

THE USE OF NATURAL MINERALS FOR THE REPLENISHMENT OF MAGNESIUM INTO DRINKING WATER FOLLOWING DESALINATION

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ABSTRACT

In the fourth edition of their Guidelines for Drinking Water Quality, the World Health Organization recommended that where drinking water supplies were being supplemented with, or replaced by demineralized or desalinated water, remineralization processes should be implemented that replenishes the water with both calcium and magnesium salts to levels similar to those found in the original source [1]. Despite these recommendations, the replenishment of magnesium salts is rarely performed, if at all. One of the main obstacles to magnesium replenishment is the relative cost of current methods, which significantly increases the total cost to desalinate and stabilize the water. This tends to position this subject as a question of luxury rather than necessity. Magnesium however is an essential mineral for the human body, being utilized by every organ and its deficiency has been strongly linked to a range of health issues, particularly cardio-vascular disease. Furthermore, the World Health organization has recognized the importance of drinking water as a significant source for minerals, whether during its consumption as beverages, or consumed as food (inherent and/or added during preparation) [2]. Whilst in some locations desalination is used to augment conventional water supplies to deal with situations of drought or increasing populations, in other locations desalination has become the mainstay for water supply and residents rely on this as the main process to provide potable water. A change therefore in the composition of the water due to supply from desalination as opposed to conventional sources, can have an impact on the overall intake of minerals for human health. Desalination is crucial technology for a sustainable future, to deal with ever increasing populations and global water shortages. As such, it is important to maintain a positive public perception of the process and develop processes that can cost effectively achieve the goals outlined by the World Health Organisation.

Over the last six months, an investigation into alternative methods for magnesium replenishment has been performed, with a focus on the application of natural magnesium-based minerals as a method to reduce the operational costs compared to current techniques. To overcome the drawbacks of slow dissolution kinetics of natural minerals, the products are supplied to the process in a micronized form. This results in an increase in the total available surface area available for reaction whilst being dissolved in a proprietary Membrane Calcite Reactor (MCR). To allow the formation of high concentrations of dissolved magnesium in a side stream, and decrease the required investment, various acids are dosed into the reactor. A range of different combinations of acids and magnesium-based minerals have been tested to quantify their respective advantages and drawbacks, as well as their respective applicability to both Greenfields and Brownfields sites alike.

Keywords: Remineralization, Magnesium, Post-treatment, Desalination, Mineral

