*Desalination and Water Treatment*
www.deswater.com

36 (2011) 65–74
December

1944-3994/1944-3986 
doi: 10.5004/dwt.2011.1968

# Recovery of water from saturated solutions by membrane processes

Payel Sarkar*, S. Prabhakar, Sushil Tiwari, D. Goswami, P.K. Tewari

*Desalination Division, Bhabha Atomic Research Centre, Mumbai 400085, India*
*Tel.: +2225594729; fax: +2225505151; Email: payelb@barc.gov.in*

Received 21 April 2010; accepted 21 April 2011

**ABSTRACT**

Recovery of water from spent aqueous streams is well known through the use of reverse osmosis (RO) but the extent of recovery is limited primarily by the scaling potential of dissolved species and the osmotic pressure of the concentrate stream. Mining industries, particularly the ones which use sulphuric acid leaching, discharge large quantities of effluents containing dissolved solutes with significant amounts of calcium and sulphate. Chemical method for the removal of sulphate is economically prohibitive to meet the discharge norm. The effluents therefore are often diluted and discharged or sent to dry areas for solar evaporation. Application of RO for the recovery of water is restricted by the scaling of sparingly soluble calcium sulphate. The use of commercial antiscalants does not help as they do not reduce the quantity of sulphates in the discharge stream. Experiments were carried out using nanofiltration (NF) membrane process with commercially available membrane element primarily to remove sulphates with minimal scaling problems. Furthers based on commercial software the performance of RO was assessed to estimate the extent of water recovery for reuse. The studies have indicated that it is possible to recover significant quantity of water for reuse. The sulphates in the concentrate stream can be converted to a solid form in a lime column. The stream depleted of sulphate can be recycled through NF. The paper presents the salient features of our bench scale studies, a precursor for field trials indicating the technical feasibility of achieving 'zero-liquid discharge (ZLD)' through membrane processes.

***Keywords:*** Saturated calcium sulphate; Water recovery; Nano-filtration (NF); Membrane processes; Zero liquid discharge (ZLD); Mining effluents

*Corresponding author