

# OTOBOR™

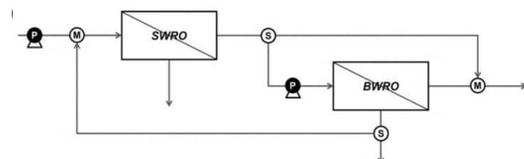
## Boron Removal-Extraction Package



### What is OTOBOR™

Numerated as precious material in industry, The Boron exist in some drinking water sources is an hazardous contaminant. In fact chronic exposure of boron may cause cutaneous disorders, retarded growth and have adverse impact on the male reproductive system. According to world health organization (WHO) the maximum allowable boron in drinking water is 0.5 mg/lit.

Boron present in seawater is difficult to remove by even our recent membrane technologies. Indeed Boron in seawater mainly exist in form of boric acid which is neutral in charge and pass through RO membrane in the same way water molecules pass. As result designer sometimes consider a second pass at huge cost to meet required standard level of Boron in drinking water.

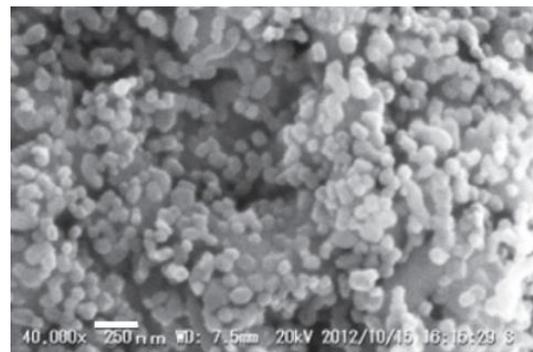


Conventional Double pass RO

Despite its harmful effect on human health, boron is an industrial precious material and seawater is a great source of it. In this regard Osmotec has developed a ground breaking technology named OTOBOR™ for boron removal, not only to maintain public health but also to help industries through introducing a new reliable source of boron.

Based on surface absorption techniques the revolutionary OTOBOR™ technology could extract boron from sea water in an efficient way with the lowest possible CAPEX and negative OPEX.

The key element in OTOBOR™ technology is our novel mineral based MC2200™ which is an highly porous Nano absorbent with ability to make flocks bigger than 100 µm. Suitable to remove via conventional sand filters. Following table briefly shows properties of the media.



Nano porous surface of MC2200™ material

### MC2200™ Specification

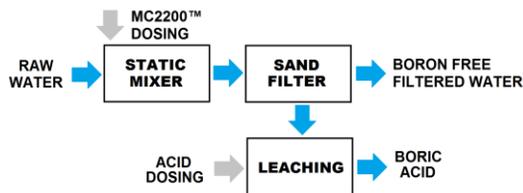
Surface molar ratio (Ca/Mg)	0.6
Specific surface area (m <sup>2</sup> /g)	12
Pore volume (cm <sup>3</sup> /g)	0.2

### Advantages of OTOBOR™

- 99% in boron removal
- boric acid production
- Lowest CAPEX
- Negative OPEX
- No sludge for disposal
- No environmental footprint
- New source of income for desalination plants

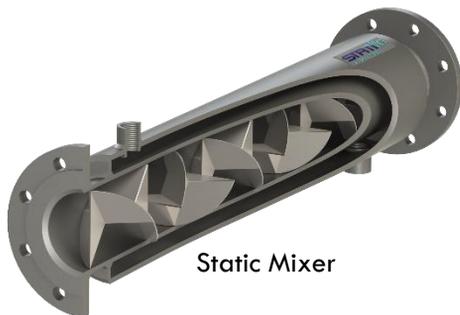
## Process description

Directly from water intake after pH adjustment our mineral based dual coagulant-absorbent the MC-2200 will inject to an specific static mixer; after absorbing boric acid on the ultrapure absorbent surface, large flock with diameter bigger than 100 micron will shape on the out put of mixer and by maintaining its initial pressure without requiring addition pump station it will flow to filtration step.



OTOBOR™ Process

Like other micro contaminant conventionally remove by sand filter in all desalination plants, the shaped boron flocks will trap on the surface of the bed in filter. It should mentioned that due to selectivity and efficacy of the MC-2200, the amount of produced sludge compare to other colloids trapping in regular operating of sand filters is negligible, thus no additional consideration is required for designing the regular sand filters in new plant and no change would happen in normal operation of existing plants employing ATOBOR™ technology.



Static Mixer

Accumulated sludge containing boron trapped on the surface of sand filter will periodically discharge to an sludge holding tank by normal backwash sequence of the filters. The sludge then will continuously pump to leaching unit specially designed for extraction of precious boric acid



Leaching unit for boric acid extraction

### OTOBOR™ Specification

Capacity (m <sup>3</sup> /day)	500 – 300k
Removal Efficiency (%)	95-99
Range of Boron in feed (ppm)	10 - 200
Energy consumption (kw/m <sup>3</sup> )	0.2
MC2200™ dosage (ppm)	1-20
ACID dosage	2-3
OPEX (\$/kg B(OH) <sub>4</sub> )	-20
CAPEX (\$/m <sup>3</sup> )	200

For more information please visit our website or contact us

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