Recirculating Aquaculture Systems

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TYPES

- Serial Reuse systems
- Partial Reuse systems
- Full Reuse or Recirculating systems
Serial Reuse systems

- Used extensively in trout and salmonid raceway production systems
- Generally just add oxygen as the water is reused and flow to next raceway
- Simple concept. Does not account for ammonia buildup
- No solids removal or additional equipment utilized besides oxygen system
Partial Recirculation System

- Can sustain higher production levels with 20% less total flow than a serial reuse system

- Separates solid wastes with dual drain tanks and small discharge flow (15-20%)

- Additional equipment needed to run these systems.
Partial Coldwater Recirc Components

- Double drain tanks
- Drum Filter (Optional)
- CO2 Stripper
- Low Head Oxygenation (LHO)
- UV Sterilization
- Pump Sump
- Pumps
- Flow meters
- Alarms
ATS Partial Recirc System

- Atlantic salmon broodstock
- Low density (<30kg/m³)
- Approx. 2,500 lbs of fish in system
- Tank rearing space: 36 m³
- Three - 12 foot dual drain tanks
- Total system: 54 m³ = 14,000 gal.
ATS System Overview
ATS Partial Recirculation System

- 80% of water is Reuse and 20% is added freshwater
- Total flow: 300-320 gpm
- Freshwater flow: 60-80 gpm
- Reuse Flow: 240 gpm
Double drain tanks
Double Drain Tanks

- Bottom drain
- Concentrates solids
- Small effluent stream
- Furncos provide control
- 10-20% of water
Double Drain Tanks

- Side box or top drain
- Fairly clean water
- Send to drum filter or radial flow settler
- 50-80% of water
Solids Removal
Drum Filter

- Solids removal
- 30-60 micron screen
- Self cleaning
- Concentrates solids for effluent
- Expensive
- Another option: Radial Flow Settler
- Maybe not needed
CO2 Stripper
CO2 Stripper

- Effectively stripping CO2 is important especially with reuse
- Note: Media and spray nozzles in the top of stripper
UV Sterilization
Low Head Oxygenation (LHO)
Oxygenation
Pump Sump and Pumps
Full Recirculating Systems

- Allows the reuse of almost 100% of water in the system besides loss from cleaning and evaporation.
- Most tight RAS systems are still 98-99% reuse.
- Additional equipment such as Biofilter and denitrification systems may be utilized.
- Harder to manage and operate. Demand a more experienced operator.
Biofilters
CW RAS system
Flow and Oxygen meters

- Important to monitor flow and oxygen
- Connected to alarm system
SCADA Monitoring System
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