



Headwork BIO's MBBR Technology Rehabilitates Failed Membrane Plant in Egypt

Introduction

Alexandria is the second largest city in Egypt, located on the Mediterranean coast. Its port serves approximately 80 % of the country's imports and exports. As is in a number of similar cities in the region, the continuing growth in population puts pressure on many of its resources including water for agricultural needs and the ability of existing wastewater treatment plants to keep up with the increase in flows.

In 2002, the government commissioned membrane bio reactors (MBR) to be installed as part of the treatment process at its wastewater treatment plant formerly known as the Mubarak Wastewater Treatment Plant which treats up to 4,000 m³/day of sewage. The goal was to take the wastewater being generated locally and turn it into water clean enough to reuse in agricultural applications.

Challenges

Given the strong influent containing rags and solids which typically enter the networks in this part of world, wastewater treatment processes in these countries require technologies which are robust and can withstand such high physical loads.

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Customer: General Egyptian Co. for Buildings
Industry: Municipal

Membrane systems are not appropriate in these applications. Unfortunately therefore, within a few years the membranes at the Alexandria plant began to foul, resulting in the requirement for frequent cleaning exercises using expensive and polluting chemicals, back washing, and regular membrane replacement.

KEY FACTS

- **Wastewater Flow:** 4,000 m³/day (1.06 MGD)
- **BOD₅:** Design influent 300 mg/L
Design effluent 60 mg/L
- **COD:** Final effluent 80 mg/L
- **TSS:** Influent 250 mg/L
Final effluent 50 mg/L
- **NH₃-N:** ~ 40 mg/L
- **Temperature:** 25 – 33 °C (77 – 91.4 °F)

These issues created an operational nightmare and mounting maintenance costs. The MBR system was unable to treat the total incoming flow, failed to meet the required effluent targets and, coupled with the operational headaches and high expenses, the government elected to take the plant out of service in 2009.

Solution

After nearly three years and several feasibility studies which reviewed alternative applicable technologies, Headworks BIO™ was contacted in an effort to rehabilitate the existing plant. What made the Headworks MBBR process more attractive than other competitive options was that it would totally replace the failed membranes with a complete treatment solution requiring minimal additional civil works, low operation and maintenance costs, and that the project could be handled regionally from the Company's office in Dubai.

Headworks International has always focused on providing specialized equipment and processes which differentiate themselves by being easy for operators to operate and maintain. Headworks BIO's MBBR process is no exception to this mission focus and for this reason was chosen by the client to remove the bulk organic pollutants in the Alexandrian effluent. The ActiveCell MBBR technology supplied was selected because of its reputation as the most robust, economical, and easy to operate solution available for the client's needs.



Tanks being loaded with 30 % fill fraction of ActiveCell® media

The ActiveCell MBBR process employs millions of proprietary polyethylene biofilm carriers operating in mixed motion within an aerated wastewater treatment basin. Each individual carrier increases process productivity by exponentially adding to the available surface area while

additionally providing protected surfaces to support the growth of heterotrophic and autotrophic bacteria within its cells. It is this high-density population of bacteria that achieves high-rate biodegradation within the system, while also offering process reliability and ease of operation.

Outcome

During construction, the influent flow was split into two trains with a common combined pre-treatment unit. Each train consists of an equalization tank, MBBR tank, settling tank, and sludge tank. The existing membrane basin was converted to an MBBR tank with 30 % fill fraction of ActiveCell media. All membranes and fine bubble diffusers were removed and replaced with Headworks' engineered coarse bubble diffusers. The existing membrane tank was also converted to a MBBR reactor and a secondary clarifier for separation of suspended solids.

“The installed Headworks solution provides increased capacity and improved effluent quality suitable. After several years of the plant being shut down and out of service due to failed membranes we are glad to see the plant in operation soon. The MBBR solution was attractive due to the small footprint requirement and minimal operation and maintenance.”

- Eng. Salah El-Din Abdelaaty

Project Manager at General Egyptian Company for Buildings