KAESER COMPRESSORS

Built for a lifetime.™

A Guide To Blowers

When it comes to the costs of running a wastewater treatment plant, the conversation tends to begin and end with blowers. These machines are a staple in wastewater operations, gobbling up energy and running up the power bill as they function, so it's worth taking the time to make the right investment.

To learn more about the differences in blower design and how to choose the right one for a given treatment plant, we spoke with Stephen Horne, product manager for blowers, from Kaeser Compressors, Inc. We covered the differences between screw and lobe style blowers, the Industrial Internet of Things (IIoT), and how to make the most out of purchase decisions.

What is the importance of blowers to wastewater treatment operations?

Blowers serve many needs at a wastewater treatment plant. The applications include agitation, aeration, filter backwash, and capturing methane. These operations are vital to the plant's operation, and the energy they consume can represent 60 percent or more of the plant's power consumption.

What are some common mistakes that operations make when trying to choose the right blower for their needs?

Plant designers and operators have a huge challenge. These plants are built for 20 to 30 years of service, which means the plant needs to serve the community both today and in the future. This means the plant must serve the design conditions for community growth at year 30 as well as today. This results in blowers that are generally oversized for the first 10 to 15 years. This is not only less than ideal for the blower, but also expensive to operate. This is generally not a fault of the designer or the user, but a consequence of regulations on sizing redundancy and blower controls. With the help of modern technologies and the IIoT, this is now changing.

How many different types of blowers are there on the market? What makes them different?

Blowers are broken into two categories: dynamic and positive displacement (PD). Dynamic machines work by accelerating air to high velocities and include centrifugal and high-speed turbo (HST). Positive displacement machines work by trapping volumes of air at the inlet port and pushing it out of the discharge port. These include lobe and screw blowers. Dynamic machines are generally more complex, can produce large amounts of flow, and can offer high efficiency ratings, but have limited control ranges.

Displacement machines are simpler devices, offer a proportionally wider control range, are less expensive to purchase, and offer greater start/stop capability. Historically, the lobe designs offer lower efficiency ratings and lower flow capacities than the larger centrifugal machines, but this is changing with the introduction of modern screw type designs.

What are the characteristics and capabilities of a lobe style package blower?

Lobe type blower packages come in a large variety of offerings. The most basic packages include a blower, inlet silencer, discharge silencer, motor, and inlet filter. More advanced

machines have sound enclosures, unloaded start valves and check valves, while the high-end units include controllers, sensors, and starters/variable frequency drives (VFDs).

The main advantages of the lobe style machines are their low investment cost, versatility in application types, (including all of the ones mentioned above), and their adaptive pressure capabilities. A lobe type blower only operates at the pressure the system requires. They can also be turned on and off frequently. This makes them ideal for tanks with fluctuating fluid depths or backwashing applications.

What does the Com-paK's tri-lobe design mean for performance?

Com-paKs offer the optimized Omega Plus tri-lobe blower and an optimized blower package. This unit provides premium performance thanks to components with low losses, optimized airflow design, and a host of standard components (filters, gauges, check valve, relief valves, and cabinet cooling fan). Additionally, you can acquire a complete end-product machine that's IIoT ready with an onboard controller and integral starter.

What is the ideal application for a lobe style package blower?

The lobe style package fits in most any wastewater application. For most parts of the U.S., the cost of energy dictates which of the technologies will deliver the best payback for the investment for one of the high-efficiency turbo and screw machines. This is especially true in applications such as filter backwashing and digesters, where minimal usage (in the case of filter backwashing) and fluctuating fluid depths (in the case of digesters) extend this payback period. Here, the lobe type machine provides sufficient performance at a reduced investment.

What are the key differences found in a screw blower package?

The package component requirements of a screw blower vary by manufacturer

but in general are the same as the lobe design. The main difference is the operating speeds of the screw. In the same airend size, a screw blower typically runs at twice the speed of a lobe design. This changes the design requirements for the drive system and poses an added challenge for oil side seals. For the drives, this means faster speed motors and greater drive ratios or a gear drive transmission system. Since they are still splash lubricated, additional care is needed to cool, seal, and capture the oil mist generated by these high speeds. This means more components inside the machine, which adds complexity, compared to the simplistic lobe type design.

How does this type of blower save on energy costs?

Screw design machines have internal compression. The process of internal compression gives a gain of 20 to 30 percent over PD designs. Truly, these numbers will depend on the operating pressures and control range speed. In addition to gains at the design points, the screw machines have a better performance at lower speeds. When examining the specific performance curves, the screw blower offers a nearly flat line, where the lobe type has a severe "ski-ramp effect" at the lower end. While turbos may offer a slightly better number at one design point, their turndown is limited, and their curve is U-shaped.

What is the ideal application for this style of blower?

To maximize the benefit of the screw blower investment, these units are best suited for steady operating pressures with many running hours. This fits nicely with aeration basins that require air all year long and where the fluid depth rarely fluctuates or doesn't fluctuate much. These applications will benefit most from this design. The ability to fully integrate the machines into the control scheme via IIoT opens the door to advanced machine control and preventative maintenance efforts. ■