



SmartGeoFish

Recirculating aquaculture system as a sustainable solution



Aquaculture is the fastest-growing food production sector since fish has experienced massive growth in demand. RAS technology enables fish growth onshore, from egg to fork, without the risk of pathogens or predators in a sustainable way.

Recirculating aquaculture system, or RAS, provide a constant and controlled environment for the optimal production of healthy fish. The culture water is purified and reused continuously. It is almost completely closed circuit. The system's components either removed or convert the waste products—solid waste, ammonia, and CO₂—into non-toxic ones. After a while, the purified water is saturated with oxygen and returned to the fish tanks.

RAS is one of the most environmentally sustainable intensive fish farming technique. It provides opportunities to reduce water usage and to improve waste management and nutrient recycling.

Every recirculating aquaculture system needs the following basic components for a successful setup: Fish tank; Mechanical Filter; Biological Filter; Pump tank; Pump; Other items (e.g. oxygenation devices, aeration devices, feeders, monitoring, etc.).

Recirculating aquaculture systems can be installed inside or outside.

The main treatment phases within the recirculating loop in indoor systems, often include collecting solid waste and converting ammonia to nitrate by nitrification. Some freshwater and marine indoor RAS implement denitrification and sludge digestion to reduce waste.

RAS conserve heat and water through water reuse after reconditioning by biological filtration using biofilters.



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Advantages

The ability to produce fish all year indoors using RAS is sustainable, infinitely expandable, environmentally friendly, and has the ability to ensure both the safety and quality of the fish produced.

Fish can be raised indoors using RAS, which allows for controlled product growth rates and predictable harvesting schedules. RAS are environmentally friendly since they consume 90 to 99 percent less water and less than 1% of the land area of conventional aquaculture systems, and they offer environmentally safe waste management treatment.

It can guarantee a completely healthy seafood source, which is free of any chemicals or heavy metals. RAS technology is the only viable option for farming tropical fish species in moderate to cold climates indoor.

RAS offers complete disease control by monitoring water quality and organising optimal feeding strategies.

Disadvantages

The disadvantage of RAS is that electricity has to be maintained 24/7, therefore the cost of electricity is a large portion of their cost structure.

A technically qualified staff is required to for a continuous process.

The closed loop system has its benefits but also makes the system vulnerable. The quality of water used is essential for healthy fish and monitoring it also proved crucial. The source of water should be chosen wisely.

The quality of fish feed also has a great impact on the operation of the system. The fish feed should be high in protein, and the fat should be extruded with high digestibility. The fish feed composition influences its ability to float or the speed of sinking in the pools. If the fish feed sinks fast, fish cannot catch the pellets which will accumulate on the bottom of the tanks and degrades water quality

Disadvantages include the relatively large size of settling tanks. These tanks are relatively challenging to clean: The removal efficiency of small or low density particles, and nutrients from the settled solids is relatively low.



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The situation in Hungary

In 2020, fish production in intensive systems was 5277 tonnes, an increase of 11% compared to the previous year. Fish produced for human consumption in intensive farms amounted to 4051 tonnes in 2020.

African catfish is the dominant species in our intensive farm fish production, and its introduction to the local market and subsequent increase in production over the past two decades has been a success story for the Hungarian fishing industry. African catfish accounts for around 93% of the fish farmed under intensive systems, with trout and tilapia and sturgeon covering the remainder.

SmartGeoFish project

SmartGeoFish project aims to empower RAS managers to supervise better and manage the nitrogen cycle. The project aims to demonstrate that its technical solution allows real-time monitoring to avoid water quality issues, high water exchange rates or other system failures that stress fish and reduce feeding. The system can be configured to provide warnings and alarms when desired levels are exceeded, which can flag any operational problems with the biofilter.

The system is implemented at the premise of Geofish Ltd (www.geofish.hu). Geofish Ltd utilizes geothermal water from greenhouses to produce African catfish in a RAS system. The company also maintain an energy tree plantation to use the post harvest nutrients.

More on SmartGeoFish: <https://campdenbri.hu/en/palyazatok/en-smartgeofish.php>



Digital Innovation Hub
&
Project Coordinator



Fish producer SME



Technology service provider

www.campdenbri.hu/en/en-magyarorszag.php

www.geofish.hu

www.seacon.hu/en/