

# Efficient oxygen supply in fish farming - advantages of ceramic aeration discs

## Case Study

In modern fish farming, efficient oxygen supply is a critical factor that directly influences the well-being and growth of the fish. However, traditional aeration methods often reach their limits, particularly in terms of efficiency and durability. This is where KERAFOLE's ceramic membrane discs come into play as an alternative. This case study highlights the benefits of the membrane discs and their positive influence on fish farming.

## The importance of oxygen supply in fish farming

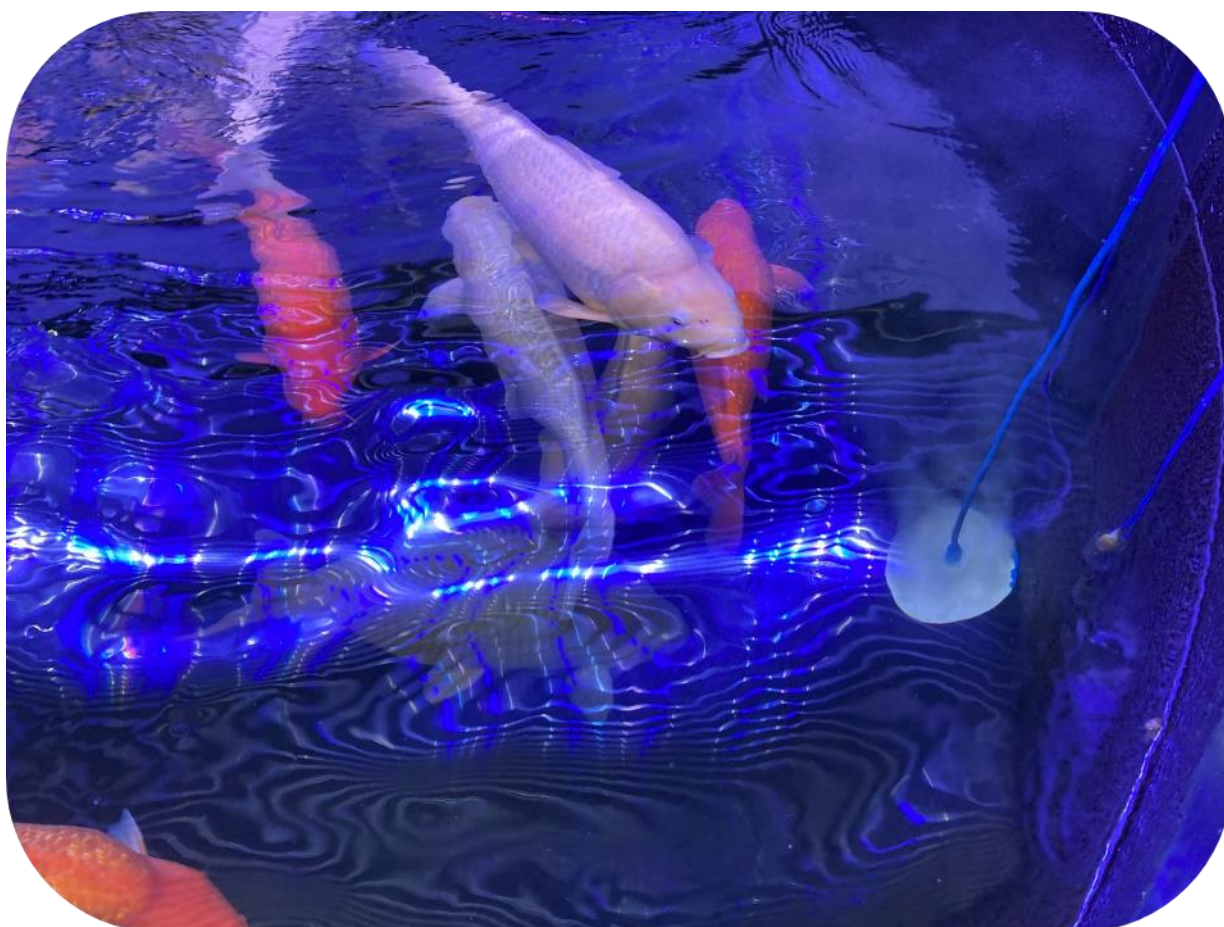
Fish need dissolved oxygen in the water in order to breathe and maintain their vital functions. In intensive aquaculture, where high stocking densities are common, the natural oxygen content in the water can quickly become depleted. Without sufficient oxygen supply, fish can suffer stress, grow more slowly and become more susceptible to disease. It is therefore crucial to install an efficient aeration system that continuously introduces a sufficient amount of oxygen into the water.

The bubbles that are introduced by such an aeration system have two functions. Firstly, gas molecules can pass into the water at their interfaces and thus dissolve. Secondly, the rising bubbles increase the surface area of the pond or tank. This enables better gas exchange with the atmosphere. Undersaturated gases (oxygen) can get into the water, oversaturated gases (nitrogen, CO<sub>2</sub>) can escape. This natural gas equalization is more efficient if additional air is introduced under pressure using an aerator.

## Limitations of classical aeration

Typically, aerator pumps are used in combination with diffusers. These can be made of plastic or ceramic and can have different geometries (rods, balls, rings, ...). The bubbles produced by these systems are often relatively large, which reduces the efficiency of oxygen enrichment. There are also aeration stones. Although these produce smaller bubbles, aeration stones tend to clog up over time and need to be cleaned or replaced regularly.

The pumps that are used often operate at a pressure of between 150 and 300 mbar, which corresponds to a water depth of 1.5 to 3 meters. Depending on the actual application depth, only a low output remains due to the back pressure. This reduced performance can be a problem, especially at night. During the day, additional oxygen is generated by the photosynthesis of naturally occurring algae. As photosynthesis does not take place at night due to the lack of light, more artificial aeration is required. Conventional systems often reach their limits here.



### Advantages of ceramic aeration discs

**Higher efficiency:** Ceramic discs produce very fine bubbles that rise more slowly and remain in the water for longer. By an additional rotation of the discs, even finer bubbles can be achieved. This increases the contact time between the bubbles and the water, allowing more oxygen to be dissolved. In addition, the ratio of bubble surface area to volume is greater. This higher efficiency means that less energy is required to achieve the same oxygen content, resulting in cost savings.

**Use of pure oxygen:** Air has an oxygen content of only 21%, 78% of it consists of nitrogen. If the pond / tank is aerated too much with air, there is a risk of nitrogen oversaturation. Even a slight oversaturation of 102 % can lead to gas bubble disease in the fish. Nitrogen oversaturation can also occur due to aeration at too great depths. However, an oxygen oversaturation of up to 130 % can be well tolerated by the fish. The supply of pure oxygen is therefore preferable. KERAFOLE ceramic discs are ideal for use with pure oxygen. They can be operated at 2.5 bar without any problems and thus enable more efficient aeration at greater depths in a safe manner.

**Even oxygen distribution:** The even spread of the fine bubbles distributes the oxygen more efficiently throughout the tank. This ensures that all fish receive sufficient oxygen regardless of their position in the tank.

**Improved water quality:** The finer bubbles not only contribute to oxygen enrichment, but also promote the circulation of the water, which helps to reduce sedimentation and organic waste. Better water quality leads to healthier fish and less susceptibility to disease. The discs can even be used to inject ozone for disinfection.

**Durability and low maintenance:** Ceramic aeration discs are more robust and durable than many other aeration systems. They clog less frequently and require less frequent cleaning. This reduces maintenance costs and the workload for fish farm operators.

**Reliability:** The aeration discs can be connected directly to a tank with liquid oxygen. Aeration is continuous and purely pressure-driven. This means that no electrical components are required that could cause the oxygen supply to fail in the event of a power failure.

