Sensitivity and uncertainty analysis of an integrated membrane bioreactor model

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ABSTRACT

Sensitivity and uncertainty analysis, although can be of primarily importance in mathematical modelling approaches, are scarcely applied in the field of membrane bioreactor (MBR). An integrated mathematical model for MBR is applied with the final aim to pin down sources of uncertainty in MBR modelling. The uncertainty analysis has been performed combining global sensitivity analysis (GSA) with the generalized likelihood uncertainty estimation (GLUE). The model and methodology were applied to a University Cape Town pilot plant. Results show that the complexity of the modelled processes and the propagation effect from the influent to the effluent increase the uncertainty of the model prediction. It was found that the uncertainty of nitrogen and phosphorus model outputs increases from the first reactor-section plant to the last. Results show also that the GSA-GLUE methodology is a valid tool for uncertainty assessment for MBR modelling. Furthermore, the GSA-GLUE allows to identify the most critical processes/plant sections and the key sources of uncertainty where attention should be paid in view of model predictions improvement.

Keywords: Uncertainty analysis; Wastewater modelling; Global sensitivity analysis; Membrane bioreactors

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