

A Preliminary End-Point Approach for Calculating Odorous Emissions in Life Cycle Assessment

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Abstract : Waste treatment and many production processes cause significant emissions of odors, thus typically leading to intense debate. The introduction of odorimetric units and their units of measurement, i.e., U.O. / m³, with the European regulation UE 13725 of 2003 designates the dynamic olfactometry as the official method for odorimetric analysis. Italy has filled the pre-existing legislative gap on the regulation of odorous emissions only recently, by introducing the Legislative Decree n°183 in 2017. The concentration of the odor to which a perceptive response occurs to 50% of the panel corresponds to the odorimetric unit of the sample under examination (1 U.O. / m³) and is equal to the threshold of perceptibility of the substance (O.T.). In particular, the treatment of Municipal Solid Waste (MSW) by Mechanical-Biological Treatment (MBT) plants produces odorous emissions, typically generated by aerobic procedures, potentially leading to significant environmental burdens. The quantification of odorous emissions represents a challenge within a LCA study since primary data are often missing. The aim of this study is to present the preliminary findings of an ongoing study whose aim is to identify and quantify odor emissions from the Tre Monti MBT plant, located in Imola (Bologna, Italy). Particularly, the issues faced with odor emissions in the present work are: i) the identification of the components of the gaseous mixture, whose total quantification in terms of odorimetric units is known, ii) the distribution of the total odorimetric units among the single substances identified and iii) the quantification of the mass emitted for each substance. The environmental analysis was carried out on the basis of the amount of emitted substance. The calculation method IMPact Assessment of Chemical Toxics (IMPACT) 2002+ has been modified since the original one does not take into account indoor emissions. Characterization factors were obtained by adopting a preliminary method in order to calculate indoor human effects. The impact and damage assessments were performed without the identification of new categories, thus in accordance with the categories of the selected calculation method. The results show that the damage associated to odorous emissions is the 0.24% of the total damage, and the most affected damage category is Human Health, mainly as a consequence of ammonia emission (86.06%). In conclusion, this preliminary approach allowed identifying and quantifying the substances responsible for the odour impact, in order to attribute them the relative damage on human health as well as ecosystem quality.

Keywords : life cycle assessment, municipal solid waste, odorous emissions, waste treatment

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