Further treatment of highly concentrated brine with dynamic vapour recompression

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ABSTRACT

Nanofiltration (NF) and Reverse osmosis membranes are widely used for diverse applications for their ability to remove natural organic matters, polyvalent cation (softening), etc. However, concentrate streams arising from these technologies often reaches concentrations up to 60 g/L which makes their disposal a major constraint and usually require additional treatments. In the PWN technologies research facility, in the context of the development of the SIX® Ion exchange process, NF is used to recover NaCl from the brine arising from the regeneration of the resin for further reuse in the process. A pilot scale of the technology aiming at ion separation (mono-valent/bivalent) focused on NaCl reuse was implemented recovering 80% of the total SIX brine. Further, NF concentrate minimisation and sodium chloride reclamation is, however, desired to allow a reduction of the disposal fees and chemical uses and therefore largely increase the overall process sustainability. Due to high total dissolved solid concentration of the NF concentrate, between 80 and 100 g/L, it was decided to use the dynamic vapour recompression evaporation technique (DVR). During operation on a pilot scale with a capacity of 250 l/h, the DVR technology has proved itself to be capable to reduce the raw regenerate another 6–10 times reaching meanwhile the solubility limits of NaCl and other salts making their recovery on a solid stream possible. The condensate that resides after DVR treatment is low contaminated and is therefore suitable for re-injection upstream the SIX pre-treatment process approaching that way the term of a zero liquid discharge process.

Keywords: Brine treatment; Evaporation; Dynamic vapour recompression; Controlled precipitation

1. Introduction

Membrane separation technologies, particularly nanofiltration (NF) and Reverse osmosis membranes have found nowadays a wild range of applications within the drinking water production, desalination from sea or brackish water, wastewater or industrial water treatment. All applications have in common to result in a separation between the desired purified permeate and*Corresponding author.

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