AQUACULTURE III

7. WEEK

Recirculating Aquaculture

WEEKLY TOPICS

Week	Topics
1. Week	Aquaculture Science and Aquaculture Engineering
2. Week	Aquaculture: Economic and Environmental
3. Week	Aquaculture: Innovation and Social Transformation
4. Week	Aquaculture: Food Ethics
5. Week	Shellfish Aquaculture and the Environment
6. Week	Advances in aquaculture hatchery technology
7. Week	Recirculating Aquaculture
8. Week	Selection and Breeding Programs in Aquaculture
9. Week	Ecological and Genetic Implications of Aquaculture Activities
10. Week	Aquaculture: Biotechnology
11. Week	Aquaculture nutrition: gut health, probiotics, and prebiotics
12. Week	Mucosal Health in Aquaculture
13. Week	Off-Flavors in Aquaculture
14. Week	Sustainable Aquaculture Techniques

- Recirculation aquaculture is essentially a technology for farming fish or other aquatic organisms by reusing the water in the production. The technology is based on the use of mechanical and biological filters, and the method can in principle be used for any species grown in aquaculture such as fish, shrimps, clams, etc. Recirculation technology is however primarily used in fish farming, and this guide is aimed at people working in this field of aquaculture.
- Recirculation is growing rapidly in many areas of the fish farming sector, and systems are deployed in production units that vary from huge plants generating many tonnes of fish per year for consumption to small sophisticated systems used for restocking or to save endangered species.

http://www.fao.org/3/a-i4626e.pdf

Bregnballe, Jacob. "A guide to recirculation aquaculture." *Copenhagen, Denmark: Eurofish*(2010).

- Recirculation can be carried out at different intensities depending on how much water is recirculated or re-used. Some farms are super intensive farming systems installed inside a closed insulated building using as little as 300 litres of new water, and sometimes even less, per kilo of fish produced per year. Other systems are traditional outdoor farms that have been rebuilt into recirculated systems using around 3 m3 new water per kilo of fish produced per year. A traditional flowthrough system for trout will typically use around 30 m3 per kilo of fish produced per year. As an example, on a fish farm producing 500 tonnes of fish per year, the use of new water in the examples given will be 17 m3/hour(h), 171 m3/h and 1 712 m3/h respectively, which is a huge difference.

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Bregnballe, Jacob. "A guide to recirculation aquaculture." *Copenhagen, Denmark: Eurofish*(2010).

Type of system	Consumption of new water per kg fish produced per year	Consumption of new water per cubic meter per hour	Consumption of new water per day of total system water volume	Degree of recirculation at system vol. recycled one time per hour
Flow-through	30 m3	1 712 m3/h 1	028 %	0 %
RAS low level	3 m3	171 m3/h	103 %	95.9 %
RAS intensive	1 m3	57 m3/h	34 %	98.6 %
RAS super intensive	0.3 m3	17 m3/h	6 %	99.6 %

http://www.fao.org/3/a-i4626e.pdf

Bregnballe, Jacob. "A guide to recirculation aquaculture." *Copenhagen, Denmark: Eurofish*(2010).

- Waste treatment in recirculating aquaculture systems

- Recirculating aquaculture systems (RAS) are operated as outdoor or indoor systems. Due to the intensive mode of fish production in many of these systems, waste treatment within the recirculating loop as well as in the effluents of these systems is of primary concern. In outdoor RAS, such treatment is often achieved within the recirculating loop. In these systems, extractive organisms, such as phototrophic organisms and detritivores, are cultured in relatively large treatment compartments whereby a considerable part of the waste produced by the primary organisms is converted in biomass. In indoor systems, capture of solid waste and conversion of ammonia to nitrate by nitrification are usually the main treatment steps within the recirculating loop.

https://www.sciencedirect.com/science/article/pii/S0144860912000945
van Rijn, Jaap. "Waste treatment in recirculating aquaculture systems." *Aquacultural Engineering* 53 (2013): 49-56.

- FISH FARMING IN RECIRCULATING AQUACULTURE SYSTEMS (RAS)

- Recirculation aquaculture systems (RAS) represent a new and unique way to farm fish. Instead of the traditional method of growing fish outdoors in open ponds and raceways, this system rears fish at high densities, in indoor tanks with a "controlled" environment. Recirculating systems filter and clean the water for recycling back through fish culture tanks.

http://fisheries.tamu.edu/files/2013/09/Fish-Farming-in-Recirculating-Aquaculture-Systems-RAS.pdf

Helfrich, L.A. and Libey, G., 1991. *Fish farming in recirculating aquaculture systems (RAS)*. Virginia State Cooperative Service.

- A Manual for Operating a Small-scale Recirculation Freshwater Prawn Hatchery
- Hatchery design
- Hatchery site selection
- Water supply
- Other site selection criteria
- Facility design
- The hatchery building
- Floor
- Drainage
- Sand filter
- Air system
- Electrical system
- Tanks
- Holding tanks
- Hatching tank
- Larvae rearing tank
- Artemia incubator
- Brine storage tank
- Mixing tank

http://www.fao.org/tempref/docrep/fao/006/ad530e/ad530e00.pdf

- References

- Regional Review On Status And Trends In Aquaculture Development In Europe – 2015, Fao Fisheries And Aquaculture Circular No. 1135/1 Fiaa/C1135/1 (En)
- The State Of World Fisheries And Aquaculture 2016, Fao. 2016
- Advances In Aquaculture Hatchery Technology 2013, Woodhead Publishing Series In Food Science, Technology And Nutrition: Number 242
- Aquaculture: An Introductory Text, 2005, Robert R. Stickney
- Aquaculture Farming Aquatic Animals And Plants,2012, John S. Lucas