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# Regenerative blowers offer efficient, high-volume aeration

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By Gary Rogers, Ph.D., P.E.

## Tech is best suited for use in ponds or tanks with depths of less than 3 meters



The use of large-diameter plumbing minimizes friction losses in regenerative blower systems. Inlet filters protect the blowers and air distribution system from dust and other contaminants.

In today's economy, there is an increased emphasis on aeration systems that improve economics while going "green." Energy-efficient operation at the best cost is very important, and many aquaculturists have considered regenerative blower technology as a solution. Regenerative blowers have a proven track record of reliable performance, long life, energy

efficiency and minimal maintenance needs at hatcheries and facilities with small culture ponds. In addition, a range of motor sizes and motor types provides a wide selection of blower systems for varied aquaculture applications.

Regenerative blowers are designed for high-volume diffused-air applications, generally with lower pressure requirements. For example, a wide range of air flow rates are available from about 42 to over 1,700 m<sup>3</sup>/hour (25 to over 1,000 cfm). Pressure capabilities can be up to 700 mbar (about 10 psi), although most regenerative blowers in aquaculture are used at lower pressures. This means that regenerative blowers are particularly suited for use in ponds or tanks with depths of less than 3 meters.

## Blower operation

A regenerative blower draws air in using impeller blades. The air moves into a compression space that consists of a hollow, circular ring between the tips of the impeller blades and the walls of the housing. The rotating impeller moves the air radially outward to the curved housing by centrifugal force, accelerating the air flow.

A certain amount of air slips past each impeller blade during rotation and returns to the base of a succeeding blade for reacceleration. This “regenerative” action allows regenerative blowers to generate pressure. When the air reaches a “stripper opening” at the outlet, it is moved out of the blower. Each regeneration imparts more pressure to the air.

## Features, benefits

The flexibility of regenerative blowers allows for a variety of motor options, including high-efficiency, variable-speed, explosion-proof and totally enclosed fan-cooled models. The Underwriters Laboratories- and/or CSA-International-certified electric motors come in single- and three-phase, dual-frequency and multivoltage versions for worldwide applications. Even 12 volt D.C. is available.

The ratings of A.C. motors range from 0.09 to 22.4 kW (1/8 to 30 hp). Motors on regenerative blowers are usually mounted into the housing, eliminating the need for a V-belt or coupling drive. In addition, permanently sealed motor bearings with up to 25,000-hour life eliminate the need for oil and can provide continuous duty.

Oil-free air is another key advantage. Air exiting the regenerative blower is the same air entering the inlet. With permanently sealed bearings, there is no chance of oil contamination.

Automatic thermal overload protection is also available and standard on most regenerative blowers. Should the motor be tripped as a result of a brownout, the blower will restart automatically after cooling.

Internal mufflers and low-restriction washable filters are important options. Filter silencers may be required in areas where reduced sound levels are important. An inlet filter – normally used in pressure systems – to protect the blower and the air distribution system from dust, air particles and other contaminants can provide ideal system performance and reliability.

## Important considerations

Proper system design is essential to optimize regenerative blower efficiency. One of the most important things to consider is the use of large-diameter plumbing to minimize friction losses. The piping should be at least the same size as the blower outlet port or ideally one size larger.

High altitude affects blower performance by reducing airflow volume and pressure. Such losses can be easily estimated by deducting 4 percent of the volume and pressure for every 300 m of elevation above sea level. For example, a blower designed to deliver 100 cfm at sea level will provide 96 cfm at 300 m above sea level.

Most regenerative blowers operate on 50- or 60-cycle (Hz) power, but performance can vary. At 50 Hz, both pressure and volume are typically 16 percent less than the 60 Hz values.

Blowers require about 10 seconds to reach full speed at start-up. The power draw during this time is higher than the full-load running specs. Engineers suggest using starting watts to size generators and full-load amps to size breakers.

The heat of compression must be considered in piping system design, as the exhaust air temperature of regenerative blowers increases with increasing pressure. For example, if a blower is operated at higher pressure due to high friction losses, the exit air may be too hot for plastic pipe. In those cases, sections of heat-dissipating pipe or longer runs of metal pipe must be considered before connection to the plastic piping system.

Finally, always consider the “laws” of fan performance. Airflow varies in direct proportion to rotational speed. Pressure changes as the square of the speed ratio. And horsepower changes as the cube of the speed ratio.

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## Author

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**GARY ROGERS, PH.D., P.E.**

Vice President of Engineering

Aquatic Habitats Inc.

2395 Apopka Boulevard

Apopka, Florida 32703 USA

**[garyr@aquaticeco.com](mailto:garyr@aquaticeco.com)** (<mailto:garyr@aquaticeco.com>).

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