

Performance analysis of the first Reverse Electrodialysis prototype plant operating with natural brackish water and salt pond brine

*Michele Tedesco**, Andrea Cipollina, Alessandro Tamburini, Giorgio Micale

*Dipartimento di Ingegneria Chimica, Gestionale, Informatica, Meccanica (DICGIM), Università di Palermo (UNIPA) – viale delle Scienze Ed.6, 90128 Palermo, Italy. *e-mail: michele.tedesco@unipa.it*

Abstract

Reverse Electrodialysis (RED) has gained a strong interest among the salinity gradient energy technologies during the last years. Recently, notable improvements have been reached in terms of membranes and stack performances using artificial solutions. However, the use of real saline solutions strongly affects the process performance, requiring additional R&D efforts for a successful scale-up of such technology.

This work focuses on the experimental campaign performed on the first RED prototype plant fed with real brackish water and saltworks brine. The plant is located within the Ettore e Inversa saltworks in Marsala (TP, South of Italy). It is the final accomplishment of the REAPower project (www.reapower.eu). A RED unit equipped with 125 cell pairs and 44x44 cm² membrane area was tested for the first time, using brackish water (conductivity equivalent to a 0.03 mol/l NaCl solution) and saturated brine from saltworks (conductivity equivalent to a 4 mol/l NaCl solution) as feed streams. The process performance was monitored in terms of pressure drops, main electrical variables and power production in a relatively long period of operation.

Keywords

Salinity Gradient Power; RED; brackish water; brine; ion exchange membrane.