lower additional energy consumption is the fertilizer drawn FO (FDFO) process using fertilisers as DS in which the diluted DS containing fertiliser nutrients can be used as non-potable water for irrigation of crops.

A 1000–4000 L/d capacity pilot-scale FDFO-NF desalination system was recently operated and tested at centennial coal mine site at Newtan Colliary, Fassifern, New South Wales for the desalination of saline water for about six months [4]. Based on the long-term pilot-scale operation in the field, it was observed that the FDFO-NF hybrid system could be a robust desalination technology in producing nutrient rich water for irrigation with the potential to support farming industry around the coal mining area. FDFO-NF hybrid desalination technology is a relatively new technology and hence, the economic and environmental life cycle assessment (LCA) of the technology needs to be conducted for the FDFO-NF system to investigate not only the hot-spots of improving the whole process operation but also to understand the sustainability and economic viability of this new technology for commercial applications. The main objective of this work is to conduct an environmental impact assessment of the FDFO-NF hybrid system and compare with the two different conventional reverse osmosis (RO) hybrid scenarios for the desalination of mine impaired saline groundwater. Conventional RO hybrid systems include where microfiltration (MF) and ultrafiltration (UF) process are used each as a pre-treatment process before RO and are termed here as MF-RO and UF-RO hybrid system, respectively. The environmental impact assessment also aims to identify the major hot-spots that are responsible for the economic and environmental impacts including chemical consumptions for membrane cleaning, materials consumed for membrane replacement and energy consumption during process operation. This study is therefore the first to conduct a detail economic and environmental analysis of the FDFO-NF hybrid process for fertigation. An economic assessment in this study considered annual operational expenditure (OPEX) that includes three cost components: electricity (energy) cost, membrane replacement cost, and cost of chemicals for membrane cleaning. A standard LCA was considered which generally consists of 4 stages; goal and scope definitions, life cycle inventory analysis (LCI), life cycle impact assessment, and interpretation.

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Optimisation analysis of reverse electrodialysis systems for power production from concentrated brines

Fabio Santoro[a], Michele Tedesco[b], Andrea Cipollina[a]*, Alessandro Tamburini[a], I. David L. Bogle[c], Giorgio Micale[a]

[a] *Dipartimento di Ingegneria Chimica, Gestionale, Informatica, Meccanica (DICGIM), Università di Palermo (UNIPA) – viale delle Scienze Ed.6, 90128 Palermo, Italy.*
**Corresponding author: andrea.cipollina@unipa.it*
[b] *Wetsus, European Centre of Excellence for Sustainable Water Technology, Oostergoweg 9, 8911 MA Leeuwarden, The Netherlands*
[c] *Centre for Process Systems Engineering, Department of Chemical Engineering, UCL (University College London), London WC1E 7JE, UK*

Reverse electrodialysis (RED) is rapidly growing as technology to produce electric energy by mixing saline solutions with different salinity. Recent developments have shown promising results on real site installations, demonstrating the feasibility of the RED process on the pilot scale. Therefore, further modelling efforts are now needed to optimise the technology, in order to enhance the performance.

In this work, an optimisation study for the RED process is presented, taking into account saline

waters and concentrated brine as feed streams. The model, which is developed within GAMS environment, predicts the optimal set of process variables that maximise the process yield, as well as the gross and net power density. The influence of various site-dependent parameters are investigated, identifying the optimal operating conditions for different feed streams.

The model shows that different optimal operating conditions can be identified, according to the specific conditions of the feeds and the target of the process. In particular, lower fluid velocities are preferable to maximize the net power density, while larger stack size leads to higher process yields. Finally, optimal stack designs are discussed, showing the effect of different technological strategies on the large-scale power production.

Keywords: Salinity gradient power; Process optimisation; Ion exchange membrane; GAMS; Electrodialysis; Brine recovery.

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Influence of polyaniline water-soluble on the electrochemical and corrosion behaviors of lead-acid battery

Naima Boudieb*, Moussa Bounoughaz**

University M'Hamed Bougara-UMBB-Boumerdes, Faculty of Science,
Laboratory of Polymers Treatment and Forming; Avenue of Independence –Boumedes- 35000- Algeria
Email: naima741963@yahoo.fr Email: moussa_bounoughaz@yahoo.fr***

The effect of polyaniline water-soluble on the lead alloy electrode was performed in order to improve the stability of the lead acid current collector and to protect the collector against corrosion which aims to increase the life of the battery.

In this work, polyaniline used were synthesized using chemical methods and has been carefully investigated and his role in the formation of the passive layer has been elucidated. Corrosion studies have demonstrated the efficiency of polyaniline for use as current collector of the positive PbO_2 electrode in lead-acid battery.

The effect of polyaniline water-soluble on the electrochemical behavior of the current collectors were evaluated by electrochemical techniques: cyclic voltammetry, electrochemical impedance spectroscopy (EIS). Instead a mixed layer consisting of lead oxide, lead sulfate, polyaniline and its degradation products (quinone species) is produced. The performance of this mixed layer as anticorrosion layer was determined from polarization curves (Tafel plot) recorded in aqueous 0.5 M H_2SO_4.

Long-terme cycling was performed by cyclic voltammetry between potential sweep domain -1 to 0.6V/ S.C.E in 0.5 M H_2SO_4 media. It was found that the use of polyaniline water-soluble in 0.5M H_2SO_4 yielded a coating with good anticorrosion proprieties. The voltammetric charge corresponding to the oxidation of lead sulfate to PbO_2 and to $PbSO_4$ is decreased by 60% for the electrode in the presence of polyaniline compared to the lead electrode without polyaniline in solution.