

# **Full-Scale Implementations of the AGAR<sup>®</sup> IFAS Process for Municipal Wastewater Treatment**

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## Introduction

Wastewater treatment plant retrofits worldwide are motivated by two main developments:

- a. Changes in effluent quality regulations, either to more stringent BOD/TSS requirements, or to include nutrient (N and P) removal
- b. Increase in flows to existing plants, due to either population growth or to expansion of sewerage systems

One process capable of giving a cost-effective solution for these two requirements is the IFAS (Integrated Fixed-film Activated Sludge) process. This process utilizes free-flowing plastic media as surface area for bio-films growth, operated within a traditional suspended-growth activated sludge system. The addition of carrier media to the activated sludge system allows treatment of increased loads as well as nutrient removal, without the need for additional tankage (both aeration basins and secondary clarifiers). Additional benefits of the system include:

- Operation of nutrient removal systems at low suspended-growth sludge ages, thereby reducing settling problems associated with long SRT nutrient removal systems
- Reduction of HRT required for CBOD removal

- Operational flexibility due to the relative simplicity of adding biomass carriers in response to growing loads

This paper summarizes preliminary operational data from two different full scale IFAS municipal wastewater treatment plants: one designed for BOD removal, and the other designed for nutrient removal.

#### Example 1: Upgrade of an aerated lagoon system for BOD Removal Only

An IFAS system was designed, constructed and is being operated for the city of Yavne, Israel. The plant treats 5,500 m<sup>3</sup>/d of municipal wastewater, to a required effluent quality of 10 mg/l BOD and 10 mg/l TSS. The upgraded plant replaces an existing aerated lagoon system, while utilizing part of the existing system. The plant configuration includes a preliminary anaerobic lagoon for flow equalization and sedimentation, fine screening, an aeration tank with a HRT of 3 hours, secondary sedimentation and gravitational sand filtration. The aeration tank is arranged as a series of 5 completely mixed tanks, without internal recycle: An initial re-aeration tank receiving settled wastewater, two fixed media tanks filled with 50% plastic carrier media, and two activated sludge tanks receiving mixed liquor. RAS from the secondary clarifiers is designed to the third tank, but can be returned to the first or second tank, or split between any of them.

Operational data from the first 6 months of operation are presented, and compared to process design data.

### Example 2: BNR retrofit for improved performance and increased capacity

The wastewater treatment plant in Monclova, Mexico, was retrofitted in order to increase treatment capacity by 50%, from some 39,000 m<sup>3</sup>/d to 58,000 m<sup>3</sup>/d. In addition, the retrofit was designed to ensure effluent ammonia levels of less than 3 mg/l and total P of less than 1 mg/l. The existing plant was an activated sludge plant with primary sedimentation, facilities for chemical precipitation, effluent filtration, and aerobic sludge treatment. The retrofit included rearrangement of the baffling in the aeration tanks and addition of biomass carriers, as well as minor hydraulic adjustments. The retrofitted aeration tanks include an initial anoxic zone, a small aerobic zone without carriers, and two consecutive aerobic zones containing biomass carriers. Nitrified mixed liquor from the final aerobic zone is recirculated to the initial anoxic zone.

During project execution, one retrofitted line was operating in parallel with an original line, producing comparative results. These, as well as operational data from the first six months of plant operation are presented, relative to process design data.

### Conclusions

Operational data from two full-scale municipal wastewater treatment plants designed and operated with the IFAS process show the process to be a stable, cost-effective alternative for both WWTP retrofits and newly designed, compact wastewater treatment plants.

Different process configurations as presented above allow implementation of BOD removal, as well as nutrient removal, with minimal interference in existing basins and little or no additional civil works.