

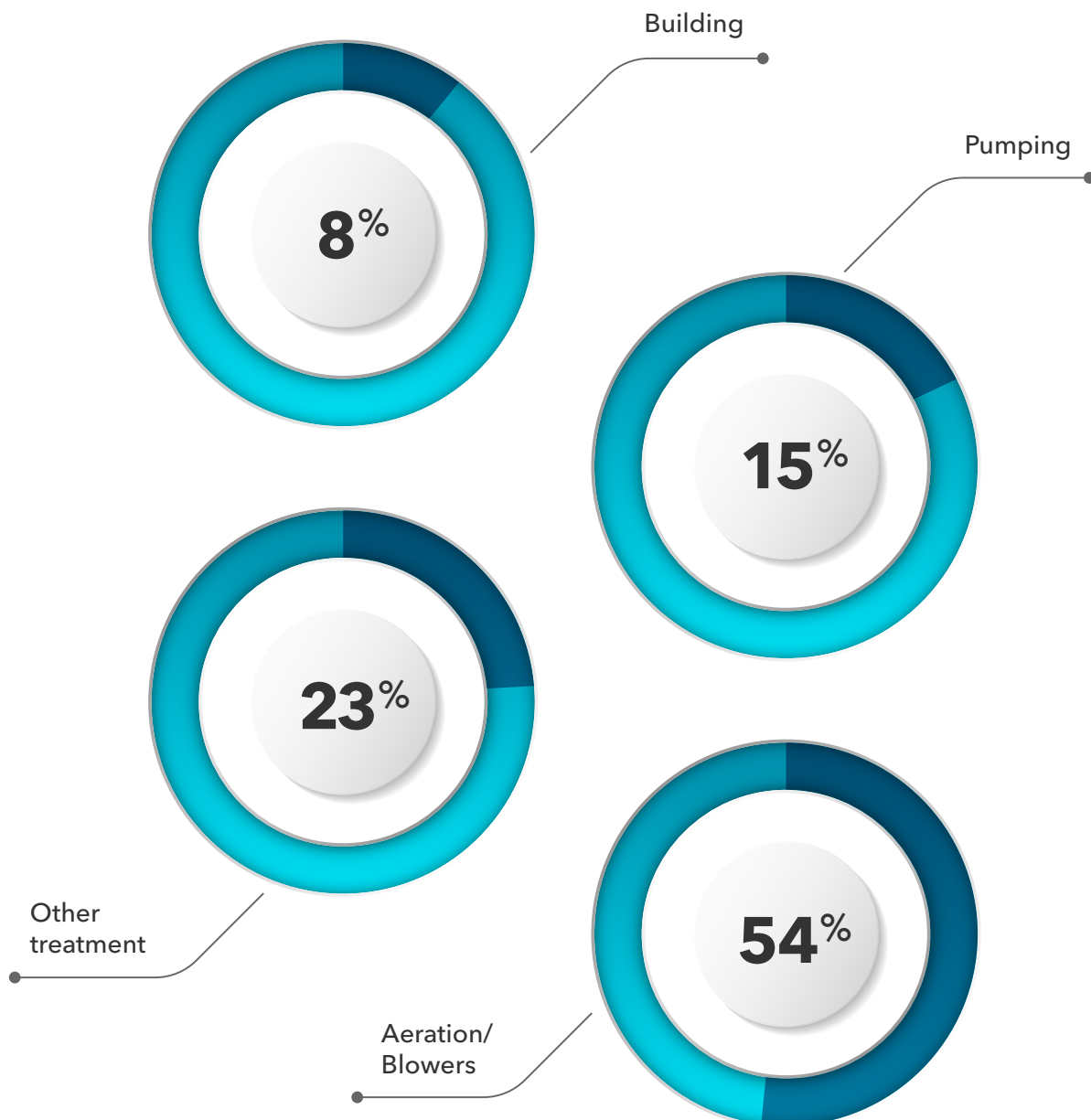
Guide to Blowers

ADVANTAGES & DISADVANTAGES
OF AVAILABLE BLOWER TECHNOLOGIES

Blower Expense

In a typical wastewater treatment plant, the blowers account for only 10% of the capital expenditure, while the operating expenses account for up to 90% of the lifecycle cost. This means that blowers can account for 40-80% of the energy used at a treatment plant.

When determining which blower is best for your application needs, you should consider not only the blower's efficiency, but also how it will perform over time, including both its turn-down capability and maintenance requirements.



Blower Criteria

On the pages that follow you'll find an overview of the advantages and disadvantages of different blower technologies and ratings for each technology's efficiency, turn-down capability, and repair and maintenance requirements.



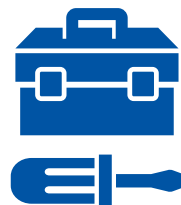
EFFICIENCY

Gauge of how the blower transfers the energy power into air power
(scale = *Excellent; Good; Fair; Poor*)



TURN-DOWN CAPABILITY

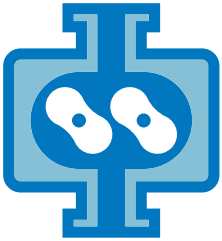
Gauge of how a blower (or group of blowers) is able to satisfy the change in future air demand
(scale = *Excellent; Good; Fair; Poor*)



REPAIR & MAINTENANCE

How easy and how often repair and maintenance is required and how economical it is to repair the blower
(scale = *Minimal; Moderate; Considerable*)

Positive Displacement (PD) Lobe Blowers



Lobe type blowers are simple and have been widely used in aerating wastewater for over 100 years. Positive displacement (PD) blowers, specifically in this case rotary lobe blowers, are the most used technology for blower applications, especially for medium to small flows.

Lobe type blower efficiency is poor due to no internal compression during the 360 degree rotation cycle. It also loses efficiency with increased pressure. However, the technology is reliable and meets the turn down requirements well if sized correctly.

Very often the internal losses of these blowers are not taken into account and the inlet flow is given as the flow value - giving the technology better performance on paper than in reality. Other losses that should be accounted for in these types of blowers include: transmission losses (often from the belt drive), motor losses, gear losses, and, if variable speed is used, losses from the variable frequency drive.

These blowers also result in high noise and vibration caused by pulsations. Recent models have been released on the market with slightly higher efficiency using twisted lobes with a prolonged sealing line resulting in slightly less pulsation.



EFFICIENCY

POOR



**TURN-DOWN
CAPABILITY**

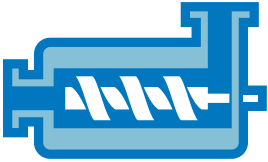
EXCELLENT



**REPAIR &
MAINTENANCE**

**MODERATE TO
CONSIDERABLE**

Positive Displacement (PD) Screw Blowers



Screw blowers, engineered using high pressure screw blower technology, are very often used in high pressure compressor applications and medium to small flows. These blowers have been adapted to suite the pressure requirements used in blower applications usually lower then 1bar.

Screw blowers are characterized by a pair of intermeshing screws that progressively reduces the volume of air as it moves along the length of the screw elements. These blowers have both low leakage and parasitic losses. The technology is reliable and meets the turn down requirements very well if sized correctly.

When compared to lobe blowers, screw blowers are slightly more efficient thanks to the accrued internal compression within the screw elements.

Similar to positive displacement lobe type blowers, this technology can experience considerable losses. Belt drive or gears are often used for power transmission resulting in additional losses in the motor and variable frequency drive. While some manufacturers use a coating on the screws in an attempt to obtain better efficiencies, that coating is lost over time. The pulsations in screw blowers are lower than lobe type blowers, however, they still create high noise and vibration. This technology also loses efficiency with increased pressure but not as much as lobe type blowers.



EFFICIENCY

MODERATE



**TURN-DOWN
CAPABILITY**

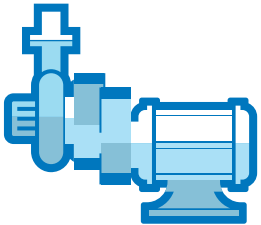
EXCELLENT



**REPAIR &
MAINTENANCE**

**MODERATE TO
CONSIDERABLE**

Integral Gear Type Centrifugal Blowers



Integral gear type centrifugal blowers have been used for many years when higher flows are required. While the compression efficiency is good, these blowers operate on fixed speed. That means that, when designed, these blowers have to account for maximum pressure that may not be experienced for several years and should include future pressure loss assumptions. This could negatively impact the efficiency of the blower from the beginning when it is first commissioned.

Integral gear blowers include a flow inlet guide vane (IGV) and variable diffuser (VD). These components are seen as complicated because they utilize many mechanical parts that require maintenance and the control system required for their operation is complex and expensive.

While the compression efficiency of integral gear blowers can be one of the highest, the gain from the compression efficiency is lost in the complex power transfer, pressurized oil lubrication system, water cooling and motor and bearing losses.

A sound enclosure is an additional accessory that does not come standard with these types of blowers. The enclosure, however, limits accessibility for blower service and increases the space required for installation. In addition, this technology emits a lot of heat and therefore requires good ventilation.



EFFICIENCY

MODERATE



**TURN-DOWN
CAPABILITY**

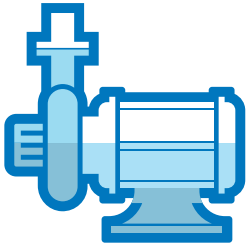
MODERATE



**REPAIR &
MAINTENANCE**

CONSIDERABLE

Direct Drive Turbo Blowers



Direct drive turbo blowers are engineered using more recent motor and variable frequency drive (VFD) technology. Based on well known turbo technology that requires high speed in order to function, these types of blowers use a VFD to transform 50 or 60 Hz of supplied power into high frequencies, achieving high rotating speed directly to the motor and impeller.

The power for direct drive turbo blowers range from 15kW up to 600kW and pressures up to 1,5bar. Not many manufacturers are able to offer the full flow and pressure range due to the shaft weight and rotating speeds in their selected bearing technologies. Turbo blowers are available utilizing two different types of technologies - either the magnetic bearing principle or the newer airfoil bearing technology.

With turbo blowers, the turbo impeller is connected directly to the shaft, which makes it possible to eliminate all transmission losses, resulting in excellent efficiency.

Regarding turndown, not all turbo blowers have a wide turndown and will vary based on the blower manufacturer.

Other factors that should be considered when selecting turbo blowers are addressing the heat emitted by the motors and how the internal functions will be monitored and controlled, which can be achieved either through simple VFD programming or by using a PLC with a touchscreen HMI. Operators have a range of options available with these types of blowers.



EFFICIENCY

EXCELLENT



**TURN-DOWN
CAPABILITY**

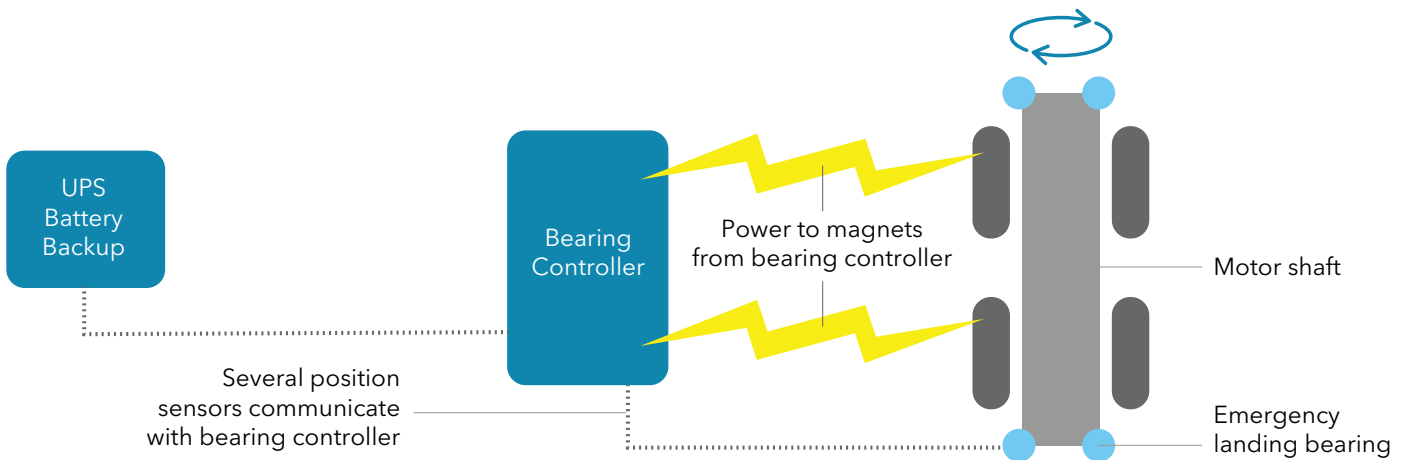
MODERATE



**REPAIR &
MAINTENANCE**

MINIMAL

Non-Contact Magnetic Bearing Blowers



When direct drive turbo blowers were first introduced to the market they incorporated the magnetic bearing principle. Magnetic bearing technology uses active magnets to position the motor rotor in the right position during both operation and at standstill.

In order to govern the magnetic force in the blower there needs to be a controller and sensors in place to constantly measure the position of the rotor. Constant monitoring means that this technology is sensitive to power failures. In order to account for possible power failures, battery backups are often needed. Backup bearings with limited crash landings capabilities should also be installed in the motor as well. Some manufactures also use the variable frequency drive charge to power the bearings during power failures.

Overall, this technology is susceptible to higher temperatures and requires several backup systems and control functions. All of this increases possible failure points.



EFFICIENCY

GOOD



TURN-DOWN
CAPABILITY

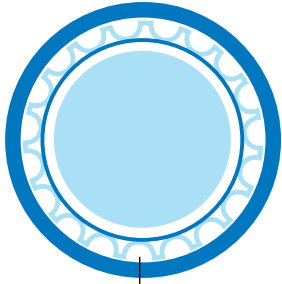
GOOD



REPAIR &
MAINTENANCE

MODERATE

Non-Contact Air Bearing Blowers



Air cushion created by rotational speed lifting the rotor

Airfoil bearing technology is nothing new - it's been around for years and is used in non-contact air bearing blowers. In these blowers an air cushion is created when the motor shaft rotates allowing the shaft to rotate freely without making contact with any other parts. This eliminates the energy transfer loss or frictional loss that is inevitable with other types of blowers.

Weight is crucial in air bearing blowers. Light-weight shafts using titanium are preferred and an aluminum machined impeller is recommended so as not to limit the start and stops of the bearings.

Air bearing blowers continue to evolve. For example, new coatings like triple Nano silver coatings have made it possible to extend the bearing lifetime 3-4 times that of blowers using a traditional Teflon coating.

These types of blowers do not require any additional backup systems and are not negatively impacted by power failures and are 100% self controlled with no need for any safety devices to protect the bearing. With these latest developments bearing lifetime has become a non issue comparing to the magnetic bearing considering aging of electrical components.



EFFICIENCY

GOOD



**TURN-DOWN
CAPABILITY**

GOOD



**REPAIR &
MAINTENANCE**

MINIMAL

Blower Comparison



EFFICIENCY



**TURN-DOWN
CAPABILITY**



**REPAIR &
MAINTENANCE**

Positive Displacement Lobe Blowers	POOR	EXCELLENT	MODERATE TO CONSIDERABLE
Positive Displacement Screw Blowers	MODERATE	EXCELLENT	MODERATE TO CONSIDERABLE
Centrifugal Blowers	MODERATE	MODERATE	CONSIDERABLE
Non-Contact Magnetic Bearing Blowers	GOOD	GOOD*	MODERATE
Non-Contact Air Bearing Blowers	GOOD	GOOD*	MINIMAL*

*Dependent on manufacturer's technical solution

Ready to find the right blower for your plant?

See what types of blowers Xylem has to offer.

[Xylem's blower offering](#)

