

The advantage of the AERZEN air bearing technology

Costs and life-cycle costs

The air foil bearing operates without the need for lubrication and maintenance, providing minimum life-cycle costs for the entire unit. Proper filtration is the only preventive maintenance requirement. Compared to turbo compressors made with magnetic bearings, this is a significant benefit, since air foil bearings do not require ancillary components, such as bearing controllers, additional electrical filters, and uninterrupted power sources.



Air bearing technology

The principle of the dynamic air foil bearings for axial and radial bearings is very simple. The operation does not require any electrical, mechanical or pneumatic control parameters. The eccentric rotation of the rotor is very distinct at the beginning and generates a thin air cushion between the rotor and the bearing, at a local pressure of approximately 300-600 psi. For this reason, there is no mechanical contact which creates wear between the surfaces. The

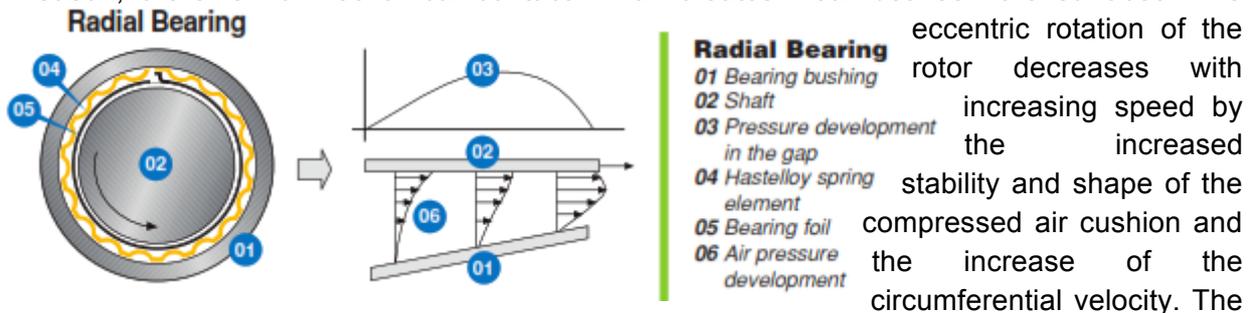


Image of pressure generation in an air foil bearing

external influences, since no control electronics and no external energy supplies are required.

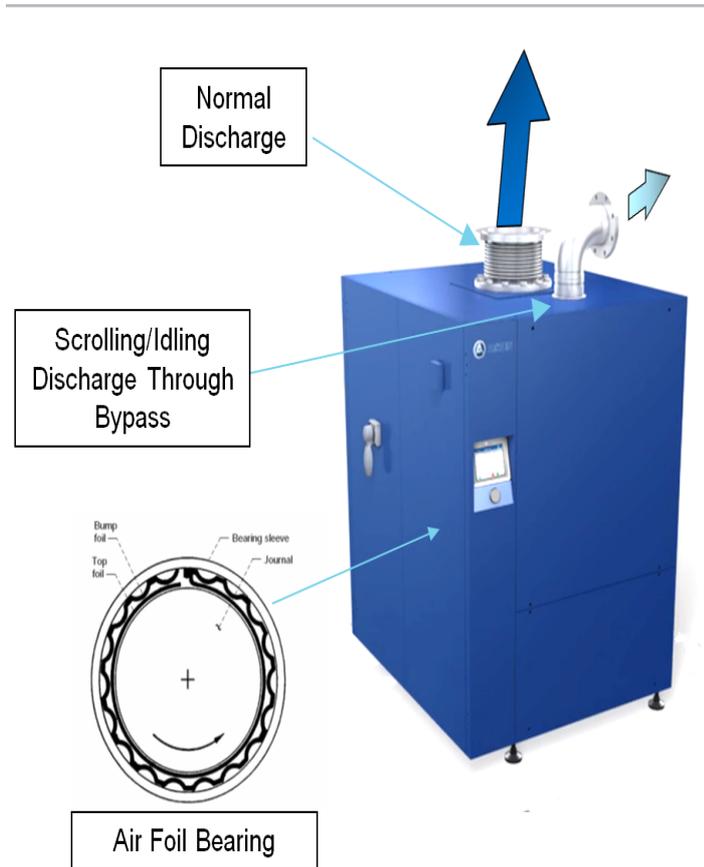


Air foil bearings are uncomplicated and reliable regarding service life and maintenance. Maintenance and exchange of single components are not necessary for the lifetime of the core unit. Operational reliability is assured by the simple construction and the insensitivity against dynamic operation conditions, such as pressure fluctuations.

Air bearing technology has been successfully used for a variety of applications for decades. AERZEN air bearing technology has been in continuous operation and successfully proven for more than 10 years.

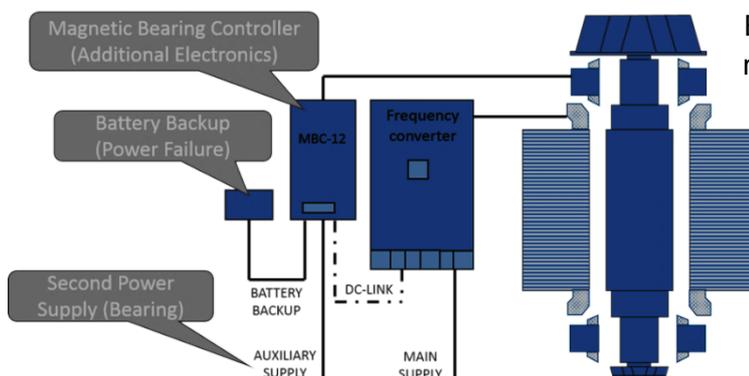
Performance and control

- The unique idle operation mode provides that the assembly can be placed in and out of service as often as required. This is useful for intermittent operation without wear to the mechanical or electronic components.
- Continuous speed and volume flow regulation allows for a wide control range depending on the demand. The machine is kept within safe operational parameters due to complete self-monitoring and self-regulating control.
- A distinct feature of the Aerzen Turbo blowers made possible by the air bearing design is the extremely fast reaction performance to pressure fluctuations, as in the case of MBR processes with fast-acting valves. Here, the speed is adjusted to the requirements of the actual operating situation within milliseconds, while keeping the machine within its safe pressure range (high-rise to surge). Smooth operation is also assured at high load and pressure fluctuations.



Summary of the air foil bearing advantages

The air foil bearing does not require external ancillary equipment such as electronic control systems. Therefore, the bearing system consists of significantly fewer components and is less susceptible to problems or additional maintenance.



Back-up bearings for the rotor are not necessary with air foil bearings. If the magnetic field fails, then the rotor of turbo compressors with magnetic bearing must be supported by mechanical back-up bearings.

Under extreme conditions, such as high compressor surges or power failure at the plant, magnetic bearings require an additional battery system to provide energy for the bearings for approximately 30-40 seconds, as the rotor speed drops to a speed that does not harm the back-up bearings. The battery system is not maintenance-free, and is prone to error at low and high ambient temperatures.

The back-up bearings of the magnetic bearings are only applicable for very low speeds. The magnetic bearing turbo runs the risk of damage if the speed is too high, as in the case of repeated power failures without the battery system properly recharged.



If the back-up bearings or the magnetic bearing are defective, the turbo cannot be repaired on site, but the complete assembly must be sent to the factory to be repaired which can cause long delivery periods.

In principle, AERZEN air foil bearings are much less sensitive to extreme or fluctuating (in general dynamic) operation conditions which can regularly occur during operation which avoids limitations, reliability issues, and failures at demanding process conditions.

An air bearing system can operate in extreme operational situations like sudden pressure fluctuations. The sudden changes are compensated using the air foil bearing and its dampening spring elements together with a high-temperature coating (rated for 650 Degrees C). The blower continues to operate safely and reliably.

If the air foil bearing is used in the correct operation mode, it is one of the most durable components of the complete assembly. Since the rotor and the top surface of the air foil bearing only make contact when starting and stopping, the wear of the coating directly depends on these events. The duration of this contact is < 1 second which is extremely short. The highly durable coating on the bearing minimizes wear. However, the unique idle function from AERZEN optimizes safe operation, especially when multiple start-ups/stops occur. Here, the turbo blower will not be entirely stopped, avoiding any wear, but continues to rotate with a minimum speed (10,000-12,000 rpm) at which an adequate air cushion will be generated, while consuming minimal power (2-5 kW). In the case of longer idle operation times, the blower can, of course, be stopped completely. AERZEN recommends inspection of the bearing after approximately ten years or 80,000 service hours.

