

Direct gas emissions in urban sewer networks. Case study of two climatic regions

Friday, 10th July 11.00 - ISIE 2015

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Direct gas emissions from wastewater collection and treatment systems have become a topic of increasing interest, given their contribution to the urban carbon footprint, as well as, to the problems associated to odours. Most studies have focused on wastewater treatment plants (WWTPs), disregarding the significant role of sewer networks in the production of N₂O, CH₄ and H₂S. Sewer networks can be considered biological reactors due to their hydraulic retention time (HRT) and operating conditions in terms of anaerobic, anoxic and aerobic environments.

After a careful analysis of the state of the art about quantification of sewer emissions, we attempt to address some of the research gaps identified by presenting the results obtained from several sampling campaigns in two Spanish cities. The cities are from different climate regions and were selected in the framework of the LIFE Aquaenvic project (LIFE10/ENV/ES/520): Calafell (Catalonia, Mediterranean climate) and Betanzos (Galicia, Atlantic climate). Sampling campaigns were performed during summer and winter. Five sewer sites were gas monitored with a sounding line and a closed chamber during one hour: manholes, wet wells before pumping stations and influent of the WWTPs.

In general, higher concentrations were found in summer than in winter, and also higher in Calafell than in Betanzos. Therefore, the results indicate that high temperatures favours gas production. Concentrations up to 316. 7 µg L⁻¹ of methane, 18. 3 µg L⁻¹ of nitrous oxide and 3. 4 µg L⁻¹ of H₂S were measured in Calafell during summer. The direct emissions contribution was estimated using Life Cycle Assessment (ISO 2006), and emission factors of 0. 01 and 0. 06 kg of CO₂eq. person⁻¹ year⁻¹ in Calafell and Betanzos, respectively were obtained for the influent to WWTP in each city. These values highlight that the contribution of direct emissions in sewers to overall gas emissions from wastewater systems is

significant. Direct emissions can represent up to 4% of the operation impacts in sewers. We believe that the direct emissions from sewers are significant enough to warrant their inclusion in urban metabolism studies, especially those focused on the urban water cycle for the sustainable development of cities.