

Mathematical Modelling, Simulation and Prototype Designing of Potable Water System on Basis of Forward Osmosis

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Abstract : The development of reverse osmosis happened in 1960. Along the years this technique has been widely accepted all over the world for varied applications ranging from seawater desalination to municipal water treatment. Forward osmosis (FO) is one of the foremost technologies for low energy consuming solutions for water purification. In this study, we have carried out a detailed analysis on selection, design, and pricing for a prototype of potable water system for purifying water in emergency situations. The portable and light purification system is envisaged to be driven by FO. This pouch will help to serve as an emergency water filtration device. The current effort employs a model to understand the interplay of permeability and area on the rate of purification of water from any impure source/brackish water. The draw solution for the FO pouch is considered to be a combination of salt and sugar such that dilution of the same would result in an oral rehydration solution (ORS) which is a boon for dehydrated patients. However, the effort takes an extra step to actually estimate the cost and pricing of designing such a prototype. While the mathematical model yields the best membrane (compositions are taken from literature) combination in terms of permeability and area, the pricing takes into account the feasibility of such a solution to be made available as a retail item. The product is envisaged to be a market competitor for packaged drinking water and ORS combination (costing around \$0.5 combined) and thus, to be feasible has to be priced around the same range with greater margins in order to have a better distribution. Thus a proper business plan and production of the same has been formulated in order to be a feasible solution for unprecedented calamities and emergency situations.

Keywords : forward osmosis, water treatment, oral rehydration solution, prototype

Conference Title : ICWPC 2018 : International Conference on Water Pollution and Control

Conference Location : Paris, France

Conference Dates : February 19-20, 2018