

QUALITY ENABLES.

Case study about chlor-alkali brine purification in a chemical plant in south India

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Photo courtesy of Indian producer of chlor-alkali products

Efficient Chlor-alkali Membrane Protection – A new generation of Lewatit® resins for ultra-high brine purity

Application and system design

The industrial customer is a leading producer of chlor-alkali products in the Indian market. The existing caustic capacity of the plant amounts to 190 kt/yr resulting in a sodium chloride brine feed of 100 m³/h for this case study review. The brine used in ion exchange membrane electrolysis requires pretreatment to remove high levels of impurities and other contaminants that lead to hardness. In order to protect the highly sensitive electrolysis membranes and substantially optimize the efficiency of the brine purification system, **Lewatit® MDS TP 208** is used for fine polishing. In service are three ion exchange filters installed in a merry-go-round set-up securing a hardness reduction from an incoming level of 2 mg/l to below 10 µg/l (Ca²⁺, Mg²⁺). Barium and strontium levels are additionally monitored and controlled below 100 µg/l.

At a glance

| | |
|--------------------------|---|
| Industry | Chlor-alkali industry |
| Application | Brine purification |
| Location | South India |
| Ion exchange resin type | Lewatit® MDS TP 208 Lewatit® MonoPlus TP 208 |
| Installation | In total: 14 filters, 2x merry-go-round, 4x lead-lag |
| Case study focus on | 3 filters merry-go-round, 2x Lewatit® MonoPlus TP 208, 1x Lewatit® MDS TP 208 |
| Production capacity NaOH | 520 tons/day, 190 kt/year |
| Production capacity NaCl | 100 m ³ /h |
| Brine type | NaCl 305 g/l, high content of Ca ²⁺ , Mg ²⁺ |

X Lewatit®

Ion exchange resin performance

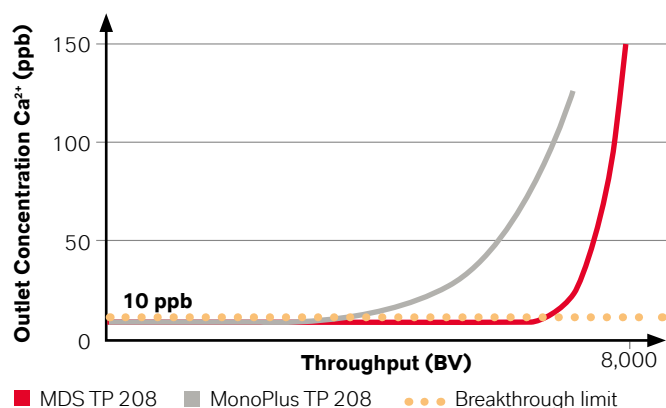
In order to maximize cost savings and gain higher operational simplicity, the brine purification process has been successfully improved. **Lewatit® MDS TP 208** gives access to significantly higher operating capacities, securing high removal rates and extended cycle times (Figure 1: Breakthrough curve of **Lewatit® MDS TP 208** in comparison with **Lewatit® MonoPlus TP 208**). For comparison purposes, one filter was equipped with **Lewatit® MDS TP 208** to compare performance with **Lewatit® MonoPlus TP 208**. On average over the eight months since start-up, the operating capacity at a breakthrough limit of < 10 µg/l of hardness was elevated from 4,480 BV to 6,660 BV of brine throughput, resulting in a 49% of capacity enhancement for **Lewatit® MDS TP 208**.

Optimization of the system to exploit the full resin capacity is possible and is currently being examined.

Figure 1: Average breakthrough curves of **Lewatit® MDS TP 208** and **Lewatit® MonoPlus TP 208** over an 8-month period.

Operating conditions:

Brine flow rate: 100 m³/h, [Ca²⁺/Mg²⁺], feed: 2 mg/l, [Sr²⁺]: 1 mg/l, [Ba²⁺]: 0.5 mg/l, [NaCl]: 305 g/l, pH: 10, temp: 60 °C, SV: 25 BV/h.



Operating conditions found in the eight month average exhaustion cycle:

Lewatit® MonoPlus TP 208:

Operating capacity: 9 g Ca/l
Cycle length: 179 h
Purified brine/cycle: 4,480 BV
Pressure drop across resin bed: 0.4 bar
Filter nozzle slit width: 0.25 mm

Lewatit® MDS TP 208:

Operating capacity: 13.3 g Ca/l
Cycle length: 266 h
Purified brine/cycle: 6,660 BV
Pressure drop: < 1.0 bar
Filter nozzle slit width: 0.25 mm.

The 2-years average performance of installed resins since start-up in 2016 until September 2018 is resulting in a 53% capacity enhancement by elevation from 3,035 BV to 4,662 BV of throughput by **Lewatit® MDS TP 208**.

Conclusion

More efficient brine purification can be secured by the use of **Lewatit® MDS TP 208**. A significant improvement of operating capacity for hardness removal paired with secure limit removal below 10 µg/l of hardness and below 100 µg/l of strontium and barium allows cost savings due to operational improvements and electrolysis membrane protection, thereby extending the membrane lifetime. The positive results convinced this customer to change the remaining brine polishing resin filters into **Lewatit® MDS TP 208** as well. Application recommendations for **Lewatit® MDS TP 208** and **Lewatit® MDS TP 260** are available upon request.

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