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Nitrification in Fluidized Bed Sand Filters for Use in Recirculating Aquaculture Systems
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A study was undertaken to examine the effects of pH and flowrate on nitrification in fluidized bed filters employed in recirculating aquaculture systems. To determine the effects of pH, three pH controlled bench scale recirculating systems were constructed and operated at various pH levels. A microcomputer interfaced with a data acquisition and control system controlled pH by manipulating the carbon dioxide concentration. The effects of flowrate were determined by operating the three bench scale systems, each with a different grain size, at various expansions.

The results indicated that pH was the main factor controlling the efficiency of a fluidized bed filter employed in a recirculating aquaculture system. In a pH range of 7.0-8.5, as the pH increased the residual ammonia and nitrite concentrations decreased. Below a pH of 7.5, at a nitrite loading of approximately three times the design loading, the residual nitrite concentration approached 1.2 mg-N/l, far above the accepted toxic limit of 0.5 mg-N/l. Therefore a method of pH management, such as that proposed by Allain (1988), is vital to the successful operation of a recirculating aquaculture system employing fluidized bed filters.

The results of the flowrate research indicated that the medium sand at 50% expansion provided the best overall treatment. In general, at low flowrates (less than 50% expansion), mixing constraints greatly affected the residual concentrations while at high flowrates (greater than 50% expansion) increased loss of bacteria contributed to higher residual concentrations.

Further research is need to better qualify the preference of each species of nitrifying bacteria to adhere to sand media.