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ABSTRACT

AN AUTOMATED AND SELF-MOVING PROTOTYPE FOR GHGs EMISSION AND AERATION EFFICIENCY ASSESSMENT IN WRRFs

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Water Resources Recovery Facilities (WRRFs) are a source of direct and indirect greenhouse gases (GHGs) emissions, such as CO_2, CH_4 and N_2O. Direct emissions originate from biological processes, while indirect emissions are mainly associated with the energy consumed by the treatment section. Aeration of the biological tanks is the major responsible for indirect GHGs emission, and thus increasing WFFR aeration efficiency can help to reduce indirect emissions. However, the trade-off between efficient aeration and N_2O emission must be carefully monitored due to the high Global Warning Potential of N_2O gas. Moreover, as the global demand for water is expected to grow in the future, new approaches to wastewater treatment and management will become necessary in order to contain energy consumptions. New strategies for evaluating GHGs emission and the WRRFs carbon footprint are being implemented in the framework of wastewater treatment in order to optimize treatment steps and reduce energy requirements. In this context, the LESSWATT project (LIFE16 ENV/IT/000486), co-financed by the European Union, was born. The project output consists of an innovative instrument (LESSDRONE) and a new protocol for converting LESSDRONE measures in actions aimed at reducing energy consumption and GHGs emission of the aerobic compartments of a WRRF. The LESSDRONE is an automated and self-moving device that moves on the surface of a biological oxidation tank and is able to capture the off-gas. The latter passes through the sampling circuit of the floating hood, equipped with sensors for the measurement of CO_2, CH_4, N_2O, O_2, humidity, temperature, pressure and air velocity. A dissolved oxygen measurement probe is also present. Moreover, it is possible to collect the off-gas through tedlar (or nalophan) sampling bags to measure, subsequently, odour and VOC. The main parameters calculated by the instrument are the oxygen transfer efficiency, the off-gas airflow and the aforementioned GHGs concentrations. The new tool has been fine-tuned in a large WRRF in Tuscany (Italy), that treats tannery and municipal wastewater. Tests that are currently carried out in other 5 European WRRFs, with different characteristics in terms of treatment trains and loads, will allow to validate the tool and make it applicable in a wide range of situations. Based on the results obtained for different airflow rates in the tank, it is possible to identify the optimal process conditions for the WRRF and to evaluate the most influencing parameters for the transfer efficiency and the GHGs emission (included odour and VOC).

Indicate preference of kind of presentation

- ¤ Oral Communication
- ☐ Poster

Indicate topic of your work for the conference:

- ☐ Policy and associated regulations for odour and air quality.
- ☐ Odour/VOC measurement, monitoring&sensor technologies.
- ☐ Odour/VOC perception, impact, formation and dispersion.
- ☐ GHG emissions particulate matter and industrial emissions.
- ☐ Source characterization and odour/VOC mapping.
- ☐ Odour/VOC abatement, mitigation and neutralization.
- ¤ Odour/VOC from waste water, sewer systems and livestock.
- ☐ Air emissions and sustainable solutions for waste handling
- ☐ Community engagement, social media and citizen action.
- ¤ Other (suggest a new topic): GHGs, VOC and odour monitoring in WRRFs

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