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THE INFLUENCE OF OPERATING MODES ON TRICKLING FILTER PERFORMANCE

Abstract

The project C.R.O.P.® (Combined Regenerative Organic food Production) focusses on the development of a biological nutrient recycling system for long-term planetary missions. The system combines microbial trickling filters for the production of fertilizer from biowaste and hydroponic crop cultivation systems. Recent experiments tested the long-term filter performance (675 days) in degrading synthetic urine when a fed batch process is applied. The resulting data were compared to the data of an earlier 646 day experiment in which identically constructed filter units (filter media: 6 l of pumice with grain size of 1.5 – 2.5 cm, 29 l bulk liquid volume) were operated in a batch process (Bornemann et al., submitted). Nitrate production rate was used as a measure of the filter's performance, because nitrification can be considered the dominating process in microbial urine degradation. Differences in performance were observed with regard to nitrate production rates and sloughing. Nitrate production rates were higher in the fed batch experiment. In eight filters to which 1 l of urine was added per day, nitrate production averaged 2801 mg NO3-N/day; in eight filters to which 2 l of urine were added per day, 2821 mg NO3-N/day were produced. In the batch experiment the average nitrate production of 12 filters was 1506 mg NO3-N/day. In accordance with the increased nitrate production rates in the fed batch experiment and the corresponding increased biofilm thickness, sloughing occurred only during the fed batch experiment and led to decreased process stability necessitating filter restarts. For future experiments, the filter design will be changed to prevent clogging and reduce maintenance effort.