

PROJECT OUTLINE

Project Title

Evaluation of adsorption based odour abatement processes

PhD Supervisor

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Project Summary

Odorous emissions from wastewater processes can provoke an array of community reactions, frequently becoming a cause of public environmental discomfort and contribute significantly to community annoyance in terms of air quality complaints. Due to poor process design adsorption based odour abatement process (such as activated carbon) often fail before the recommended design life. The impact of environmental and operational factors on the performance of adsorption based systems will be evaluated using a combination of chemical and olfactory techniques.

Background

Most odour abatement systems are conventionally designed on the use of one key odorants, H₂S to determine the loading capacity for the system with some secondary odorants such as VOCs and / or volatile organo-sulfur compounds (VOSCs) been used in limited applications. This approach of using a one odour markers doesn't adequately account for the actual composition and individual concentrations that vary over time and rank the emission differences in terms of odorant removal (i.e. receptor impact) and abatement loading due to chemical saturation

Adsorption based odour abatement systems such as activated carbon filters or beds are one of the most common techniques used to remove odours in wastewater processes. Due to poor activated carbon filter design, odour breakthrough has been found to occur well before the recommended design life is reached. Several possible explanations have been given for such low performance. These include (i) the high moisture content of the odorous air that causes capillary condensation in the carbon, and (ii) the presence of low polarity non-odorous, gases such as methane, and other short chain alkanes that compete with higher polarity odorous compounds for adsorption sites or displace already adsorbed odorous compounds. However, it is unknown to what extent these factors affect the performance of activated carbon filters.

Project Objectives

1. Investigate the removal of odorants and VOCs in adsorption based odour abatement.
2. Investigate the impact of operational conditions on the treatment performance.
3. Develop a database of the removal of odorants and VOC for different adsorbent materials.

Project Methodology

A combination of chemical and olfactory techniques will be used to acquire detailed data on the removal of odorants and VOCs for adsorption based odour abatement processes. A novel adsorbent testing protocol will be developed to support future process selection and design with life cycle analysis being used to evaluate overall adsorbent performance of the adsorbent in term of material sustainability.

The project will involve laboratory and field-based experimentation as well as the statistical and chemometric analysis of parameters used to optimise the performance of adsorption based odour abatement systems. It is anticipated that different adsorption materials will be assessed during experimental program to evaluate the removal of H₂S and VOCs for different carbon compositions.

Project Outcomes

The intended outcome of this research will be to contribute to:

- Improve the selection and design of adsorption based odour abatement processes commonly applied in odour management
- Establish a database on the fate of odorants and VOCs removal for different adsorption based configurations.

Further Information on the project may be obtained from Prof Richard Stuetz (email: r.stuetz@unsw.edu.au). Applications (including a cover letter, academic transcript and CV) should be submitted to Prof Stuetz, UNSW Water Research Centre, University of New South Wales, Sydney NSW 2052.