Environmental Engineering and Management Journal *August 2014, Vol.13, No. 8, 2063-2072*
http://omicron.ch.tuiasi.ro/EEMJ/

"Gheorghe Asachi" Technical University of Iasi, Romania

EFFECTIVENESS OF AIR TREATMENT USING A PLATE-TYPE BIOFILTER WITH A CAPILLARY SYSTEM FOR HUMIDIFICATION OF PACKING MATERIAL

Pranas Baltrėnas, Kęstutis Mačaitis*

Vilnius Gediminas Technical University, Department of Environmental Protection
11 Saulėtekio Street, Vilnius, LT-10223, Lithuania

Abstract

In this study a new generation of plate-type laboratory air treatment biofilter is applied for the removal of gaseous contaminants from air. The packing material for the biofilter consists of porous plates arranged vertically one after the other to produce a capillary humidification effect. The porous plate is made of polymer to secure the stiffness of the plate. Birch fibre granules thermally treated in a steam explosion reactor are fixed on both sides of the polymer board. The granules are covered with needle-punched nonwovens. This technology enables to improve the durability of the packing material. During the capillary effect of humidification of the packing material, moisture (bio-medium) is spontaneously rising together with the humidification of the wood fibre and needle-punched nonwovens. Therefore, this system of self-humidification does not consume additional energy, the packing material remains well humidified in case of interruption of technological processes or when power supply is discontinued for any other reasons.

This paper presents findings of the research into the effectiveness of air treatment and microbiological tests involving air contaminated with gaseous acetone, xylene and ammonia contaminants passing through the packing material. The results of the research show high air purification degrees and microbiological activity. The activity of microorganism in the packing material was 1×10^8 CFU/g on average, while air treatment effectiveness was around 91%. It was established that, with the packing material of the aforementioned composition, microorganisms are able to use such combinations as acetone, xylene and ammonia for their metabolism. Bacteria and micromycetes (fungi) were found to be most dominant in the process of destruction of contaminants. *Pseudomonas, Arthrobacter, Acinetobacter, Bacillus* were the genera most frequently identified during the research tests.

Key words: biodegradation, biofilter, capillary, microorganisms, packing material, porosity

Received: February, 2014; Revised final: August, 2014; Accepted: August, 2014

* Author to whom all correspondence should be addressed: e-mail: kestutis.macaitis@vgtu.lt