

How to Choose the Right Air Compressor

Air compressors have been around for well over 100 years and have as many uses as there are tools that use air. One

reason for their popularity is because air as a resource is safe, flexible, clean and convenient. These machines have

evolved into highly reliable pieces of equipment that are almost indispensable in most of the applications they serve.

Compressors can come in a wide variety of different types and sizes.

Ultimately, as with any tool, air tools and the compressors that drive them, have to save the user time and money on any

given project. Most compressed air tools are more powerful and typically lighter than standard electric tools or battery

powered cordless tools. They are used by virtually every industrial sector from aircraft to automobiles to dairy farming to

textiles.

While there are many types of compressors, they all perform the same function, which is to increase the pressure and

reduce the volume of a given gas such as air. The most common type of compressors work by filling a chamber with air

and then reducing the chamber's volume. These are called positive displacement compressors. They are the most widely

available compressors and include reciprocating, rotary screw and rotary vane compressors.

Of all the positive displacement compressors, Reciprocating or Piston compressors are the most commonly available on

the market and can be found in ranges from fractional to very high horsepower. These compressors are sold world wide

by many mass marketers and a large variety of retail outlets.

Rotary compressors (Screw and Vane) and the centrifugal compressors are also commonly found but in more of an

industrial/commercial environment. Normally they are operated at significantly higher horsepower and flow rates, which

makes them more expensive buy and to operate.

The following paragraphs contain some very general information on piston compressors that will allow for a more

informed decision concerning the type and size of compressor being considered.

Single Stage and Two Stage Reciprocating Pumps

Reciprocating (Piston) Compressors can be widely found in two primary configurations; Single Stage and Two Stage.

Single stage air compressors work by drawing air in and subsequently compressing the air to its final pressure in single

piston stroke. Single stage air compressors can attain pressures of up to 150 PSI.

Typically, a single stage pump will

have a higher CFM(Cubic Feet per Minute) rating than a two stage pump because every cylinder is drawing in air and

compressing it with air during every rotation.

Two stage air compressors work in a very similar manner with the primary difference being that they compress the air in 2

steps or stages. During the first step or stage, air is drawn in and compressed to an intermediate pressure. After being

compressed in the first stage, the air is piped, usually through an intercooler where the air is allowed to cool, to be

compressed in the final or second stage. Two stage compressors are normally good for pressures up to 200psi. Two

stage pumps are more efficient at higher pressures because the air is cooled between the stages.

DCFM, SCFM and ACFM

Displaced CFM (DCFM) is a mathematical formula that calculates the bore, stroke and rpm into a CFM figure(Bore

$\times \text{stroke} \times \text{rpm} / 2200 = \text{DCFM}$). This figure will always be the highest CFM because this formula does not take into account

variables like temperature, atmospheric pressure, humidity, friction and heat dissipation.

Another CFM term often used is Standard CFM (SCFM). It defined as the measured flow of free air and converted to a

standard set of reference conditions (14.5 PSIA, 68 Degrees F, and 0% relative humidity).

Yet another CFM term is Actual CFM (ACFM). ACFM can be determined in a number of different ways. The most

common methods include measuring the volume of air that is moved through an orphic plate or measuring pump up times

on large compressor tanks and running through a simple calculation. This CFM number takes in effect all the variables

and will give the true output of the pump at the current working conditions (i.e. temperature, altitude, humidity, ...).

Often times, CFM numbers are also shown at various pressures. These numbers can be very useful to help determine if

a compressor produces enough CFM for the desired application, but can be confusing when comparing differing

pressures or volumes or different compressors.

The best way of comparing compressors is through SCFM. Since all the measurements are calculated back to a set of

reference standard conditions, it levels the playing field among the multitude of different manufacturers.

Electric Motors and Horsepower

Compressors are often rated by Horsepower(HP). As simple as this sounds, there are different variations of HP.

Some compressor manufacturers rate their air compressors by peak horsepower, also known as brake horsepower. Peak

horsepower is the maximum output that a motor can produce while the motor has the start windings engaged. Peak HP

can be as much as 5-7 times the rated or running HP. Under normal operating conditions, the start windings are only

engaged for a small fraction of a second. Therefore, using peak horsepower as a comparison tool can be somewhat

misleading since under normal operating conditions the motor only develops this horsepower during startup. If a motor

drive system causes the start winding to remain engaged for a long period of time, the motor will either overheat if it has

thermal protection or fail prematurely.

Most electric motor manufacturers rate their motors by the horsepower developed after the motor has come up to its

designed operating rpm's and disengaged the start windings. This is often referred to as running or rated horsepower and

is a true indication of the HP a motor can sustain over a long period of time.

Some other factors to consider when looking at motors is Duty Cycle and Service Factor. Duty cycle is normally rated as

either intermittent or continuous and is defined as the time rating under full load. In other words can the motor run at full

load horsepower continuously or only intermittently. The other of the two noteworthy factors is the Service Factor (S.F.)

rating of the motor. It is defined as the percentage of rated horsepower at which the motor can safely operate (i.e. 1.15 SF

= 115% of rated HP). Higher service factors allow motors to handle more varied conditions without causing motor

overheating or premature motor failure. Examples that could cause a motor to run within its Service Factor could be

caused by low voltage, higher ambient temperatures, higher startup load ...etc.

Note: Many companies are now eliminating the peak HP reference and instead using SCFM as a more accurate performance indicator.

Air Compressor Buying Guidelines

Before choosing any compressor to purchase, understanding the compressor's uses will ensure that the machine

can do the required job. Buying a compressor that is too small will waste valuable time. Buying a compressor that is way

too large will waste valuable resources. (See the CFM Usage Chart)

It is worth noting that the price of a compressor cannot be based solely on the up front purchase price of the unit. The

price of any item should be based on the overall cost over an extended period of time or the life of the unit. Inexpensive

units are designed to be disposable, like lighters.

The questions that need to be answered are:

1.) What is the maximum required operating pressure?

This will determine if a Single Stage or Two Stage compressor will be needed

2.) What is the maximum required CFM usage?

Add up all of the air tools that are to be used at the **same** time. When looking at the compressor, add approximately

30% to the determined CFM number. This will allow for a reasonable buffer against unknown or uncommon compressor

usage.

Do not simply add up all of the air tools that will be used throughout the work day since this will produce an inflated CFM

number and require the purchase of an overly large compressor.

3.) Does the machine need to be portable or stationary?

Determine whether or not the unit will need to be moved around your facility or work site regularly or if it will be a

stationary unit. This will aid in determining other factors such as size and weight. Higher pressures and volumes will

require the unit to be larger in size and heavier in weight since horsepower requirements, pumping systems, chassis

construction, electrical components, etc... will have to be larger to accommodate these increases.

4.) What type of drive system is needed? Electric Motor or Gasoline Engine?

Knowing the environment that the compressor is to be used in will determine what type of drive system the machine will

need. If there is always electrical power available, then the drive system should be an electric motor since they are

significantly less expensive to buy and run and require less overall maintenance. If electrical power is not always available

then the convenience of a gasoline engine driven compressor will be the way to go. They offer the best in portability and

work area flexibility.

5.) What receiver tank size will be needed?

The size of the compressor tank, usually measured in gallons, should be determined by the overall type of usage. If the

usage is in short quick concentrated bursts, such as an air nailer, then a small tank size can be used. If the unit is to

sustain long periods of usage, such as a board sander or impact wrench, a larger tank size will be necessary.

Choosing the Correct Compressor Company

There are a large number of manufacturers of air compressors in the U.S. today and any one of them will be more than

happy to sell you an air compressors. Before purchasing any unit from a manufacturer, there are several key factors that

should be considered:

1. How long has the company been in business?
2. Have you ever heard their name before?
3. Do they have an actual manufacturing plant or are they just resellers? Do they have machines private labeled for them?
4. Do they manufacture a full line of machines?
5. Do they carry parts and accessories for their machines?
6. Do they have a good distribution network?
7. Do they have a good service network?
8. Are they knowledgeable about their product?
9. Are they knowledgeable about air compressors in general?
10. Do they have a reputation for building quality machines?
11. How efficient are their machines?
12. How long is the machine designed to last? 100, 500, 1000, 2000, or 5000 hours
13. Where is the machine manufactured? US, China, Japan, Europe ...etc.
14. What materials are used in the machine's construction? Cast Iron, Steel, Aluminum, Plastic ...etc.

Air Tool Description Average CFM @ 90 PSI

Take each rating and then add how many of each tool will be running at the same time and add up each tools respective cfm usage to find how much cfm you will need to run your shop.

Angle Disc Grinder - 7" 5-8

Brad Nailer 0.3

Chisel/Hammer 3-11

Cut-Off Tool 4-10

Drill, Reversible or Straight-Line 3-6

Dual Sander 11-13

Framing Nailer 2.2

Grease Gun 4

Hydraulic Riveter 4

Impact Wrench - 3/8" 2.5-3.5

Impact Wrench - 1/2" 4-5

Impact Wrench - 1" 10

Mini Die Grinder 4-6

Needle Scalar 8-16

Nibbler 4

Orbital Sander 6-9

Ratchet - 1/4" 2.5-3.5

Ratchet - 3/8" 4.5-5

Rotational Sander 8-12.5

Shears 8-16

Speed Saw 5

***add 30% (for future growth and to allow the air compressor time to cool between cycles) to average CFM to get required CFM**

To begin your search click www.aircompressormaster.com .