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SOLVENT EMISSIONS CONTROLLED BY BIOREACTOR

Marcello Civilini[*1], Giovanni Cortella[2]

[1]Dipartimento di Scienze degli Alimenti, University of Udine, Udine, Italy; [2]Dipartimento di Ingegneria Elettrica, Gestionale e Meccanica, University of Udine, Udine, Italy

Abstract

A biofilter with a working volume of 25 m^3 and a max capacity to treat 16000 m^3/h of exhausted air was built two years ago to treat emissions containing solvents used during the varnishing of unfinished items of the wood-working industry. The biofilter was fed with polluted air from the drying zone emissions, because their relatively steady and high concentration were advantageous to our studies

After some months for optimization, the biofiltration of polluted emissions was monitored during different seasons and the behaviour was correlated with temperature and the industrial painting procedures.

The biofilter treated 4000-6000 m^3/h of polluted air; the resulting Empty Bed Residence Time ranged between 10 and 70 s. Organic loads of VOCs during the observed period were between 10 and 110 g C $m^{-3}h^{-1}$. The performance of the biofilter showed to be influenced by different conditions. To maintain emissions below the permissible threshold (100 mg C Nm^{-3}), particular managing procedures were adopted especially during low temperature (first) periods.

During the process, the microbial heterotrophic viable counts were performed from samples of the biofilter organic matter and internal recirculation water used to adjust the moisture content. The relative numbers of single VOC degraders were tracked and their value showed to be suitable even in the presence of VOC concentrations or air temperature harsh conditions.

Environmental and safety rules require continuous monitoring to determine the yield. A thorough control of emissions from plants and their reduction by filtration requires a continuous or very frequent measurement of VOC concentration. Various methods for VOC detection can be applied, with different ability to deal with quick variations in composition and concentration which can be encountered and actually lead to a misleading interpretation of the results. For the purpose of comparing some of such methods, for about two years the behaviour of the biofilter pilot plant has been monitored by on line Photo-Ionization Detector (PID) analyzer and Gas Chromatography analyzer with Flame Ionization Detector (FID), and by discontinuous sampling with sorbent tubes. The comparison of 27 FID measurements and 34 PID measurements with the corresponding analysis of samples resulted in the evaluation of response factors for various mixture. A marked unpredictability of such factors showed that on line measurements fit for the only purpose of a rough control of the operation, while discontinuous sampling is required for an accurate evaluation of the biofilter performance.