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The influence of percentage share of municipal landfill leachates in a mixture with synthetic wastewater on the effectiveness of a treatment process with use of a membrane bioreactor

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ABSTRACT

The investigations were focused on the determination of the most favorable amount of leachates treated along with a synthetic sewage in a membrane bioreactor. The leachates percentage share was changed over a range of 3–40 vol%. COD and BOD5 of the leachates varied from 3,000 to 3,500 mg/dm^3 and from 170 to 280 mg/dm^3 respectively. The leachates were characterized by a high concentration of ammonia nitrogen (over 1,000 mg/dm^3) and low BOD_5/COD ratio (0.06 in average), which indicated their negligible susceptibility to biodegradation. The concentration of activated sludge in the membrane bioreactor was maintained within 3.5–4.0 g/dm^3, the sludge load with contaminants reached the level of 0.1 g COD/g_{DM}d while the oxygen concentration in the aeration tank was 4.0 mg O_2/dm^3. The system operated in a 12-h cycle. The degree of impurities removal was assessed analyzing changes in the following indicators: COD, BOD_5, TOC, N-NO_3^-, N-NH_4+, P_{tot}. The results revealed that the volume of leachates in the treated mixture of sewage should not exceed 10 vol%. All the tests showed a decrease in COD and BOD_5 of around 90%. The only indicator which exceeded the permissible value was nitrate nitrogen. Thus, the leachates purified by activated sludge were additionally treated by reverse osmosis.

Keywords: Membrane bioreactor; Landfill leachate; Activated sludge; Reverse osmosis

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