



Aspects of Brine Treatment for Salt Production Processes

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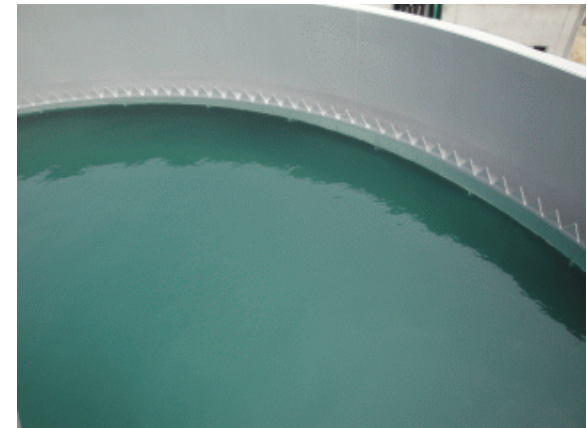
Raw Brine Treatment - Structure

- Introduction into Basic Brine Purification Processes – Common and Schweizerhalle Process
- Process Optimization with Mother Liquor Return into 1. Process Step
- Conclusions

Brine Treatment – Optimization of the Salt Production Process

Benefits of raw brine treatment to the salt plant operator:

- to avoid contaminants and impurities in the salt
- to avoid scale forming in the tubes of pre-heaters and evaporators
- save on energy consumption
- prolong the working time of the evaporators
- reduce the washing period outages
- minimize the maintenance costs
- increase the salt production capability



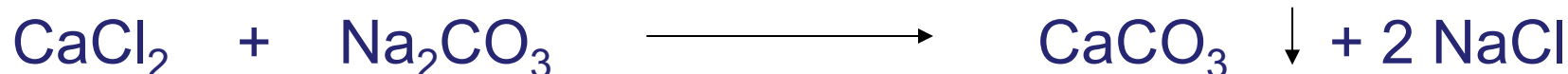
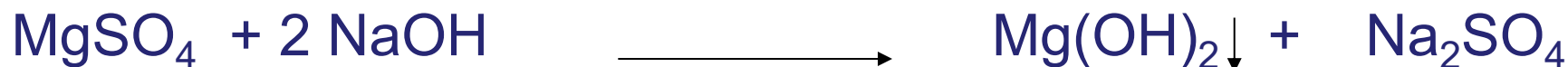
Brine Treatment Plant in Jintan / China



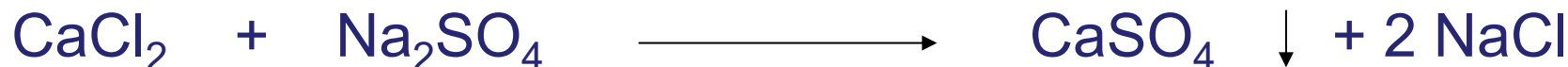
Brine Purification – Former Process

Remove earth alkaline ions like Ca^{2+} , Mg^{2+} , Sr^{2+} and potentially present heavy metal ions!

- Former Process utilizes NaOH and Na_2CO_3
- Can lead to high costs for chemicals

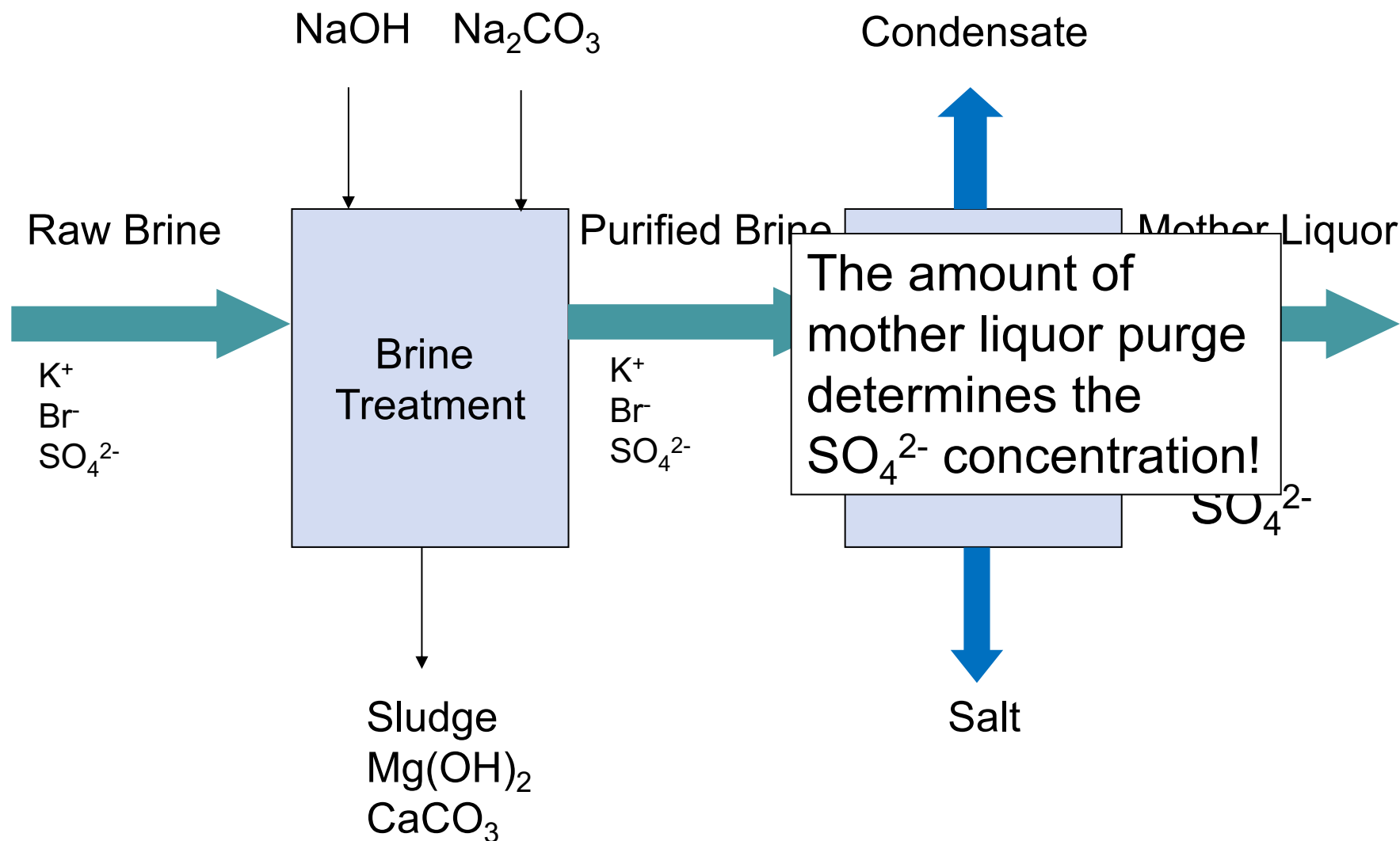


Mother liquor treatment with calcium chloride to precipitate sulfates:



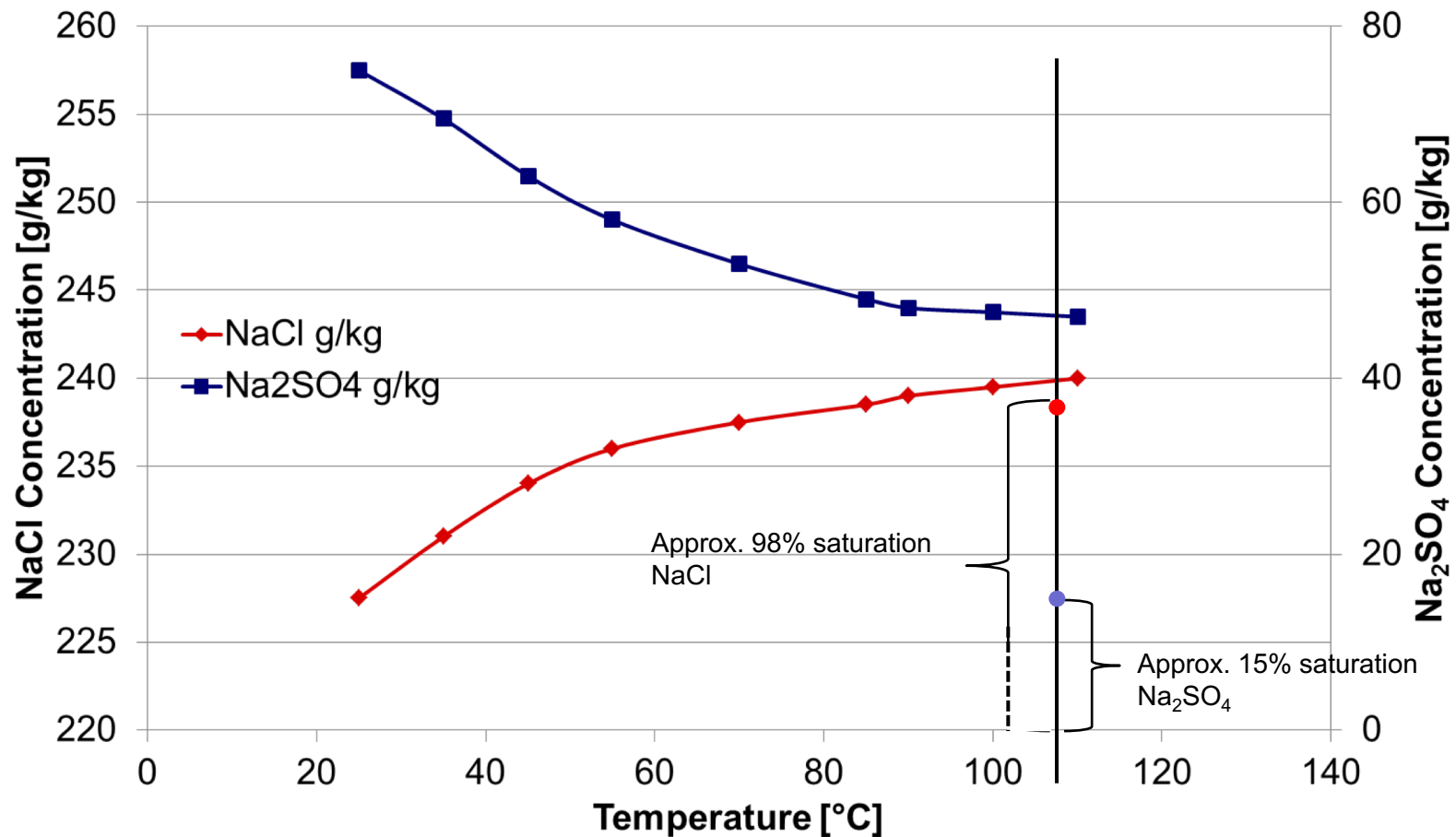


Brine Treatment – Former Process Scheme



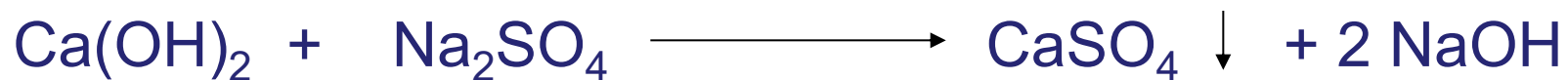
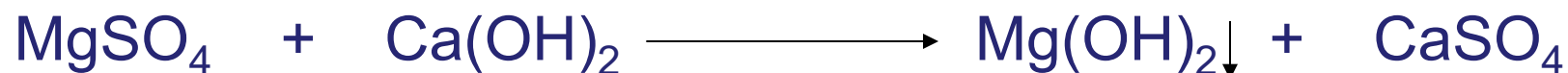
Single Stage (MVR) NaCl Production

Solubility of NaCl and Na₂SO₄

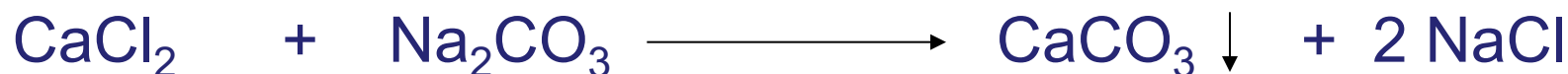
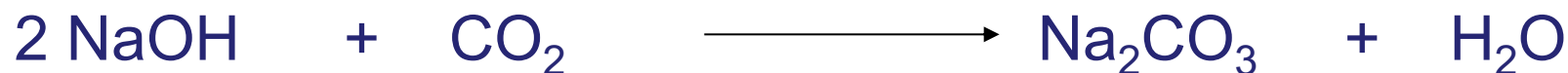


Brine Treatment – «Schweizerhalle» Process

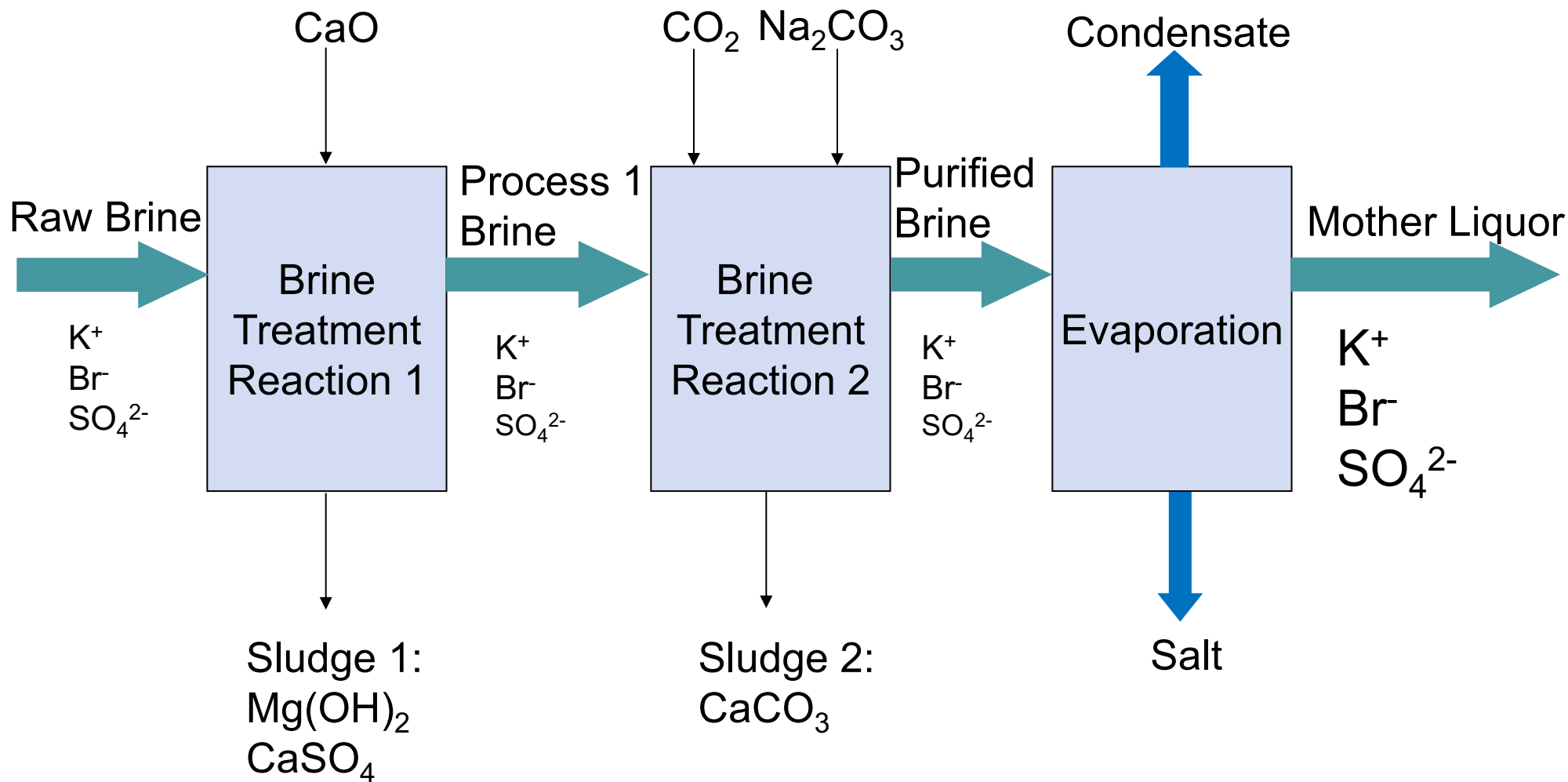
First reaction step:



Second reaction step:



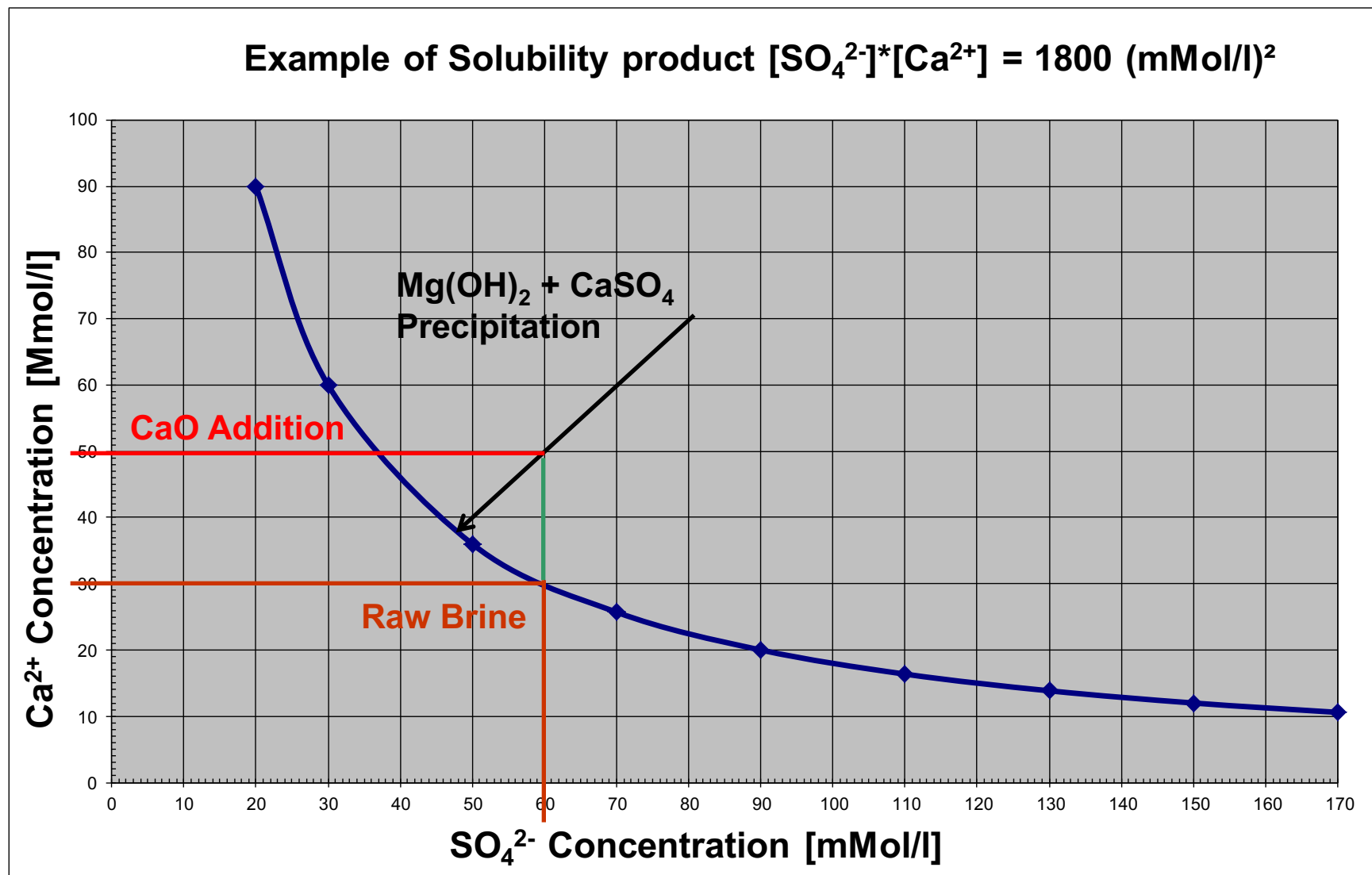
Brine Treatment – «Schweizerhalle» Process Scheme



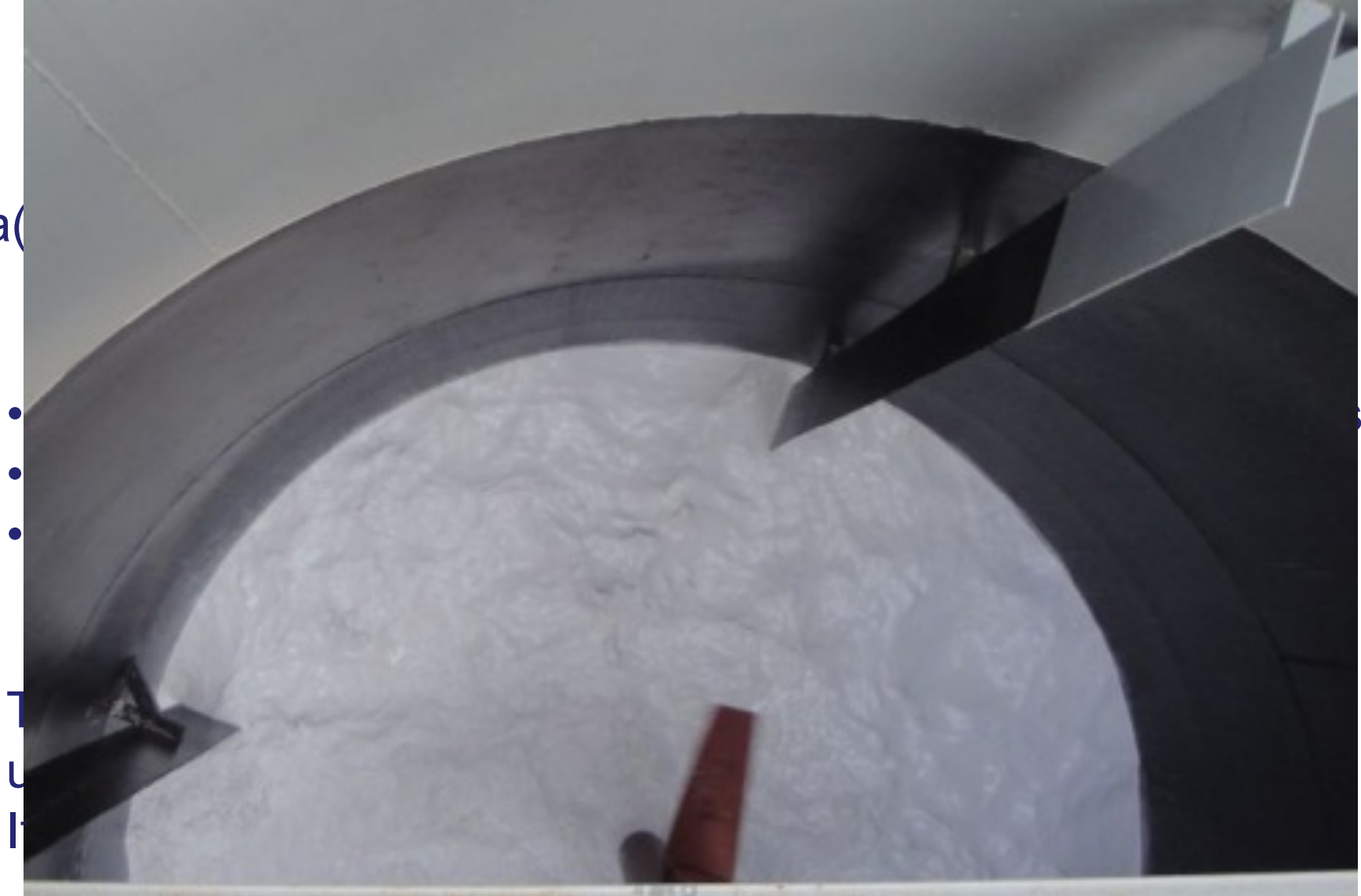
Schweizerhalle Process in Jintan / China



Brine Treatment – First Process Step



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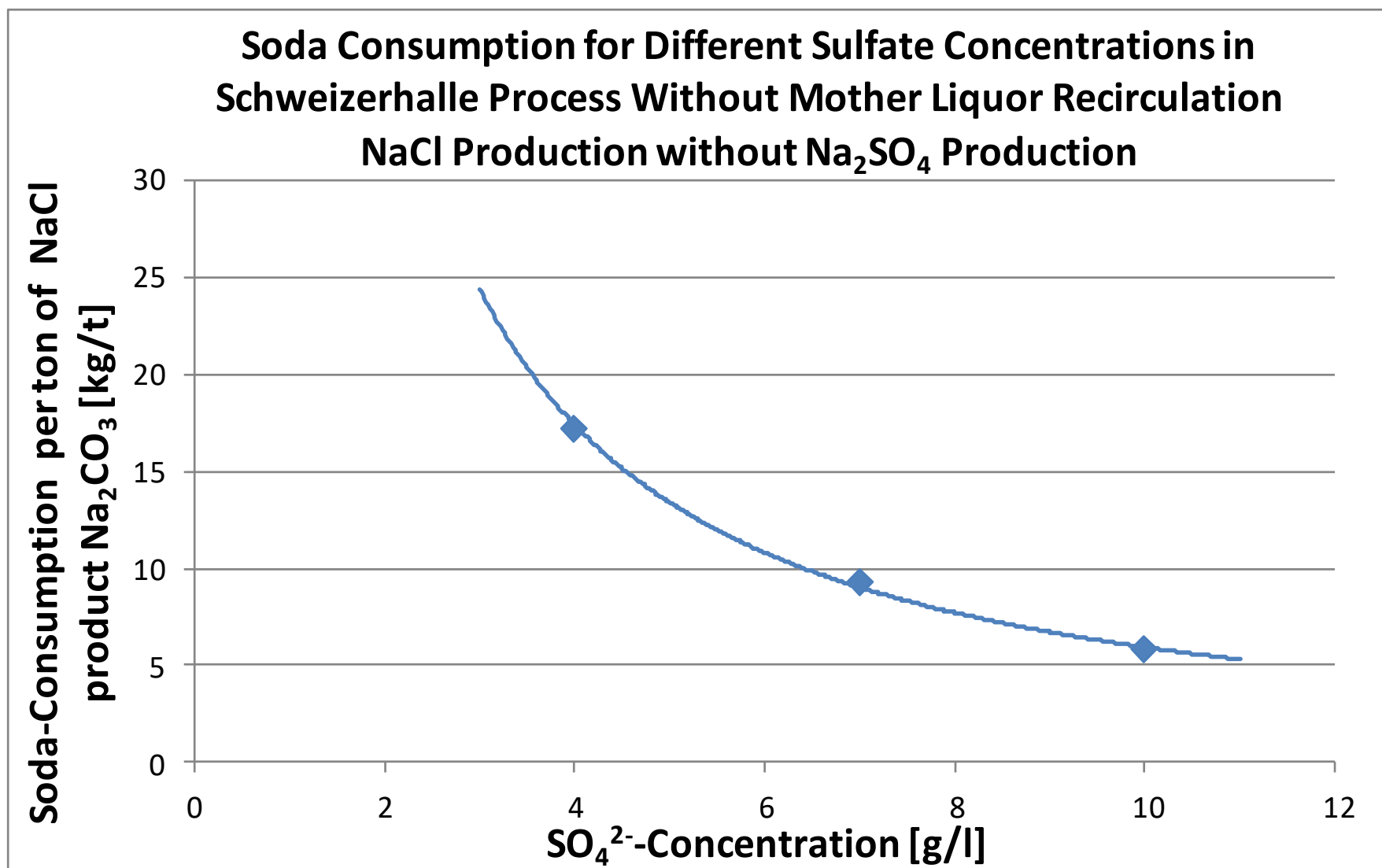


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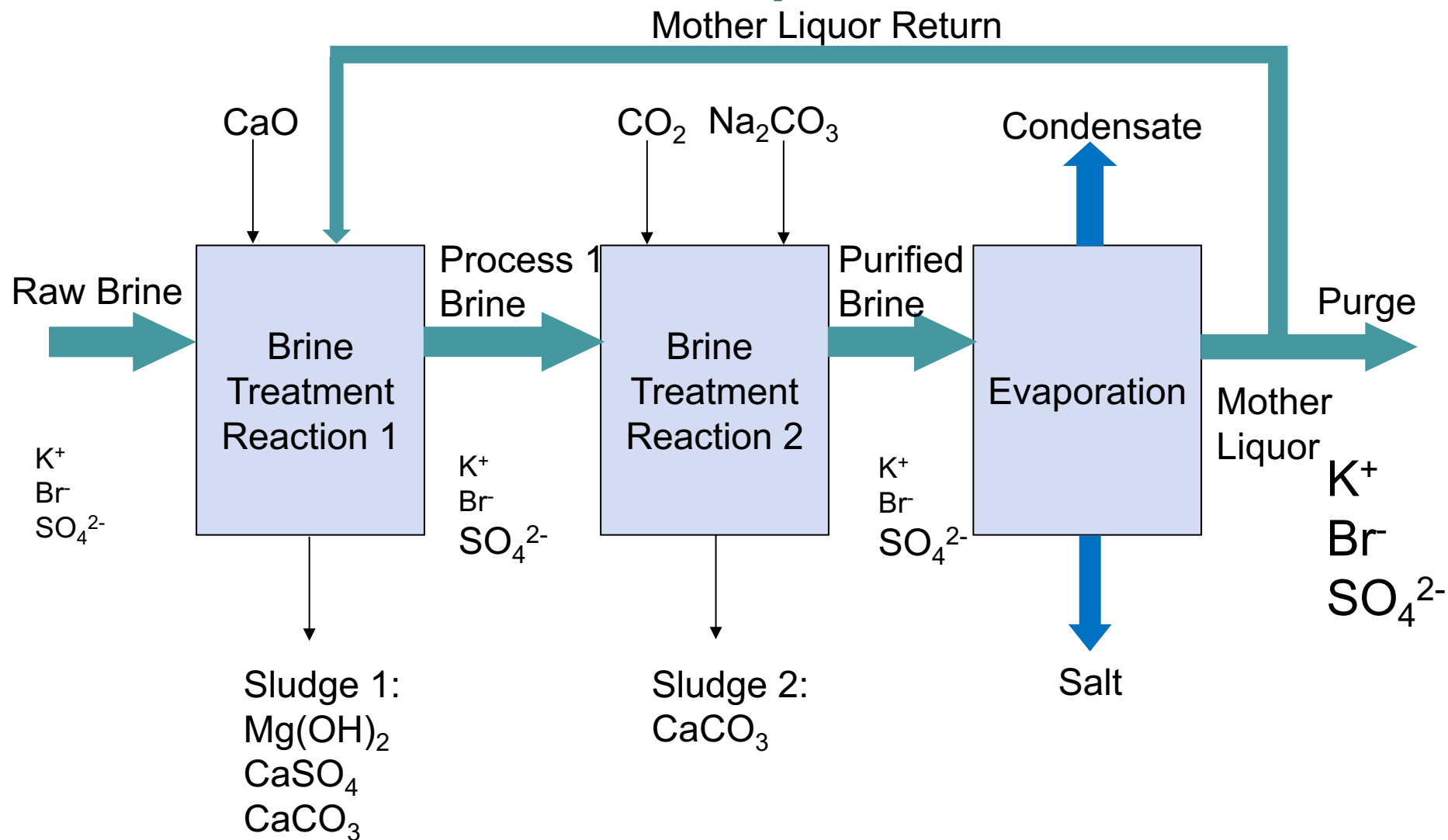
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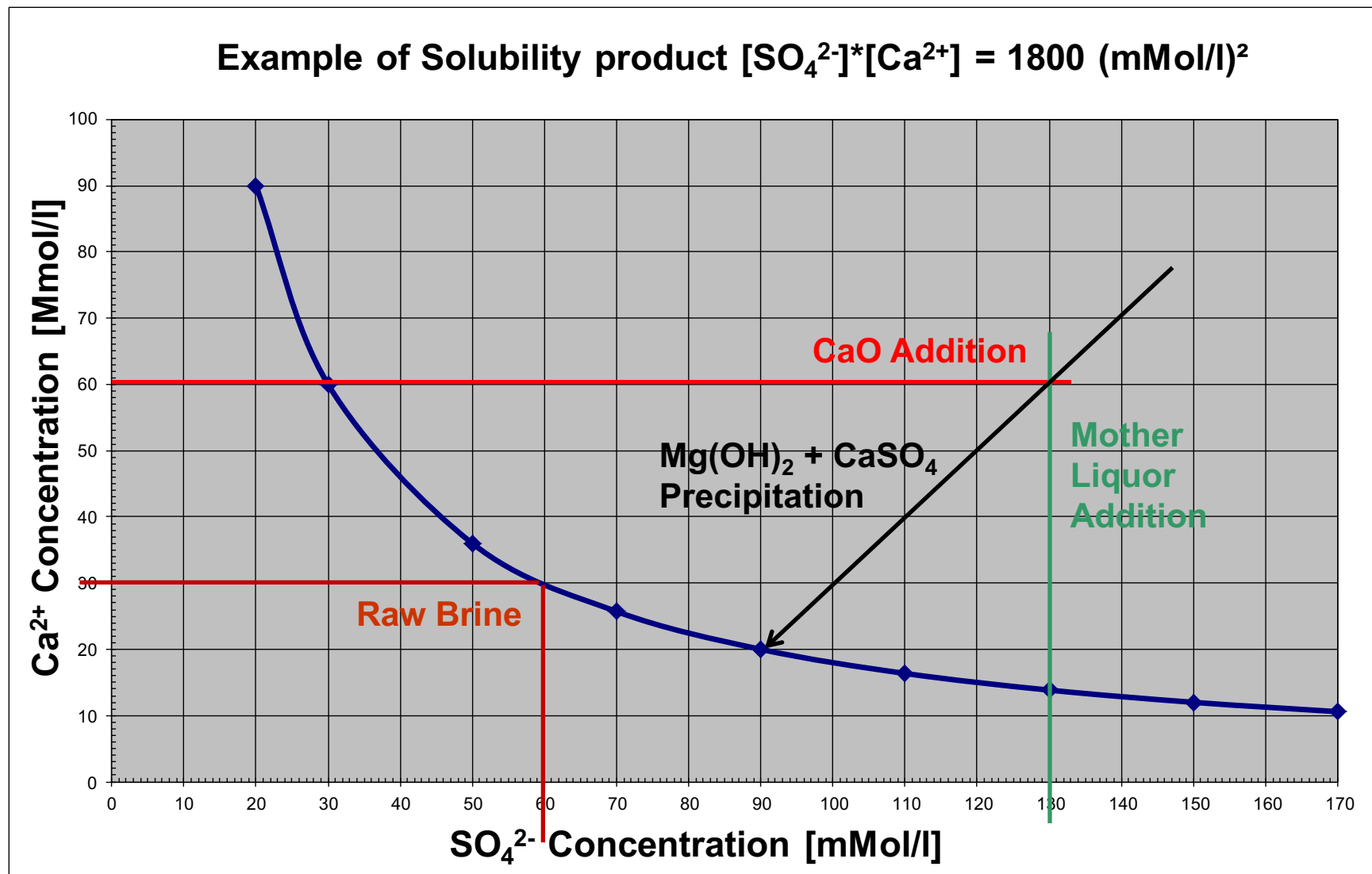
Soda Savings with Sulfate in Raw Brine



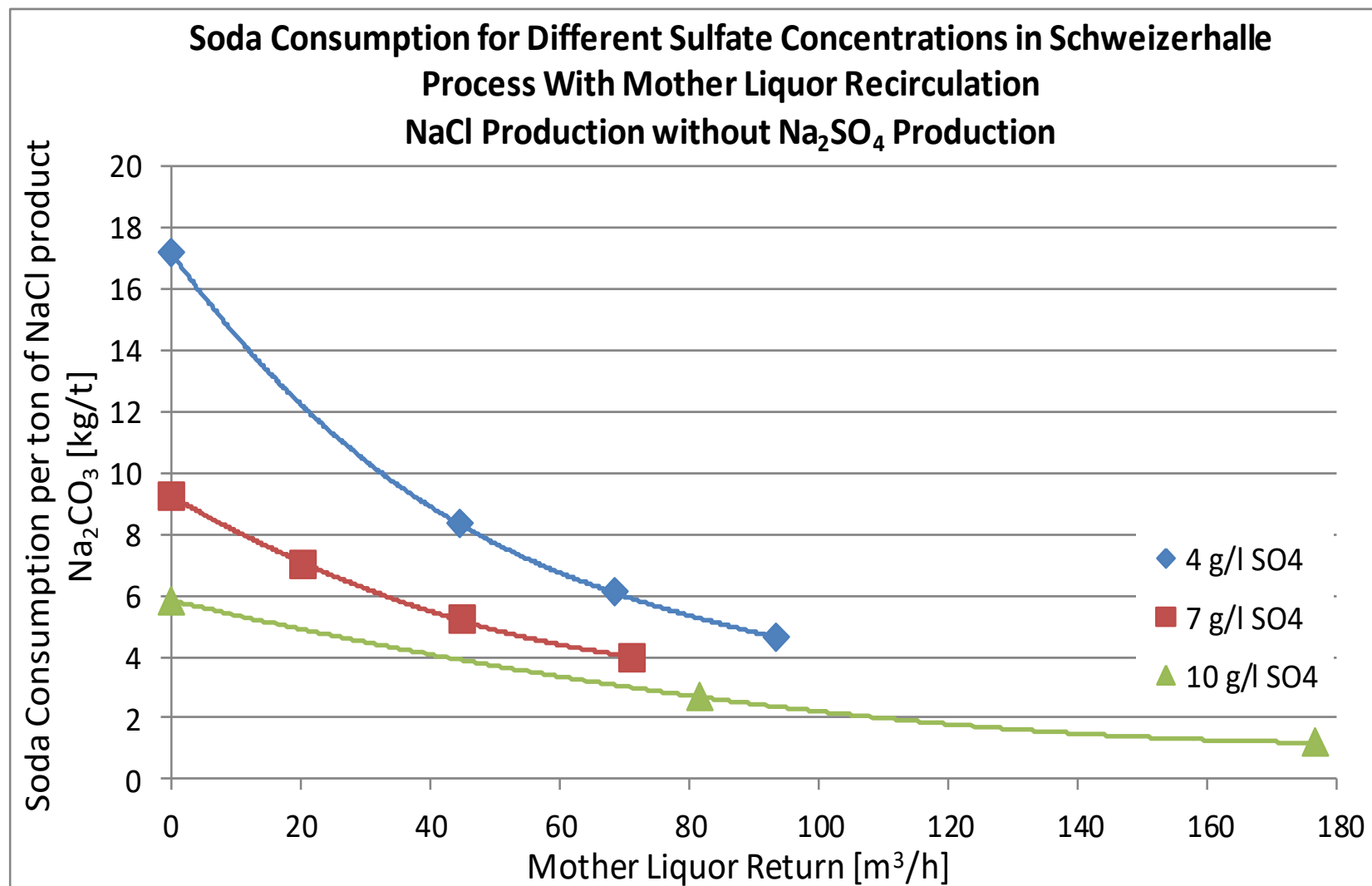
Brine Treatment – Mother Liquor Return to First Process Step



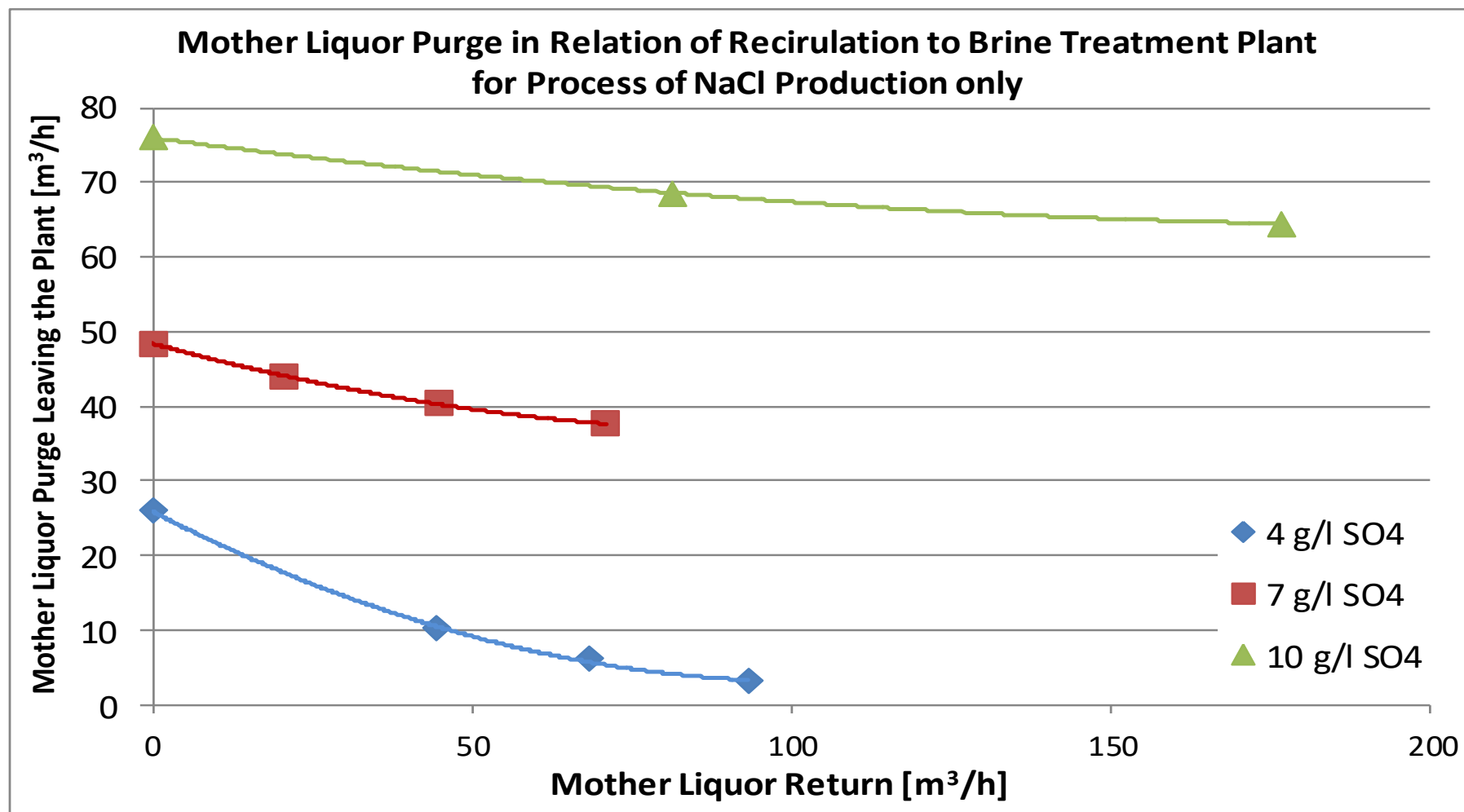
Brine Treatment – First Process Step with Mother Liquor Addition



Brine Treatment – Soda Savings with Mother Liquor Recirculation



Brine Treatment – Purge Reduction with Mother Liquor Return



Conclusions

- The **common brine purification** process is mainly suitable for **low sulfate** brines and in cases where caustic is available on site at production costs.
- In cases of raw brine with **high sulfate**, the **Schweizerhalle process** is most economic since the caustic is substituted by lime and soda can be saved by carbonization.
- Even for raw brines with **low sulfate** content, the Schweizerhalle process can be very economic if **mother liquor** from the evaporation process is **returned** into the first or second process step.
- Depending on the chosen process combination, the **liquid purge** can be **eliminated**.
- The **optimum design** for a brine treatment plant depends on process conditions and the chosen evaporation process and has to be **investigated carefully** for each case **individually**.

Thank you!

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