GARDNER DENVER

Industrial Blowers

Industrial Blower Products

Industrial Blower Buyer's Guide
Choosing the Right Industrial Blower

Gardner Denver is a recognized industry leader of industrial blowers and vacuum pumps backed by extensive local and factory aftermarket products and service support.

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Industrial Blowers

The Industrial Blower Buyer's Guide has been created to make it easy for any company to select industrial blowers that are most beneficial to productivity and the bottom line.

With the information provided in the Guide, the engineer, plant manager, maintenance specialist, safety and environment manager, purchasing agent and controller will understand how the right blower helps them reach and exceed their goals. The information provided in this Guide will also allow you to make a greater, and more knowledgeable, contribution to the selection process.

Section 1 provides basic information how a positive displacement blower works.
Section 2 lists various types of positive displacement blowers and vacuum pumps and their applications.
Section 3 explains the factors buyers should carefully consider when making their choice of blowers.
Section 4 focuses on installation, maintenance and service.

Section 1: How a Positive Displacement Blower Works

Positive displacement blowers operate on the same principle as the human lungs. When a person inhales, the chest cavity expands and the lungs' volume also increases. Conversely, the air pressure in the lungs is reduced, resulting in a partial vacuum. Atmospheric pressure then forces air into that vacuum in the lungs, so a person can take the next breath.

A positive displacement blower is built with a cavity, much like a lung, that is capable of expanding, which allows the cavity to hold more volume. When gas flows into the chamber, the cavity seals itself from the chamber behind the flow. Then, the gas exits the chamber into the air.

Positive displacement blowers typically come in either bi-lobe or tri-lobe configurations. The inner workings of a blower can be understood in the following example of a twin lobe rotary air blower, which is a type of positive displacement blower. The two lobes, or rotors, are shaped like a figure 8. An external source provides power for the driving lobe. Equal ratio gears then rotate the driving lobe, and that force is imparted to the second lobe, which turns in the opposite direction, but at the same speed.

With the rotation of the rotors, the amount of air, or volume, doesn't change. The air simply moves from the intake portion of the cylinder's interior to the outflow end. Once it is forced from the cylinder, the air is restricted from re-entering. This type of positive displacement blower provides 100 percent oil-free air because each lobe just clears the inside of the casing. A twin lobe rotary air blower produces an almost constant flow rate, which is a function of the operating speed.

Tri-Lobe Blowers

Other types of positive displacement blowers that serve the needs of many industries and processes include the tri-lobed, screw, helical screw and helical tri-lobed.

The tri-lobed positive displacement blower has a three-lobe configuration. Well designed and well built tri-lobed positive displacement blowers typically allow higher throughput than their twin-lobe counterparts, and operate with less noise and pulsation levels. Adding a helical design to Tri-Lobe blowers further reduces noise pulsations for quieter, more efficient operation.

HeliFlow helical tri-lobe Rotor

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Helical Screw Blowers

A helical screw positive displacement blower consists of two screws with complementary rotations, but they do not contact each other. Air in these contactless blowers is compressed by the outward rotation of each rotor. The contactless type is most often used in environments that must be oil free and demand lower noise pulsations and improved efficiency such as waste water treatment. They are also typically used for conveying materials in the power generation industry.

CycloBlower Helical Screw Rotors

Blower Packages

Our blower packages are built to meet variable demand in a dynamic work environment. For example our IQ Blower Package includes a Gardner Denver blower/vacuum pump: Sutorbilt Legend Dual Splash Lube, HeliFlow & Duroflow. As an enclosed unit it offers intelligent design, precision control & protection, energy efficiency and noise abatement. All enclosed package units come with the AirSmart Controller that provides peace of mind with its intelligent monitoring capability.

Typically, positive displacement blowers will be used one or more of the applications in the following list.

Water treatment
Aquaculture
Flocculation
Electroplating
Pneumatic conveyance
Electric lamps, tubes and CRT production
Radiotherapy, Radiosurgery, Radiopharmacy
Instrumentation to analyze various materials
Vacuum engineering
Freeze drying
Cement production
Biogas boosting
Chemical plants
Paper products
Plastic molding
Semiconductor processing
Vacuum coating
Glass coating
Sewage systems
Milking machines

Section 2: Types of Industrial Blowers, Vacuum Pumps and Their Uses offered by Gardner Denver Inc. Companies

In addition to lobe designs, positive displacement blowers come in many forms including, rotary vane, screw and large centrifugal blowers. A centrifugal blower is a dynamic machine. This operating principle for each type of blower is very similar manner to the twin-lobe rotary air blower mentioned in Section 1.

Rotary Vane Pumps

A single rotor containing multiple vanes within the chamber instead of the two figure-8 lobes. The center point of rotation, however, is offset from the center of the chamber. By offsetting the center of the rotor, it causes these sliding vanes to rotate in an eccentric pattern. As the rotor turns, centrifugal force slides the vanes out for continuous contact with the cylinder. With a larger internal space at the intake port and a smaller at the discharge, a cell of air is created between vanes at the inlet. As it rotates toward the discharge the cell between the vanes get smaller, compressing the air and increasing the pressure then forcing it from the pump. Elmo Rietschle pumps are normally used for units that operate under vacuum.

Elmo Rietschle V- Series

Screw Pumps

A screw vacuum pump consists of two screw rotors, one with a right-hand thread and the other a left-hand thread. Synchronized via a precision gear, each screw turns in opposite directions compressing air in the cylinder in the direction of the discharge without friction and very tight clearances. Both the rotors and cylinder have optimal shapes to form the a contact free compression chamber. Screw pumps are primarily used where clean and oil free vacuum is needed. They can also be combined with a vacuum booster in customized systems for very high suction applications. Vacuum pumps are used for applications requiring some type of low pressure above atmospheric pressure.

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Centrifugal Blowers

A centrifugal blower in an idealized sense, achieves a pressure rise by adding kinetic energy/velocity to a continuous flow of fluid through the rotor or impeller. This kinetic energy is then converted to an increase in potential energy/static pressure by slowing the flow through a diffuser. Depending on the speed capability of the blower, multiple stages are used until the desired pressure is met. These blowers are produced as direct driven, v-belt driven or gearbox driven with an electric motor. Our Centrifugal blowers are offered under our Hoffman and Lamson Company and are used in a wide variety of applications such as waste water aeration, vapor recompression, and many more.

Section 3: Important Criteria for the Purchase of Positive Displacement Blowers

Speed, Rate, Vacuum and Pressure

The performance of a positive displacement blower can be evaluated according to its pumping speed, throughput rate, vacuum and pressure. Positive displacement pumps are the most effective with high volumes at low vacuums and pressures. Of course, these measurements vary with the type of positive displacement blower, its size and application.

- CFM (cubic feet per minute), is a measure of the outlet displacement volume.
- ICFM (inlet cubic feet per minute), refers to the amount of gas or other substance, by volume, that enters the blower during a given period of time.
- The throughput rate is calculated by multiplying the pumping speed by the gas pressure at the inlet. The result is expressed as units of pressure·volume/unit time.
- Vacuum is expressed in inches of mercury (Hg).
- The pressure is measured in psig (pounds-force per square inch gauge).

Energy Efficiency and ROI

Choosing the right blower is critical to maximizing productivity and return on investment (ROI). As much as 78 percent of the total cost of ownership of a rotary lobe blower package during a five-year period is energy consumption. (The equipment is only 13 percent of the total cost, maintenance 9 percent.)

An idle fixed-speed blower, for example, consumes as much as 90 percent of the energy needed when operating at full load. Similarly, choosing too small of a blower and asking it to operate beyond its capacity can also contribute to inefficient and costly energy use.

Variable speed technology, therefore, may be an important criterion for the smart blower buyer. Blower packages with that technology only use energy, as it is required, by increasing or slowing the speed in direct correlation with airflow requirements. They are typically built with the following energy-efficiency features:

- TEFC EPAct high-efficiency motor.
- Integrated variable frequency drives that regulate blower use in conjunction with demand.
- Package sequencing capabilities that allow blowers to be turned on and off in sequence, as dictated by overall facility demand, avoiding the need to oversize systems for “worst case,” high-demand scenarios.
- A manufacturer that is an Energy Star Partner.

Technology Simplifies Operations

ROI is also a function of the time and energy efficiency and measures the time taken for energy cost savings to pay back the cost of investing in more advanced technology.

A "smart" control system is a recent technological innovation that simplifies control and helps this process by matching work and energy to demand, so personnel use their time more efficiently. The best control devices have easy-to-ready displays, allowing the operator to navigate quickly through various menus. He or she has immediate access to all operating parameters, such as pressure and message reports about operating status. Smart controllers allow operating parameters to be preset for the package. The controller continually measures all the performance parameters of the package, such as pressure, flow, heat, etc. Should a critical threshold be passed, the controller will recognize the situation and automatically take corrective action.

With this control technology, operators spend less time than required for manual monitoring. They can even monitor the data remotely with access through the Internet. "Smart" control systems can also be pre-programmed with preventative maintenance schedules or other notifications. Operators are alerted to certain proactive maintenance needs, such as changing a filter.

Smart controllers allow systems to function as a single unit. In this mode packages can be sequenced to come on-and-off line as required ensuring maximum efficiency by matching air supply to specific needs. Controllers can also actively communicate with other systems such as SCADA control centers. This allows an operator to view and understand the performance outputs of the blower package from a remote location

Environmentally Aware

The energy-efficiency features and "smart" controller technology on positive displacement blowers also help companies to address the reality of emission standards and Cap and Trade programs. Because energy is the primary cost of operating an industrial blower, a single blower can produced as much as 400 tons of carbon per year. Selecting a blower with high energy-efficiency standards and "smart" controller technology can reduce annual carbon output by as much as 25 percent, or 100 tons per unit.

The Low-Noise Factor

Whether a positive displacement blower is installed on the floor of an industrial facility or at an exterior location, noise abatement is another important criterion when purchasing a blower. Personnel that work near a blower or any industrial machinery should be appropriately protected, and neighboring businesses or residences don't want to hear excessive noise from an exterior blower.

Blower purchasers should look for blower products that utilize one of a number of technologies to reduce noise. These include blowers with a one-piece cylinder, or chamber; dynamically balanced rotors; or tri-lobe designs. Many comprehensive blower packages are manufactured with custom air inlet filters and outlet silencers. Such systems are often tested in ISO certified sound room and guaranteed a basic sound reduction of more than 20 dba.

Section 4: Blower Installation, Maintenance and Service

Maximum operating efficiency, productivity and ROI are dependent on both the manufacturing quality of any positive displacement blower and how strongly the manufacturer stands behind the installation, maintenance and service.

Buyers of industrial blowers will know they have chosen the best products for their needs when they find blowers that are easy to install and operate. Often, technologies, such as variable frequency drives (VFDs), have complications and costs of installation and maintenance. Owning an integrated blower package offers plug-and-play capability, saving time and money.

Some manufacturers have had the insight to develop complete blower packages with pre-wired, pre-engineered and pre-programmed features. This results in much faster, cheaper and simpler installation, without needing extra space, wiring or additional manpower to complete the installation.

These plug-and-play technologies include:

- Fully programmed VFD – Eliminates programming on site at the time of installation.
- VFD integrated inside package frame – Eliminates wall-mounted drives and the wiring between them and the package.
- Integrated wiring – Eliminates wiring between the VFD, controller and motor.
- Vibration isolators – Eliminates any special housing pads or bolting to the floor.
- Structural rigidity – Stronger base and frame reduce the risk of damage during installation and operations.

Low-cost maintenance is also a function of how a positive displacement is designed and built. Buyers are encouraged to question manufacturer about the following features:

- Does the blower have an auto self-tensioning belt to optimize belt load, reduce belt wear, regulate overhung loads and minimize bearing wear?

- Does the blower have multiple internal monitoring sensors that are connected to a “smart” monitoring system to regulate internal heat, pressures, oil levels, etc.?
- Does the blower have enclosure panels that are easy to remove, so personnel can access all components quickly?
- How many tools are needed to inspect the blower?
- Can the blower, motor and components be removed as one piece for quicker service and less downtime?
- Can the Blower detect and alert you that an issue is developing before it becomes a problem?

A blower manufacturer and distributor’s service and support is also of paramount importance to the smart blower buyer. One can be assured of long-term support from manufacturers with long track records of delivering on the promise of their warranties. Reliable and trusted distributors have factory-trained technicians. Plus, parts, lubricants and other operating supplies are readily available and come with training for operational personnel.

The information in this Industrial Blower Buyer’s Guide will make the selection of a positive displacement blower a much easier, less stressful and quicker process.