CONSTRUCTION OF A PILOT-SCALE METHANE DEGRADATION WINDOW AT OPERATING LANDFILL

Oksana Tsibernaja[1]
Anastasiia Sholokhova[2]
Valeriy Mykhaylenko[2]
Valdo Kuusemets[1]
Kaur-Mikk Pehme[1]
Mait Kriipsalu[1]
[1] Estonian University of Life Sciences, Estonia
[2] Taras Shevchenko National University of Kyiv, Ukraine

Abstract
A landfill is a large bioreactor, in the body of which landfill gas is generated due to anaerobic degradation of organic material. According to European legislation, the emissions of the landfill gas should be kept to a minimum. With large volumes, gas can be used for energy production, but if the collection is uneconomic, an attractive option would be to cover the landfill with a bioactive layer to degrade methane in-situ. In operational Uikala sanitary landfill, Estonia, where active gas collection system exists, it was found that uncaptured gas could be degraded in bioactive cover layer. To check whether such cover layer could be built from fine fraction from mechanical biological treatment (MBT), two experimental cells were constructed (0-20 mm and 0-40 mm fractions). The paper presents the design of experimental cells, a description of materials for construction and construction process, and preliminary results. Measurement system was installed in both cells: gas wells at eight depths and on three locations on surface. Three-level lysimeters were installed to determine water balance. Research is planned for two years with monthly gas sampling. The objective of the work is proving which of the MBT fractions, <20 or <40 mm, functions better for methane degradation. Confirmation of the methane degradation efficiency in fine MBT fraction is important not only from the ecological point of view. The use of a fine fraction as a material for methane degradation layer would reduce the cost of processing this fraction and become a good example of a circular economy since the landfill would be recultivated using its own resources.

Keywords: Landfill gas, MBT fine fraction, Methane degradation layer, Landfill cover