



Technology integration for removal of organic pollutants from saline water

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Motivation

Two third of the fresh water produced in Netherlands is used by industry and ends up as wastewater, often rich in inorganic salts and containing a complex mixture of organic compounds. The presence of salts limits biological treatment.

Within the Water Nexus project, a new treatment scenario is proposed based on a wetland for removal of organics, combined with electrochemical oxidation (EO) and membrane treatment for recalcitrant compounds and plant-microbial desalination cells (PMDC) for desalination.

This project focusses on the integration of EO within this concept.

In the EO process, electrons are transferred from organic compound to the electrode using electrical energy. In this process, in-situ generated strong oxidizing species can degrade a wide variety of compounds. EO does not need the input of chemicals and can run at normal temperature and pressure. Moreover, this robust technology has the ability to withstand the variation of incoming wastewater quality and quantity.

However, still, the EO process is not a standalone alternative for wastewater treatment due to high costs, and toxic by-product formation. Hence, optimization and integration of EO with other technologies is required. Integration of EO process with a membrane process concentrating the organics is suitable when organic chemical are present at a very low concentration where EO is not feasible due to mass transfer

limitation. Moreover, the EO of chloride containing wastewater generates perchlorate (ClO_4^-) and active chlorine, which reacts with an organic compound forming highly toxic Absorbable Organic Halide compounds (AOX). In this case, using Plant-microbial Desalination Cell (PMDC) before the EO process is useful.

Technological challenge

The challenge of this research is to optimization of the EO process in saline water in order to reduce the cost and by-product formation, and to develop case specific technology integration scenarios including membranes and PMDC for application of the EO process.

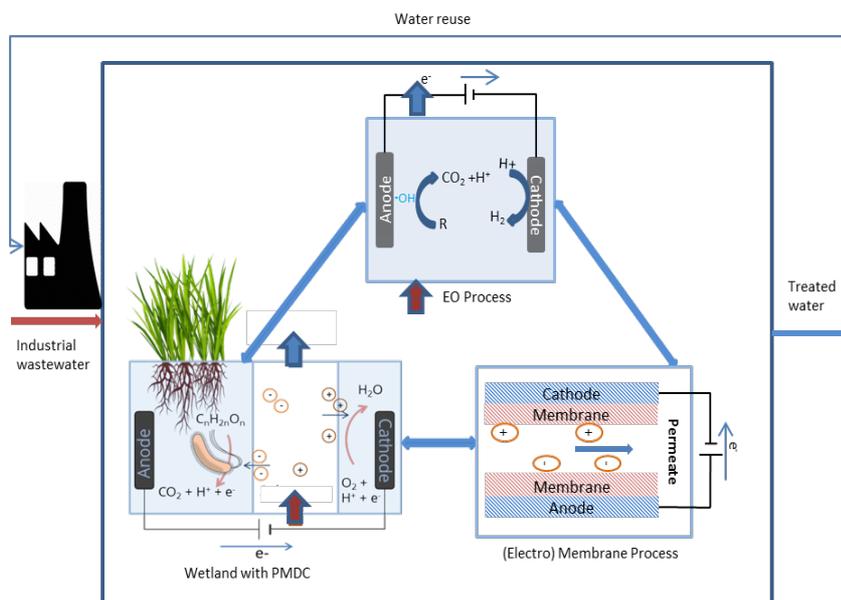


Figure: Approach for technology integration for wastewater treatment



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