. The best choice is 100% but a 0%–60% duty cycle is OK. If you want to use the machine for long daily operation, you need a 100% duty cycle or the compressor will not meet your expectations.
- Almost all small air compressors will be vertical to save floor space. Vertical models must pass a vibration test standard to make sure it doesn't walk across the floor and fall over. This normally means the vertical type often uses a smaller, safer pump size. It's also another reason you find very large tanks on vertical models. Always pay attention to the volume of compressed air produced at 90-100 psi, the second CFM number.

TO SUM IT UP

- Cast iron ir compressors are usually best.. Two-stage models pump higher pressure and normally more air volume. A 100% duty cycle is at the top of the list but not required. Vertical units save space but may have smaller pumps to pass the vibration test standard. Always look for the CFM volume rating at 90-100 psi tank pressure. It matters for the operation of the sandcarving machine controls.
- Where should the air compressor be purchased? You can find these types of air compressors at almost any big-box store. Take advantage of free shipping to the store location in your area, then

find someone with a pickup truck you can borrow. Store staff may even load it into your truck for free.

- Many big-box stores carry air compressors. Most are vertical, many are two-stage compressors. Take some time to research before making a purchase. Some units are merely intended for inflating bicycle tires. Others are more seriously engineered. A nice air compressor for sandcarving will meet an operator's needs without breaking the bank. ■■■



Robert Robinson draws from four decades of experience in the sandblast machinery manufacturing industry. In 1977, Robinson founded Media Blast & Abrasive, Inc., manufacturer of the CrystalBlast line of sandcarving and etching machinery and

manufacturer of the largest line of abrasive blasting cabinets available on the market today. Media Blast & Abrasive partners with IKONICS Imaging to offer the sandcarving industry a complete line of machinery, photoresist, and expertise. As a consultant to Media Blast, Robinson continues to design new machinery in response to the needs of the sandblast manufacturing industry.

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