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# Simulation of the spiral wound RO membranes deformation under operating conditions

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**ABSTRACT**

A mathematical model for the simulation of the deformation of the spiral wound reverse osmosis (RO) membranes in real operating conditions for seawater was developed. A simple analytical equation for the trans-membrane pressure was used and a mathematical procedure was applied to determine the membrane compactions. The derived mathematical model can be considered as a tool to give a detailed picture of the membrane deformation in real operating conditions, in order to relate the membrane compaction with the water flux decline. The estimation of the 2D compaction is based on the modeling of the composite membrane using the theory of a plate on an elastic substrate. Results indicated that the compaction of both composite membrane layers is varying smoothly along the membrane surface. The maximum compaction of the active bi-material polyamide-polysulfone on top of the membrane is located at the point $(x, y) = (0 \text{ cm}, 117 \text{ cm})$ having value $w_{1max} \approx 0.1$ μm while the maximum compaction of polyester sub-layer is $w_{2max} \approx 16$ μm taking place at the interior point $(x,y) = (29 \text{ cm}, 82 \text{ cm})$ for the 8″ RO membrane modules.

*Keywords*: RO membranes deformation; Plate on elastic foundation; Composite membranes

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