F) Control and user interface
⇒ The remote monitoring and control software is in the process of being implemented in the system to offer the possibility to transfer data via GSM from all parts of the world.

For the first field test a salted well in the desert of Somaliland was selected. The PV powered pilot plant was installed in May 2018 at the site in the village Beeyo Gulan to collect data from the operation under the Somali sun.

The presentation will give an insight into the technology used, the performance of the first pilot run in the field and the experiences collected during the preparation and operation of the field test.

Also information will be provided on the plans and progress for the other pilot units that will be tested under real conditions in Asia and Africa within the REvivED water project.

Keywords: Desalination, Electrodialysis, PV power, Stand-alone, Brackish water

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EU Disclaimer

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Fluid-structure interaction in electromembrane processes: modelling of membrane deformation, fluid dynamics and mass transfer

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In recent years, water and energy supply issues have boosted a noticeable interest in the scientific community on electromembrane processes such as electrodialysis and reverse electrodialysis. In order to gain an important place in the industrial market, technological challenges on various aspects are involved for the optimization of these processes. In this context, profiled membranes exhibit interesting performances and offer countless geometric alternatives. However, the mechanical behavior of the membranes and its interaction with fluid dynamics has been poorly investigated so far.

In membrane-based processes, a trans-membrane pressure (P_{tm}) between the different solutions flowing through a module may be a design feature or may arise for various reasons, including flow arrangement and differences in physical properties, flow rate or friction coefficient. This leads to local deformations of membranes and channels, affecting flow and mass transfer characteristics, thus causing uneven distributions of flow and mass fluxes, which worsen the process performance.

In this work, we developed an integrated model for the numerical simulation of local mechanical deformations and of fluid dynamics and associated mass transport phenomena inside deformed channels. Two diverse profiled membrane types ("overlapped cross filaments", OCF, and "round

pillars", RP) were simulated under conditions representative of (reverse) electrodialysis and under the assumption of perfectly elastic behaviour. 3-D simulations of a couple of membranes and of the interposed fluid were conducted by the unit cell approach (periodic domain). *The Ansys Mechanical 18 (Workbench)* and the *Ansys CFX 18* software was used.

The selected geometries were simulated under P_{tm} ranging from -0.4 to +0.4 bar, computing expanded and compressed configurations. Then, CFD simulations of the deformed channels were performed, showing significant effects of the deformation on fluid flow and mass transfer. The influence of P_{tm} was to increase friction under compression conditions (up to ~2.2-2.5 times) and to reduce it under expansion conditions (but to a lesser extent, i.e. up to ~50-60%). Overall, compression enhanced mass transfer and expansion reduced it, but with smaller and more complex effects than on friction. The influence of the flow attack angle was negligible for friction, but more significant for mass transfer.

In future works the same simulation approach will be adopted in order to compute also the Ohmic resistance in deformed configurations. The simulation results will be implemented in the form of correlations into higher-scale models, in order to study distributions of flow, mass transfer and Ohmic resistance in whole channels. The method proposed can be extended to other membrane applications with minor modifications.

Keywords: Ion exchange membrane; Electrodialysis; Reverse electrodialysis; Membrane deflection; Fluid-structure interaction; CFD.

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New innovative thermal system for improving the performance of HCPV cell and its application in solar desalination system

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High concentrating solar cells technology is one of state of the art solar energy technologies, which recorded an electrical conversion efficiency up to 43%. The high concentration photovoltaic