

## Characteristics of desalinated water in reverse osmosis plants in Spain

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### ABSTRACT

In this study on desalinated water characteristics, the mean total dissolved salts content is 280 mg/L, of which approximately 72% is NaCl. The  $\text{HCO}_3^-$  (<4 mg  $\text{HCO}_3^-/\text{L}$ ),  $\text{Ca}^{2+}$  (2.5 mg  $\text{Ca}^{2+}/\text{L}$ ) and  $\text{Mg}^{2+}$  (<4 mg  $\text{Mg}^{2+}/\text{L}$ ) contents are all low. The  $\text{Mg}^{2+}$  content is approximately twice that of  $\text{Ca}^{2+}$ , both expressed in mg/L. The pH at the outlet of the reverse osmosis racks ranges from 5.2 to 6.7, depending on the plant.  $\text{CO}_2$  content varies between 0.8 and 16 mg  $\text{CO}_2/\text{L}$ . Certain waters may move outside this range because of specific treatments. Permeates with high pH are related to the need to increase boron rejection. The data obtained corroborate the logarithmic ratio established in the literature between the pH of desalinated water and its  $\text{CO}_2$  content. Desalinated water has a Langelier Saturation Index (LSI) of less than  $-4$ , because of which it tends to dissolve calcium carbonate. This also implies the risk of problems of corrosion due to its higher chlorine (60–200 mg  $\text{Cl}/\text{L}$ ) and sulfate content (2–5.7 mg  $\text{SO}_4^{2-}/\text{L}$ ) compared to its content of bicarbonates (2–4 mg  $\text{HCO}_3^-/\text{L}$ ). The pH of desalinated water quickly balances with the  $\text{CO}_2$  content of the atmosphere, so that it should be analyzed carefully and preferably *in situ*. In equilibrium with the atmosphere, the pH of desalinated water is between 6.9 and 7.0 and its  $\text{CO}_2$  content around 0.3 mg  $\text{CO}_2/\text{L}$ . The LSI remains at around  $-4$ . The turbidity of desalinated water is around 0.2 NTU, and higher values may be an indication of problems in the facilities. The sodium adsorption ratio of desalinated water is equal to or higher than 9, indicating that it may be harmful to the structure of agricultural soils and cause problems of toxicity for certain crops due to the excess of  $\text{Na}^+$  with respect to  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$ . Finally, the results suggest that desalinated water generally does not contain sufficient  $\text{CO}_2$  to permit adequate remineralization without extra input of  $\text{CO}_2$ .

**Keywords:** Remineralisation; Reverse osmosis; Desalination; Water characteristics

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