UPGRATING THE EFFICIENCY OF A SEWAGE TREATMENT PLANT VIA BIOAUGMENTATION: LONG-TERM RESULTS IN A FULL-SCALE APPLICATION

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ABSTRACT

The activated sludge (AS) process is currently the most widespread method for biological wastewater treatment [1]. AS microbial consortium consists of different types of microorganisms (bacteria, fungi, yeasts, protozoa etc.), usually competing one another with regard to their growth on different pollutant substrates. On the same time, the most dominant species are not necessarily the most efficient in terms of treatment performance and biomass quality. As a result, significant problems concerning plant efficiency, as well as sludge settling and activity characteristics are often encountered in AS systems treating municipal and/ or industrial wastewater [2, 3]. On the other hand, by somewhat modifying the AS microbial community in order to include specialized strains, it is possible to improve its characteristics. This practice is widely known as *bioaugmentation* and targets to enriching the biomass with specialized microbial species, which are able to enhance its ability to successfully respond to process nuisances and prevent sludge quality abnormalities [4, 5]. The bioaugmentation technology has been applied by regularly dosing a facultative bacterial consortium in a full-scale wastewater treatment plant (WWTP), serving 8.000 population equivalent and operating as a conventional AS system with nitrification/ denitrification and chemical phosphorus removal (Doerentrup, North Rhine-Westphalia, Germany). The method application has been also accompanied with some minor modifications of the initial plant operational parameters (i.e. sludge age, sludge loading rate, level of MLSS in aeration tank) in order to ensure favorable conditions for the growth of the added bacterial strains. The application of the bioaugmentation technology after two (2) full years of plant operation resulted in significant benefits, such as: i) improvement of sludge settleability, ii) limitation of filaments, large and compact sludge flocs, iii) improved performance concerning the removal of organic material and nitrogen, iv) 25% reduction in surplus sludge production and v) 18% reduction in power consumption. In the absence of sufficient technical reports on the application of the bioaugmentation technology in full-scale WWTPs, this paper contributes to partially filling this gap in the relative research field.

KEYWORDS: Bioaugmentation, Activated sludge, Wastewater treatment, Biomass

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