Start-up evaluation of a peat biofilter treating waste gas contaminated with ethyl acetate by using two strategies: without inoculation and with inoculation

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The increasingly restrictive environmental regulations related to emissions of volatile organic compounds (VOCs) from industrial sources have lead to require treatment technologies. Among these ones, the vapour-phase biotechnologies, including biofilters, have been classified as best available technologies (BATs) for the reduction of these emissions in the chemical sector by the European IPPC Bureau [1]. Biofilters work by passing polluted air through a packed bed on which a pollutant-degrading biofilm develops [2]. The peat presents some advantages over other packing materials, such as the presence of indigenous microorganism and nutrients. However, if the pollutant is not a quite readily biodegradable compound, such as hydrogen sulfide, inoculation of specialized microorganism may become necessary [3]. The development of a specific microbial adapted to the pollutants by using an activated sludge from waste water treatment plant has been a satisfactory procedure previously used [4].

This study was performed to investigate the start-up of a peat biofilter to treat waste gas contaminated with ethyl acetate by using two strategies, evaluating the transient time to achieve optimal performance. The two used strategies are: (a) biofilter start-up without using specific inoculum, being the only present microorganisms in the system the indigenous biomass of the peat; and (b) biofilter start-up by using a specific inoculum obtained from an activated sludge coming from a waste water treatment plant. The biofilter were operated for a

total period of 36 days, the first 20 days with the strategy (a) and the last 16 days with the strategy (b). The empty bed residence time (EBRT) and the instantaneous inlet load (IL) were fixed at 90 s and 40 g m^{-3} h^{-1}, respectively, corresponding to an inlet concentration of 1.0 g m^{-3}.

The performance of the biofilter showed an overall removal efficiency value of 40% when the reactor was start-up without inoculum. However, removal efficiencies greater than 95% were obtained when a specific inoculum was used. Therefore, the use of a specific inoculum presents operational advantages, such as the start-up time minimization.

References

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