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# BRINE VALORISATION USING MECHANICAL VAPOR COMPRESSION DESALINATION: APPROACHES TO CONSIDER

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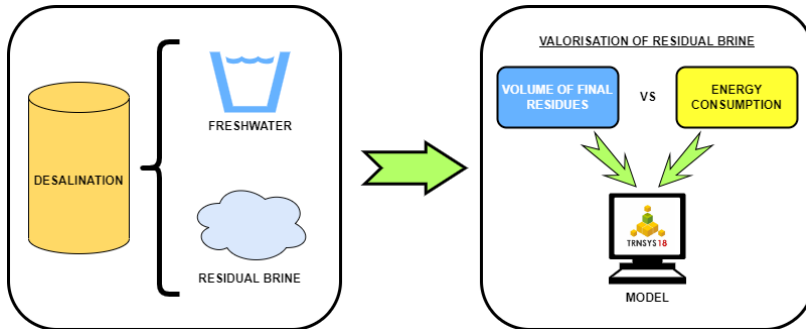
**Abstract** – Water scarcity is one of the biggest challenges we are facing due to climate change: lack of rainfall and polluted water sources are an increasing reality worldwide. Sustainable Development Goals reinforce the urgency of dealing with this issue, targeting scientific community's efforts towards solutions for this trending topic, where desalination of seawater is one of the main proposals. However, concerns regarding environmental effects of residual brines, generated in the desalination process, are emerging on the spots where this technology has been applied.

To contribute to the implementation of desalination technologies, the valorisation of these residual brines brings the opportunity not only to reduce the volume of wastewater generated, but increasing its final concentrations and producing more freshwater from a residue. Nevertheless, it comes with the cost of higher energy demands than in the previous stage: the higher the concentration of the fluid, the higher its energy consumption. The authors can approach this challenge from two different perspectives – focusing on the final amount of concentrated residue, or focusing on the energy demand of the installation.

While focusing on reducing the volume of residue to its minimum expression is the most attractive option for concentrating the dissolved salts, it comes with the cost of excessive energy demands. On the other hand, focusing on reducing the power consumption of the installation allows the usage of variable renewables in a more efficient way, allowing the carbon neutrality of emissions during its operation but obtaining a lower concentrated residue. By using a computational model of the installation, we can replicate its operation and compare results from both perspectives.

This paper looks at the usage of two scenarios with fixed conditions for a basic mechanical vapor compression (MVC) desalination plant modelled in TRNSYS, where we can observe the correlations between the final volume of residual brine and the energy consumption required for achieving those results. One of the scenarios will show the biggest final concentration, while the other one will consider the minimum operating conditions for the desalination plant. Apart from those results, there will be an analysis of environmental and economic advantages that can be achieved by the implementation of this technology as well as an early approach towards the technical aspects involving the development of the model used for these calculations.

**Keywords** – *Carbon neutrality; energy efficiency; model; seawater; sustainable development goals (SDGs); TRNSYS*



General ideas regarding to the presented valorisation of brine approaches.

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