



Omya Advanced Remineralization Process

Remineralization
of Desalinated Water



THINKING OF TOMORROW



Omya: A Global Partner

Omya is a worldwide producer and supplier of industrial minerals and a distributor of specialty chemicals in a wide range of industries including paper, plastics, building materials, food, pharmaceuticals, agriculture and environmental applications. With 180 production sites in over 50 countries, Omya supplies customized products for its partners to all corners of the globe through its own logistics networks and distribution partners.

Omya in Water Treatment

Omya has over 40 years experience in the water treatment market, supplying a range of products to treat drinking water as well as municipal & industrial waste waters. Omya supplies Calcium Carbonate and dolomite products for alkalinity addition and mineral content modification of naturally soft, unbuffered or desalinated waters, including Omyaqua®, a micronized Calcium Carbonate that can be directly dosed into a process as a slurry and a portfolio of specialty water treatment chemicals, including reverse osmosis anti-scalants and cleaning chemicals as well as sodium metabisulfite.

Omya also supplies mineral based products into the industrial and municipal water treatment sector for both alkalinity addition and to improve the flocculation and settling performance.

Products include:

- Omyafloc: an environmentally friendly mineral-based flocculant.
- Omyalime®: a highly reactive milk of lime suitable for direct dosing.





Remineralization after Desalination

Permeate produced from desalination processes is lacking in mineral content and is of a low alkalinity. As a result, it is extremely corrosive to water distribution infrastructure and can be detrimental to human health. Remineralization or stabilization is therefore a necessary step where desalination processes (including IPR/DPR) are used to achieve a buffered and stable final water quality.

Calcium Carbonate or Lime?

The majority of remineralization processes globally utilize either Calcium Carbonate or lime to provide the required calcium and alkalinity following desalination. Historically, lime has been more widely applied for remineralization, due mainly to its reactivity, footprint, and dosing method. Calcium Carbonate offers many benefits over lime including cost, handling, and operation & maintenance advantages as outlined in the table below:

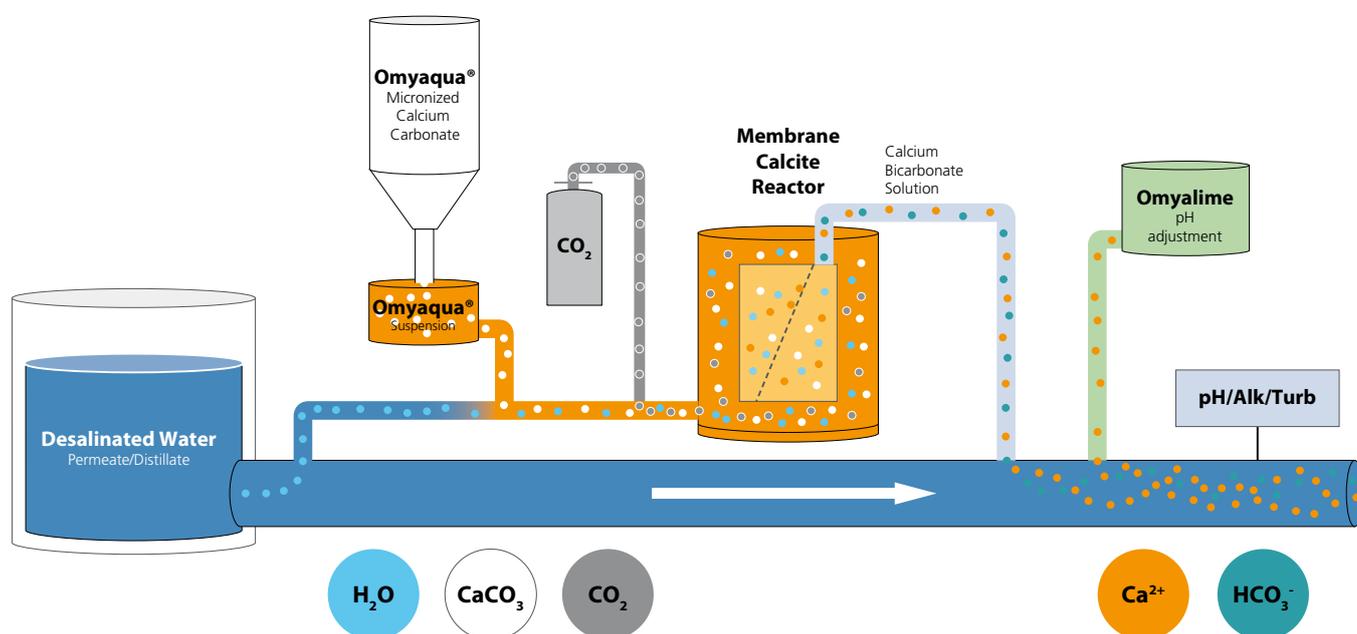
	Calcium Carbonate	Lime Process
Environment	Natural sustainable product with low carbon footprint	High carbon footprint with CO ₂ emissions 10 times bigger than for CaCO ₃
Health & Safety	Non-corrosive, non-hazardous · Safe to work with	Corrosive and hazardous · Difficult to handle
Maintenance	Non-hygroscopic · no tendency to clog pipes	Frequent maintenance required due to clogging of pipes and fouling of plant
Operation	Extremely pure product · little to no waste disposal	10-15% of product removed as sludge and sent to waste disposal · Additional costs of flocculants used and waste disposal
Water quality	Stable process · High purity Calcium Carbonate	Difficulties to control process · Turbidity and pH spikes

Omya Advanced Remineralization Process (OARP)

To exploit the technical and economic advantages of Calcium Carbonate over lime, as well as improve on the reactivity, Omya has developed a number of advanced remineralization processes that utilize micronized Calcium Carbonate at their core.

These processes offer reduced contact times, improved

CO₂ efficiency, reduced plant footprint, as well as simpler storage and dosage systems. Modular, flexible and robust process design and operation provides for the ability to adapt to changing operating conditions and consequently delivers stable and reliable remineralization of desalinated water at all times.



The Omya Advanced Remineralization Process (OARP) utilizes the generation of a concentrated Calcium Bicarbonate solution within a side stream, which is then dosed into the final water stream to increase the hardness and alkalinity content of the final water. The Concentration of the initial Omyaqua® suspension, micronized Calcium Carbonate suspension, the acid

dosage and the contact time can all be controlled to obtain the desired final (drinking) water specification. Furthermore, the OARP process accommodates different permeate flow patterns and therefore provides for an optimized remineralization process under varying plant conditions.



OARP Benefits

- **Premium Quality Water** – achieved through stable operation and set to any target water quality objective.
- **Cost Optimized Design** – minimal plant footprint, due to improved dissolution kinetics and increased chemical efficiency.
- **Modular & Flexible Operation** – able to accommodate varying plant flow rates.
- **Zero Product & Backwash Waste** – achieved by using ultra high-purity minerals and chemical products.

High Quality & Performance OARP Products

Omya has developed a range of products specifically for use in the remineralization of desalinated water, or mineralization of soft water.

Omyaqua®: a micronized Calcium Carbonate product developed for drinking water applications.

Omyaqua® products possess unique physical characteristics, including specific surface area and particle size distribution to obtain the best dissolution properties within the Omya Advanced Remineralization Process. In addition, Omyaqua® products are characterized by their high purity: in all cases over 98% as Calcium Carbonate, with an insoluble content as low as 0.1%, making them suitable for drinking water applications and compliant to International Standards such as DIN-EN 1018 and NSF-60. This high level of purity results in little-to-no waste generated during the operation of the process. This is in direct comparison to standard limes used for remineralization processes, which contain anywhere between 5-15% of their own weight in impurities, resulting in the need for

additional investment and operational costs to separate, remove and dispose of elsewhere.

- Omyalime®: a high purity, highly reactive lime milk suspension, suitable for direct dosing into the final water stream.

Omyalime® is used within the Omya Advanced Remineralization Process as a substitute for sodium hydroxide, being a more cost efficient neutralizing agent used to increase the pH of the final water to slightly positive LSI value. Omyalime® has the additional advantage of increasing the Calcium Bicarbonate content of the final water, resulting in smaller plant sizes, decreased operating costs and removing the need to strip excess CO₂ to the atmosphere.





OARP Demonstration and Piloting Units

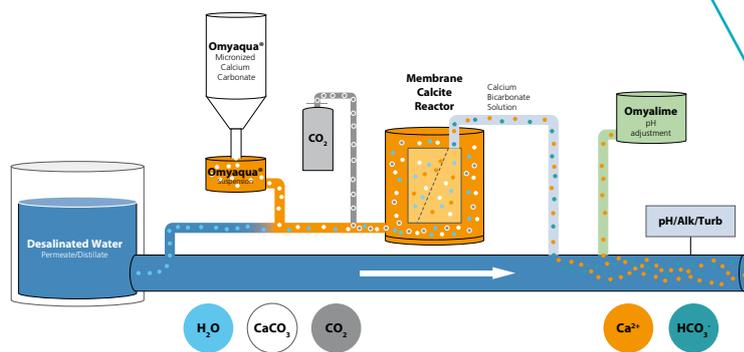
Omya has a number of pilot units used to demonstrate the Omya Advanced Remineralization Process at customer sites. The pilot units are each provided within a 40 ft shipping container and are fully automated with remote monitoring capability. Step-down transformers allow for

varying supply voltages. The pilot units each treat approximately 100 m³/day of desalinated permeate and have a variety of settings to allow the process to be individually tailored to meet the customers' desired final water quality with an optimized process design.



Optimize Your Desalination Performance

Omya Advanced Remineralization Process (OARP)



Omyaqua®
natural Calcium Carbonate for re-mineralization and neutralization of aggressive desalinated water

Antiscalants

High performance scale inhibitors control scaling & fouling from salts, inorganics, metals and colloids

POST-TREATMENT

REVERSE OSMOSIS

SEAWATER

PRE-TREATMENT

Omyafloc®

This green functional mineral utilized in liquid-solid separation and adsorption substantially improves the removal of contaminants and provides a more sustainable and eco-sensitive alternative to traditional polymer chemistry.



Omya Water & Energy

+41 62 789 21 91
info.water@omya.com

Omya International AG
CH-4665 Oftringen
www.omya.com



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**THIS PAPER CONTAINS
OMYA PIGMENTS**