

# Abstract

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## **Assessing the Performance of IFAS Systems to Raise the Capacity of Existing WWTP**

This paper focuses on using the Integrated Fixed-film Activated Sludge (IFAS) technology to retrofit existing wwtps specially those who are apt to receiving high fluctuations in organic loads. A model was constructed in Zenien wwtp, Giza, Egypt to study three flowrates: 1.013 m<sup>3</sup>/d, 3.04 m<sup>3</sup>/d, and 6.08 m<sup>3</sup>/d with HRTs 18, 6, and 3 hours respectively to be implemented for extended aeration (AS) and IFAS systems. The results obtained from the field have then been validated using computer modeling GPS\_X which is a vital tool specifically when evaluating operating treatment plants. Results showed that the extended aeration system (AS) performed well with a HRT of 18 hours where the removal efficiency ranged from 85 – 92 % for BOD, COD, and TSS which complies with the literature except for TKN which was about 77%. However the system failed to target the acceptable removal efficiency when the HRT decreased to 6 and 3 hours where it reached a range of 57 to 72 % for the 6 hr HRT and ranged from 34 to 66 % for the 3 hour HRT. This gives a strong suggestion that the extended aeration process couldn't resist high variations in organic loads incoming flowrate. For the IFAS system used in this study, much better removal efficiencies have been achieved. For HRT 18 hr, the removal ratio was 92% for BOD, COD and TSS and was 80% for TKN, thus a higher level of performance compared to the extended aeration process. Furthermore for the 6 hour HRT, the ratio ranged from 90 to 92 % for BOD, COD, and TSS and 80 % as well for TKN and similarly for the 3 hour HRT except that the removal of TKN decreased to about 75 %. F/M values from field and modeling have been recorded and had lower values for the IFAS system compared to those obtained for the extended aeration system. Despite the promising results obtained further efforts would be recommended to thoroughly identify reliable and profound design criteria for the IFAS system as is the case with the existing conventional and extended activated sludge systems.