## ABSTRACT

Filamentous bulking and foaming are considered the major problems in the operation of activated sludge systems (ASS), that consists of slow settling and poor compaction of solids in the clarifier causing high total suspended solid (TSS) content in the effluent with adverse impacts on process performance. The goal of the study was to present the main reasons that cause the sludge bulking and foaming in Al-Bireh Wastewater Treatment Plant (AWWTP) by analyzing the physical, chemical and biological parameters of both aeration and sedimentation tanks (1) and (2). Also the goal was to verify the process performance and sustainability of the ASS with special emphasis on process operation relationship and their implications for effluent reuse. This study was conducted to the main reasons that caused sludge bulking and foaming in AWWTP by monitoring of the sludge volume index (SVI) of both aeration tanks (1) and (2) over a period of ten months. The SPSS software was used to make ANOVA and regression analysis to differentiate between the critical parameters that are responsible for increased SVI. The decrease of the temperature, the dissolved oxygen (DO) concentration and the increase of fat, oil and grease (FOG) level and the F/M ratio were the main reasons that lead to the increase of the SVI especially in aeration tank (1).

The results showed that the bulking and foaming was mainly caused by the excessive propagation of some filamentous bacteria. The dominant

filamentous bacteria identified from mixed liquor and foam samples included a long branched form of *Nocardia, Microthrix parvicella, Type 1701, and Sphaerotilus natans*. *Microthrix parvicella,* was dominant in the cold winter and spring period while *Nocardia* was dominant in warm weather.

All filamentous bacteria identified were found in both samples that came from aeration tanks and scum throughout the study period. It is concluded that specific filamentous bacterial population in mixed liquor and foaming activated sludge was constant and not dependent on variability of seasons.