



## Denitrification and Ozonation Processes for Mature Landfill Leachate Treatment

Susana Cortez, Pilar Teixeira, Rosário Oliveira, Manuel Mota

*IBB-Institute for Biotechnology and Bioengineering, Centre of Biological Engineering, Universidade do Minho, Campus de Gualtar, 4710-057 Braga, Portugal*

The current problematic of leachate management in Portugal is intimately connected with the inefficiency of the systems in operation, with subsequent discharge into sewers and water streams of effluents still with high levels of contamination. More specifically, many leachate treatment or pre-treatment plants have been experiencing difficulties in the removal of nitrate ( $\text{NO}_3^-$ ).

The main objective of this work was to evaluate the removal of nitrate from a mature landfill leachate with high  $\text{NO}_3^-$  load by denitrification in an anoxic rotating biological contactor (RBC).

The anoxic lab-scale reactor was inoculated with acclimatized activated sludge and operated in a continuous mode, with a hydraulic retention time of 10 h.

Under a phosphorus-phosphate concentration of  $10 \text{ mg P-PO}_4^{3-}\cdot\text{L}^{-1}$  and nitrogen-nitrate concentrations above  $530 \text{ mg N-NO}_3^-\cdot\text{L}^{-1}$  the reactor achieved nitrogen-nitrate removal efficiencies close to 100%, without nitrite or nitrous oxide accumulation. Although the reactor presented a very good denitrification performance, the effluent carbon concentration was still above the legal discharge value.

In order to increase the biodegradability of the leachate recalcitrant carbon load, a pre-ozonation was further investigated. The pre-ozonation led to a total organic carbon (TOC) removal of 28%. The sequence of treatments, leachate ozonation followed by RBC denitrification did not affect the denitrification efficiency. In fact, it was possible to attain a denitrification rate of  $123 \text{ mg N-NO}_3^-\cdot\text{L}^{-1}\cdot\text{h}^{-1}$ . The moderate decrease in the carbon load of the final effluent indicated that some recalcitrant compounds were still present after ozonation. The anoxic RBC showed to be a promising technology for removing nitrate from landfill leachate.