Marketable high-performance compact technologies for the abatement of VOCs in EU waste treatment plants, decreasing CO_2 emissions and energy consumption- LIFE ABATE (LIFE22-ENV-EN-EN-LIFE-ABATE/101113838)

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ABSTRACT

In 2017, 570 mechanical biological treatment (MBT) plants were operating in the EU. It is expected that by 2025 the number of installations will increase to 690, with a total expected emission of 3,900,000 t/year of volatile organic compounds other than methane (NMCOV). In addition, 2,926,000 tonnes of CO_2 were emitted in the waste management sector in 2020. The treatment of VOCs in MBT plants is carried out either by means of a biofiltration system or by thermal oxidation (TO), which requires a large surface area and high energy consumption in the first case, due to high air flow rates, and high energy costs in the case of TO. This implies a high carbon footprint.

The European project LIFE ABATE (LIFE22-ENV-ES-LIFE-ABATE/101113838) aims to significantly reduce VOC emissions, odour impact, energy requirements (saving natural gas and electricity) and operating costs of MBT plants. To achieve this, the project proposes two solutions: the first consists of the pre-concentration of air flows with low concentrations of VOCs (as is the case of pre-treatment buildings) by means of zeolites arranged in a rotoconcentrator followed by a TO; and the second, the pre-concentration of air streams with low concentrations of VOCs also in zeolites arranged in a rotoconcentrator, but in this case with the subsequent supply of the concentrated VOCs to a biological treatment through a two-phase biotrickling filter (aqueous/oil). The LIFE ABATE technical solution will be validated at industrial scale at the Ecoparc de Sant Adrià (Barcelona) for one year and replicated at the organic matter management plant in Las Dehesas (Madrid) (Figure 1).

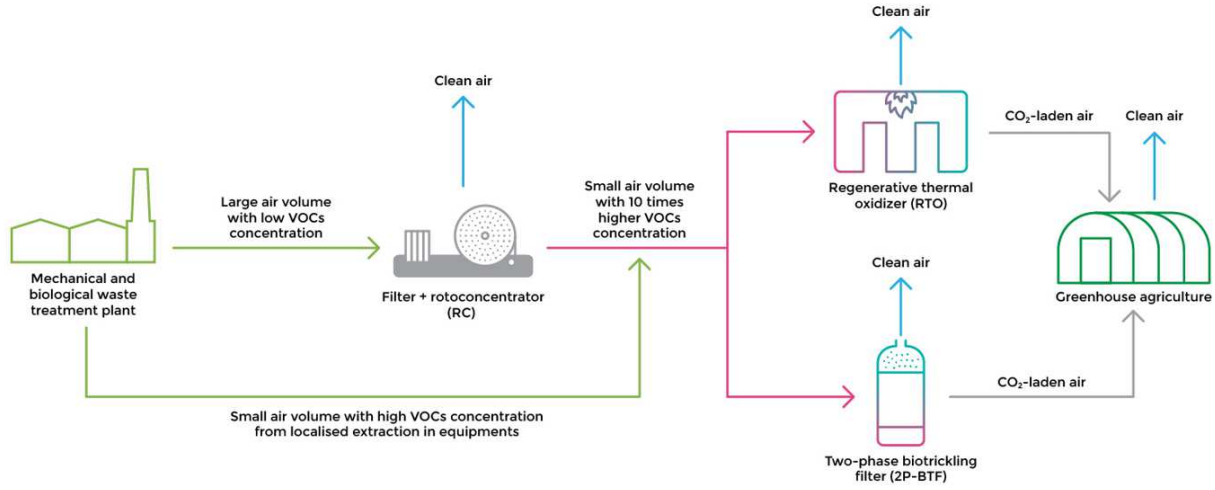

Figure 1. Diagram of the Life ABATE pilot at Ecoparc 3 (Sant Adrià-Barcelona)

The zeolite rotoconcentrator has traditionally been applied to concentrate specific industrial VOC emissions. This project will, for the first time, apply the technology to manage gaseous emissions containing a wide spectrum of VOCs. The demonstration plant will treat 20,000 m^3/h of real air from a waste management plant. To close the

cycle, the CO_2 generated in the VOC treatment process will be recovered in a greenhouse to promote crop growth, preventing it from being emitted into the atmosphere. The final manuscript will present the preliminary results of the characterizations of the air to be treated at Ecoparc3 in Barcelona and the specific selection of zeolites that has been carried out for the VOC spectrum characteristic of waste treatment processes.