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RECIRCULATORY AQUACULTURE SYSTEM (RAS)

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[1]Ramagiri Mahesh Kumar, [2]Gora Shiva Prasad*, [3]Naresh Lavadya and [4]B Yeshdas

[1]KVK, Bellampalli, Telangana, India
[2]Faculty of Fishery Science, Kolkata, West Bengal, India
[3]College of Fisheries Science, Veraval, Gujarat, India
[4]FFO-Rangareddy district, Department of Fisheries, Government Telangana, India

Email: ghorashivaprasad@gmail.com

The Recirculatory Aquaculture System (RAS) is a water recycling and reuse technology which also eliminates suspended matter and metabolites through mechanical and biological filtration. This technique is used for the high-density culture of various fish species while using a minimal portion of land and water.

It is a high-density fish culture that is more intensive than other aquaculture production systems. Instead of growing fish outdoors in open ponds and raceways, this system typically rears fish in indoor/outdoor tanks under controlled environmental conditions. By recycling water back to fish culture tanks, recirculating systems filter and clean it. The technology is essentially focused on the employment of mechanical and biological filters, and the process can be applied to any aquaculture species. Only new water is added to the tanks to compensate for splash out, evaporation, and waste material flushing. The reconditioned water circulates through the system, and no more than 10% of the system's total water volume is replaced daily. In order to compete economically and efficiently use the substantial capital investment in the recirculation system, the fish farmer needs to grow as much fish as possible in the inbuilt capacity. The quantity and quality of feed, as well as the kind of filtration, are critical factors in the administration of recirculating systems. Many different filter types are utilized in

Volume 3 – Issue 8
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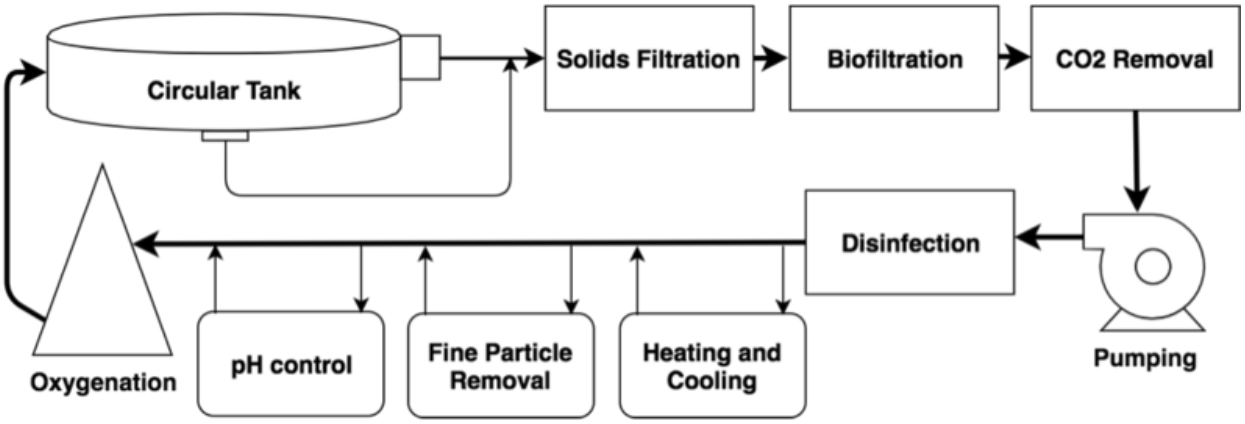
recirculating systems, but the ultimate purpose of all filtration is to remove metabolic wastes, excess nutrients, and particles from the water and provide good water quality for aquatic animals. It is important to examine all the factors when designing and investing in aquaculture systems.

However, in order to encourage small-scale fish farmers and entrepreneurs, as well as to facilitate fish production in urban and semi-urban areas where land and water are rare, Backyard Recirculation Aquaculture Systems should be promoted.

Flow-Chart of Recirculatory Aquaculture System



Advantage of RAS

- ✓ Equipment and other tanks have been predicted to last for a long time.
- ✓ Because antibiotics and therapeutics are used less frequently, there is a greater chance of obtaining high-quality fish.
- ✓ Direct operational costs linked with feed, predator control, and parasites will be decreased to some extent.
- ✓ Potentially eliminate parasites in recipient waters.
- ✓ Risk reduction due to environmental factors(Climatic change), disease, and parasite impacts
- ✓ RAS production can promote flexibility in terms of location for farming, proximity to market.

- ✓ Allow for the production of a diverse variety of species regardless of temperature needs. Feed management is much improved in RAS when feeding can be closely monitored for 24 hours. Stock stress on RAS can be mitigated by reducing exposure

Volume 3 – Issue 8
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to elements such as bad weather, adverse temperature conditions, external pollutants, and predation.

- ✓ Enable secure production of non-endemic species.
- ✓ Judicial use of water and land areas.

Disadvantage of RAS

- Constant uninterrupted power supply is required if electric power fails then backup of electricity is required
- Capital cost of starting a recirculating aquaculture system is high as compared to ponds and raceways.

Species Suitable for RAS

- ➢ Baramundi/ Asian Seabass/Bhetki (Lates calcarifer)
- ➢ Cobia (Rachycentron canadum)
- ➢ Silver/Indian Pompano (Trichinotus Blochii/ Trichinotus mookalee)
- ➢ Tilapia (Oreochromis niloticus)
- ➢ Pearl spot/Karimeen (Etroplus suratensis)
- ➢ Pangasius (Pangasianodon hypophthalmus)
- ➢ Rainbow Trout (Oncorhynchus mykiss), especially in Hilly/cold water Region.

Feed

- A high protein feed that contains all of the necessary minerals and vitamins
- Species-specific feed
- Feeding can be done at 3-5 percent of the fish's body weight, depending on the quality and protein level of the feed.
- More frequent feedings (many times per day) will result in faster growth rates and, as a result, a better feed conversion ratio.

Water Quality Management

- Source of water is important in Recirculatory Aquaculture- Well water is suitable, which is free from contaminants. If Municipal water is used, it should be treated with chlorine compounds to avoid pathogens.

Volume 3 – Issue 8
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- Most important water quality parameter is temperature; it affects the metabolic rate in microorganisms as well as cultural species. During the culture period, pH and temperature should be maintained at the lowest end of the optimal range to decrease the unionized ammonia.

- Fish survival is mostly depending upon Dissolved oxygen, and it can be maintained by the aeration process. Warm water and cold water fishes require 4 and 5 ppm DO, respectively.

- High and low pH causes ammonia and hydrogen sulfide toxicity respectively, Carbon-dioxide will cause acidic in nature if proper aeration is reduced.

- From the total feed, 25% becomes waste, immediately uneaten feed should be removed by different methods such as mechanical filtration, Flotation and Skimmers etc.,

- Copper toxicity increases due to low alkalinity; to overcome this effect sodium bicarbonate is used to increase alkalinity.

Conclusion

Recirculating Aquaculture Systems (RAS) are examined in order to provide better solutions for future management; potential areas for overcoming issues in the fishing industries are highlighted. Selection of species and regulation of water quality are the essential aspects of the RAS system, and greater knowledge of the RAS system was conveyed to fish farmers, researchers, and extension workers in order to promote the RAS system.

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