

张 正,王印庚,曹 磊,王 岚,曲江波,廖梅杰,李 彬.海水循环水养殖系统生物膜快速挂膜试验[J].农业工程学报,2012,28(15):157-162

## 海水循环水养殖系统生物膜快速挂膜试验

### Pilot-scale test for biofilm rapid formation in biofilter of recirculating mariculture system

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中文摘要:

循环水养殖系统生物膜的挂膜成熟是一个比较耗时的过程, 通常需要30~40 d。为解决这一技术瓶颈, 该文在一个大型海水循环水养殖厂的生物滤池内进行了生物膜快速挂膜的中试试验。该养殖厂循环水养殖系统有并联的生物滤池4个, 单个为跑道式2级串联结构, 总容量为800 m<sup>3</sup>, 采用毛刷状聚乙烯丝为生物载体。试验设计为预先培养水质净化菌的种子液, 制备经200目筛绢过筛后质量比为4:1的黏土和沸石粉超细颗粒混合物悬液, 然后按103 cfu/mL和5 g/L的浓度在两级滤池中分别加入4种不同水质净化菌的种子液和“黏土-沸石粉”混合物悬液, 静水充气培养8 d后, 生物载体上能够形成较为牢固的生物膜。打开循环水系统运行2 d后, 连续5 d检测生物滤池进、出水口的氨氮、硝酸盐、亚硝酸盐和COD(化学需氧量)含量, 其5 d平均消除率分别为: 52.04%、17.24%、26.82%和62.94%。结果表明, 与传统生物膜自然培养方法相比, 该文所采用的挂膜方法将海水循环水养殖系统生物膜的挂膜成熟提前了20 d以上, 起到了增速效果, 在生产上也是可行的。

英文摘要:

Biofilm formation is a time-consuming process with more than 30 days in recirculating aquaculture system. In order to improve its efficiency, a pilot scale test was performed in a seawater recirculating aquaculture farm. There were 4 shunt-wound biofilters with runway-like, two-stage structure in each one and total capacity of 800 m<sup>3</sup>. The biofilm carrier was needle-like polyethylene. Before the test beginning, high concentrated bacterial suspension and "clay + zeolite powder mixture (filtered by 200 mesh screen and mixed at w/w 4:1)" suspend solution were prepared. And then, about 200 m<sup>3</sup> wastewater flowed into the biofilter with 100 m<sup>3</sup> in each stage. After that, bacterial and "clay + zeolite powder mixture" suspension were poured into the biofilters with respective concentration of 103 cfu/mL and 5g/L. Stable biofilm can be observed on the surface of biofilm carrier after 8 days incubation with constant aeration but without water changing in the biofilters. The concentration of ammonia, nitrate, nitrite and COD (chemical oxygen demand) were measured once a day from the 11th day to the 15th day after the system running for 2 days since the 9th day. Their average removal rates reached to 52.04%, 17.24%, 26.82% and 62.94%, respectively. Comparing to traditional biofilm forming method, the method in this paper can advance the time of biofilm formation more than 20 days. Beyond this, the method is feasible to demonstrate and popularize in recirculating mariculture farm.

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