

Treatability of Alexandria wastewater using pure oxygen activated sludge process

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Abstract

Alexandria is the second largest city and main port of Egypt. It lies north west of the Nile Delta. Most of the collected sewage from the city is pumped to two wastewater treatment plants. Both plants are using primary treatment technology and discharge their primary treated effluents into lake Maryut. Therefore the discharges of these plants have resulted in more deterioration of the lake. In Alexandria, the population growth had also led to an increase in land cost due to rarity of land and expansion of residential areas. Accordingly, a suitable wastewater treatment technique characterized by less land requirement, less sludge production, high efficiency, and lower gaseous emissions should be considered. This study was carried out to investigate the treatability and feasibility of applying pure oxygen activated sludge process compared to air activated sludge process.

Two pilot scale activated sludge units with internal solids circulation were used. One of these units was operated with compressed air and the second was operated with pure oxygen gas. The units were fed with the primary settled effluent of the East Treatment Plant. Both units were operated at different sludge ages and detention times. At each condition, both units were evaluated. The results showed that a satisfactory effluent quality could be achieved at sludge age of 6 days and detention time ranging from 5.5 to 9 hours, and at sludge age of 6 days and detention time ranging from 2 to 3 hours for air and pure oxygen activated sludge units, respectively. The pure oxygen system produced better effluent quality at higher Food/Microorganism (F/M) ratio than that of the air unit. Pure oxygen can produce a good settling activated sludge compared with the air activated sludge system. Lower sludge quantities could be obtained for the pure oxygen system compared to the air system operated at the same sludge age. Nitrification occurred in both systems during all the applied operating conditions. The feasibility study showed that pure oxygen system is better than air system in both plants in saving the cost of land required to achieve secondary treatment, and in the cost of sludge thickening. Finally, the study ended by some recommendations which are suitable for Alexandria city.