

## The effects of feed water de-gassing on the permeate flux of a small scale SWRO pilot plant

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### ABSTRACT

The effects of pressure release on feed water cavitation have been studied using a small pilot scale SWRO system. The presence of dissolved atmospheric gases in seawater leads to a potential for cavitation within the porous membranes used in high pressure processes. The rapid application and release of applied pressures in the range of 10–60 atm was found to cause visible cavitation throughout the bulk solution phase. This phenomenon was not related to increased gas solubility under the applied pressure, since no additional gases were allowed into the system. It was found that almost complete removal of the initial dissolved atmospheric gases prevented this cavitation. Earlier laboratory scale studies had reported that removal of cavitation by feed water de-gassing enhanced permeate flow rates by 3–5% but this level of improvement was not observed in the pilot scale study operating at an applied pressure of 38 atm with seawater feed. It is possible that larger effects may be observed with the use of more hydrophobic membranes and at higher working pressures. Pre-heating seawater feed to enhance RO efficiency may also lead to greater cavitation within the RO membrane. This study has also demonstrated that pre-treatment using hollow-fibre membranes with efficient vacuum pumping systems can readily produce a high flow rate of 99.5% de-gassed seawater. Feed water de-gassing at these high levels also has the advantage of reducing both inorganic and biological fouling and reduces oxidative degradation of the polymeric membranes.

*Keywords:* Desalination; Degassing; Seawater; Reverse osmosis

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