Microbial oxidation of landfill methane in a biofilter

Catherine M. Fischer[1] and Marco Bichsel[2]
[1] Laboratory of microbiology, University of Neuchâtel, Emile Argand 11, case postale 2, CH-2007 Neuchâtel 7, Switzerland, tel: 032 718 2251, fax: 032 718 2230, e-mail: cmfischer@datacomm.ch (corresponding author)
[2] TDU GmbH, Konzerthallenstrasse 8, Postfach 129, CH-4513 Langendorf, Switzerland

Methane production in a landfill lasts for decades after its closure and requires continuous monitoring and abatement measures over extended periods, e.g. active extraction and flaring of the gas. The methane oxidation potential of the cover soil of landfills is now being increasingly investigated, in view of reducing the amount of methane that escapes to the atmosphere. The rates of methane oxidation measured in landfill-soil microcosms permeated with methane are the highest that have been observed to date in natural soils. Biofilters have also been suggested as a cheaper alternative to flaring for landfill gas, to degrade the malodorous or greenhouse compounds it contains, in particular for hydrogen sulphide and chlorinated hydrocarbons, generally present at low concentrations (0-1%), but also for methane, present at much higher concentrations (up to 55%). This could be particularly interesting once the methane production in a landfill has abated due to exhaustion of the substrate, so that its concentration in the gas extracted has fallen below combustible levels (<5%). The rates of methane oxidation obtained experimentally to-date may be sufficient to intercept most of the methane diffusing extensively up from the waste through the cover soil. However, they are still too low to allow for the intensive oxidation in the comparatively much smaller volume of a biofilter of methane from actively extracted landfill gas, which even in a small landfill is of the order of several m^{-3} h^{-1}.
We will present here the first results of a pilot biofilter for methane oxidation, where various techniques were tested in view of increasing the efficiency of the degradation. We will among others focus on the possibilities offered by thermophilic methanotrophs, a group whose potentialities have been little studied to date.