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IMPACT OF BIOFILM GROWTH IN THE MICROBIAL COMMUNITY COMPOSITION OF A SEQUENCING BATCH REACTOR

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Conventional activated sludge wastewater treatment plants (WWTP) for carbon and nutrient removal operate at high sludge retention time and, consequently, at a low food to microorganisms ratio. While the first condition is favourable for nitrifying bacteria growth, an excessive growth of certain species of filamentous bacteria often occurs in the presence of the second one. Interestingly, no problems with excessive growth of filamentous bacteria have been reported for the activated sludge process when combined with biofilm growth more than a decade ago. In this context, the present work aims to compare the microbial community composition of two sequencing batch reactors (SBRs) operating in the presence and in the absence of biofilm growth, and to correlate microbial composition with the performance of the reactors.

Two SBRs with a working volume of 1.5 L were operated in parallel with a constant cycle time of 4 h, a volume exchange ratio of 0.5 L/L and a resulting hydraulic retention time of 8 h. The duration of the individual operating phases was: 5 min fill, 225 min aerated, 5 min settle and 5 min draw. During the aerated phase airflow was applied through membrane diffusers, causing the reactor contents including the carrier bed to circulate. The SBRs were operated with synthetic water containing acetate as the only carbon source and ammonium as nitrogen source. One SBR was operated just with suspended biomass while the second one combined suspended biomass with biofilm cultivation. The biofilm was formed on a new type of polyethylene support developed by University of Minho, consisting of hollow, star-shaped, carriers with 17 mm external diameter and a height of 10 mm. The bed formed by these carriers had a specific surface area of 407 m^2/m^3, an average porosity of 0.74 and occupied 20 % of the reactor volume. Grab samples were taken and analyzed for acetate using a HPLC system. Observation of the filamentous microbial and microfauna communities was accomplished by microscope inspection at 100 to 1000X magnification, in fresh samples and after Gram and Neisser staining.

The microbial community of the SBR operating just with suspended growth was dominated by fungi micelar growth, while in the other reactor the communities were clearly more complex. The incorporation of carriers for biofilm growth in the other SBR apparently suppressed the excessive growth of fungi. Differences in the microfaunas community were also observed, the SBR operating just with suspended growth showing clearly a delay in the microfauna succession comparing to the other reactor. Despite this, acetate was completely removed in both SBRs.