ASSESSMENT AND REDUCTION OF ODOUR AND GREENHOUSE GAS EMISSIONS FROM MEDITERRANEAN SEWERS

THE CHALLENGE

Sewers systems are a very important source of hydrogen sulfide ($H_2S$) and methane ($CH_4$) compounds, which are respectively odorous ($H_2S$), corrosive ($H_2S$) and contribute to global warming ($CH_4$). Both compounds are generated from sewer biological activities and are expected to increase due to constant expansion of the sanitary wastewater collection. In the Mediterranean context, $H_2S$ and $CH_4$ emissions from sewers are yet to be considered in the integral management of Urban Water Systems despite the impacts at local and global scale. Wastewater industry is facing the critical challenge of operating at the highest treatment standards and simultaneously reduce its carbon-footprint to achieve greenhouse gas neutral operation.

THE PROJECT

The aim of the project is to identify the extent of sulfide and methane emissions from characteristic Mediterranean sewers and to design and apply best control strategies for the cases studied. To achieve this aim, the project has:

- Performed sampling campaigns at wastewater collections systems in the coastal area of Girona, L’Escala sewer and Sant Pere Pescador sewer system.
- Established the production and emissions of sulfide and methane from both systems.
- Simulated the functioning of the sewer system in the advanced model of sewer systems.
- Proposed the optimal functioning strategies to the sewer operators.

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BENEFITS

- The project performed the most accurate assessment for detrimental sulfide and methane emissions for both sewer systems.
- The combination of the comprehensive sampling campaigns and advanced modelling allowed establishing the optimal control strategies with regards the sulfide and methane.
- The project produced a simultaneous reduction of emissions and a reduction in the cost of chemicals used, ensuring savings to local water utilities.

RESULTS

- Simultaneous and significant emissions of sulfide and methane were detected in l’Escala sewer system especially at the inlet of the wastewater treatment plant. On the other hand, the Sant Pere Pescador system showed only sulfide emissions and no methane was detected.
- Despite the lower population serviced in Sant Pere Pescador when compared to l’Escala, (2000 inhabitants vs 7000 inhabitants), sulfide emissions from the small community were in the same order of magnitude than the bigger town due to the higher distance the wastewater needs to be pushed to reach the WWTP.

Figure I: Location of the l’Escala and Sant Pere Pescador UWS with monitoring locations.

- Control of detrimental emissions was carried out by the dosage Nitrate into the sewer networks. The dosing patterns and locations have been studied and optimized. Thus a reduction of sulfide and methane emissions at hot-spots was achieved simultaneously to a reduction in the cost of chemicals, higher than 50% of was dosed by default by the local water utility.

Figure III: 24h typical profiles of the dissolved H2S concentration at the inlet of the WWTP. Black line: wastewater coming from Sant Pere Pescador; Grey line: wastewater coming from l’Escala.

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Figure III: Example of 24h typical profiles of the H2S concentration in the gas phase at the inlet of the WWTP. A, B and C depict different location showed in Fig 1 of nitrate dosage for sulfide control.