

BioCord™ for Nitrogen Control in a Tilapia fish farm in Petchaburi, Thailand

Information from the study “Inorganic nitrogen control in a novel zero-water exchanged aquaculture system integrated with fibrous nitrifying bio filters”. bio resource Technology 100 (2009) 2088–2094

The Challenge

Excessive accumulation of nitrogen pollutants is a common problem in aquaculture. A buildup of ammonia and nitrite above 1.0 mg/L lowers oxygen transport and weakens the immune system of aquatic animals, often causing death. For this reason fish farms often exchange water with external sources to dilute the nitrogen pollutant concentration.

Nitrification is the well studied biological process in which ammonia and nitrite are converted to nitrate, a form that is far less toxic to aquatic animals. Traditional technologies including activated sludge, sand filters, RBC’s and trickling filters can reduce ammonia and nitrite concentrations to safe levels. However these solutions are costly due to being located outside the fish production ponds, having extensive energy requirements for pumping and backwashing, and requiring skilled operators.

The BioCord™ Reactor Solution

The Manit Fish Farm in Petchaburi, Thailand, in conjunction with Chulalongkorn University, came up with an innovative solution using PP-45 BioCord™ Reactors

BioCord™ was installed vertically on stainless steel frames, enclosed in a net to prevent fish interference. The frames were then installed directly into the fish production tanks. Four tanks were used, two tanks with BioCord™ already seeded with nitrifying bacteria, one tank with new, unseeded bacteria, and one tank as a control with no BioCord™. This pilot study lasted 44 days, where no water was exchanged from an external source.



Tilapia Fish Farm

Results

Parameter	Tank 1 with seeded Bio-Cord™	Tank 2 with seeded Bio-Cord™	Tank 3 with new unseeded Bio-Cord™	Tank 4 Control
Time to achieve complete nitrification	Immediately	Immediately	38 days	Never
Fish Survival Rate	100%	100%	100%	0%
Final Ammonia concentration	0.32mg/L	0.55mg/L	0.56mg/L	22mg/L
Final Nitrite Concentration	0.30mg/L	0.48mg/L	0.51mg/L	11mg/L
Final TSS concentration	2.86mg/L	5.28mg/L	2.59mg/L	160mg/L

Conclusion

BioCord™ Reactors provided a low cost, easy to install solution for nitrogen pollutants management in a fish farm production tank. The reactors can be installed already seeded with nitrification bacteria, or unseeded where the nitrification bacteria will eventually develop. BioCord™ also showed a ability to capture and treat suspended solids.