Desalination and Water Treatment
www.deswater.com

doi: 10.5004/dwt.2020.25763

191 (2020) 93–99
July

Reducing the ecological footprint of PVDF membrane storage

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Received 26 September 2019; Accepted 25 February 2020

ABSTRACT

The aim of the research is to develop a cost-effective and environmentally friendly membrane inspection method for over-stored PVDF membranes. It is generally accepted that PVDF-based fiber membranes are sensitive to dehydration during storage. The current practice to prevent this is that membranes stored beyond the planned period are returned to the manufacturer's site for costly re-impregnation, which like the original impregnation, delivers a glycerol-water solution to the pores. This is a costly process, as it is labor-intensive, needs high raw material consumption, and requires membrane cassettes to be transported over long distances. During the research our goal was to replace this, so we developed a new method to control the drying process. The method involves the in-situ sampling of membrane fibers from filters and transporting the samples to the manufacturer's laboratory. There we measured the membranes' performance with a custom-built permeability tester, and the data obtained here were compared with the values measured at the time of manufacturing and from this data we inferred to the condition of the fibers. After 5 y of storage no fiber property degradation was observed.

With this method, it's possible to save 98.78% of the normal storage extension cost. We also experienced a significant reduction in the environmental load, as the yearly transportation of the cassette can be eliminated, thus significantly reducing the CO_2 emissions associated with traveling, by 2,423,250 kg for the project under investigation.

Keywords: PVDF membrane; Membrane drying; Membrane permeability; CO_2 pollution

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