

# Crystallization – an important step from the mine to the pure product

Digital German – Australian Mining Delegation

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engineering for  
a better world



Federal Ministry  
for Economic Affairs  
and Energy



## Crystallization – an important step from the mine to the pure product

GEA – at a glance

Who is GEA?

Crystallization

Crystallization – from theory to industry

Purity is key

Production of ultra-pure battery-related compounds

Case study

$\text{LiOH} \cdot \text{H}_2\text{O}$  from Western Australia

References

Innovation meets experience

# GEA – at a Glance

"GEA is one of the world's largest systems suppliers for the food, beverage and pharmaceutical sectors. A major focus is on continuously enhancing the sustainability and efficiency of customers' production processes. GEA plants, processes and components help achieve significant reductions in carbon emissions, plastic use and food waste in production worldwide. In this way, GEA makes a decisive contribution toward a sustainable future, fully in line with its corporate philosophy of "engineering for a better world."

GEA is listed on the German MDAX and the STOXX® Europe 600 Index and also included in the DAX 50 ESG and MSCI Global Sustainability indexes.

FY 2020

## Order intake



**4,703**

EUR million

## Revenue



**4,635**

EUR million

## EBITDA before restructuring measures



**532**

EUR million

## EBITDA before restructuring measures



**11.5**

percent of revenue

## Dividend proposal



**0.85**

EUR per share

## Employees



**18,232**

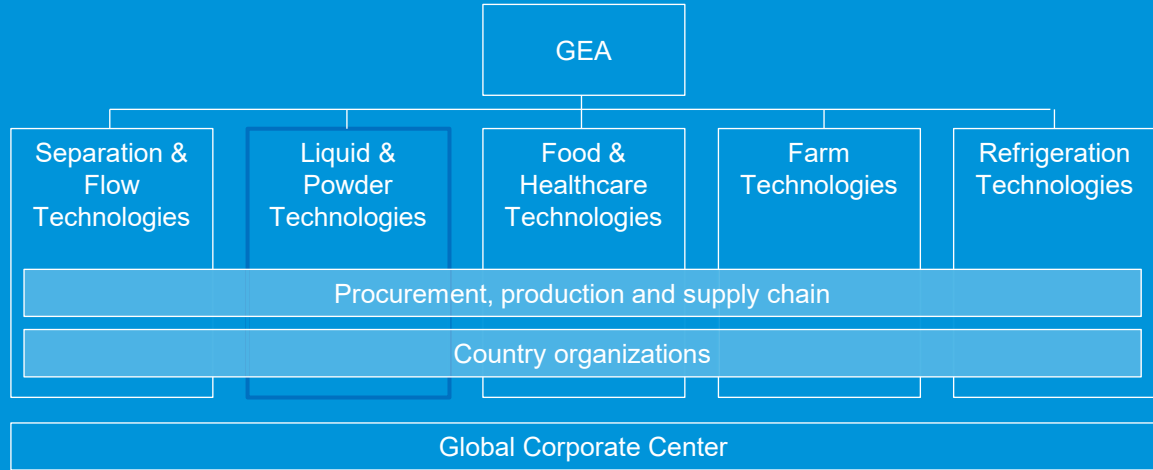
full-time equivalents

## Group structure

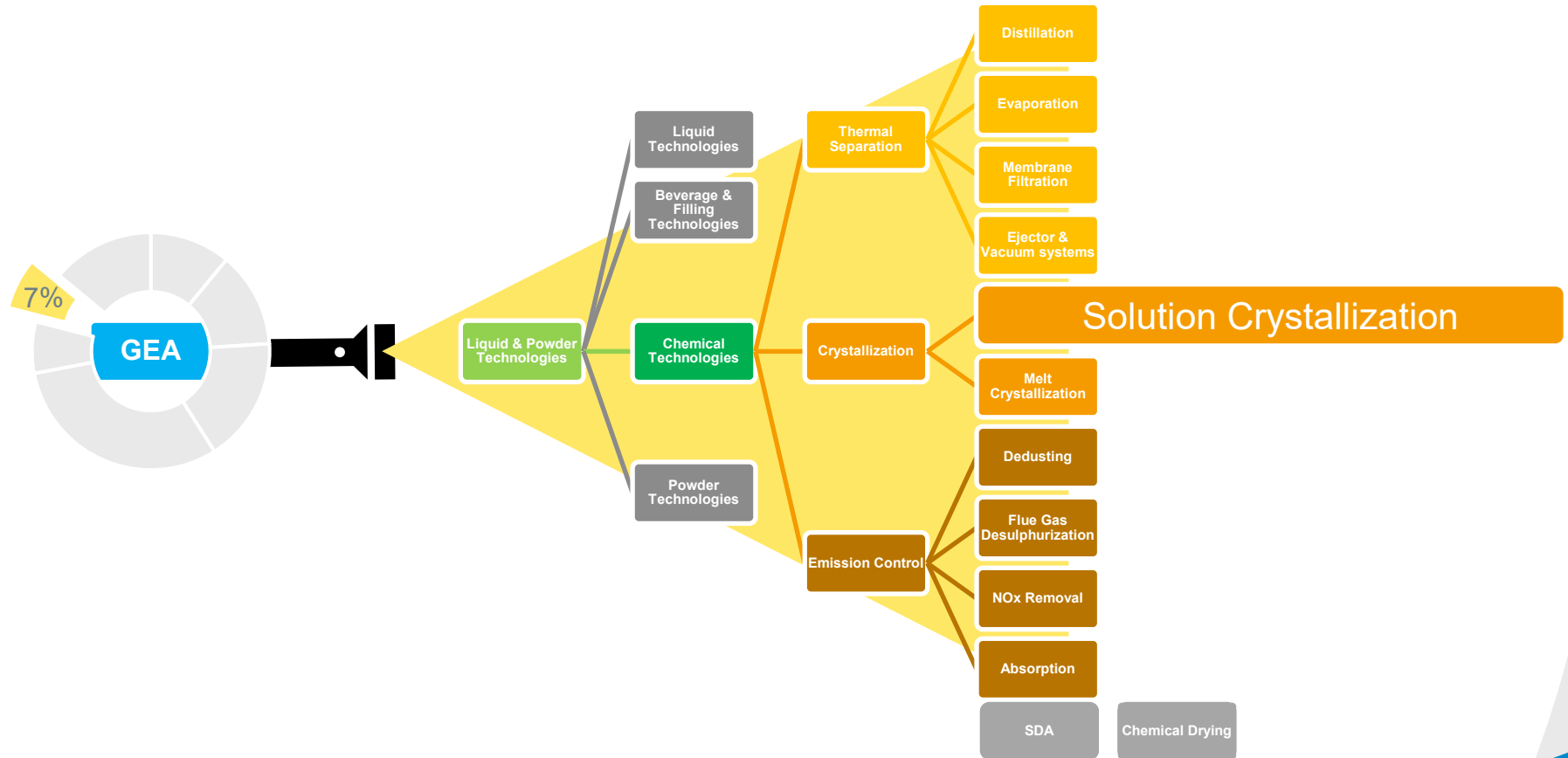
GEA is divided into five divisions, each with up to six business units. The units are based on comparable technologies and have leading market positions.

The country organizations stand ready to serve their respective customers as a central point of contact, offering them local access to an extensive portfolio of products and services.

## Technologically-oriented divisions



# GEA – Spot on Chemical Technologies





GEA Messo has been present worldwide in the field of crystallization since some 66 years now with all engineering services for the chemical, the food, the steel technology and the environmental industry.



GEA Messo has supplied more than 1200 crystallization plants. With steadily growing experience and with continuous research activities we are striving to keep our expert knowledge ahead of time.



GEA Messo is expert for process and plant design, from process development in the laboratory to delivery of large-scale tailor-made solutions.

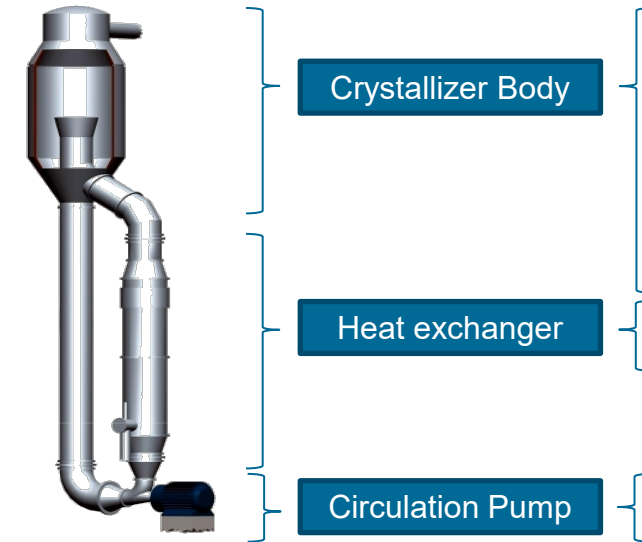
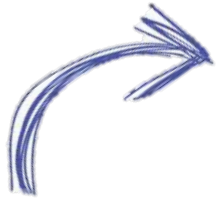


# Crystallization – from theory to industry

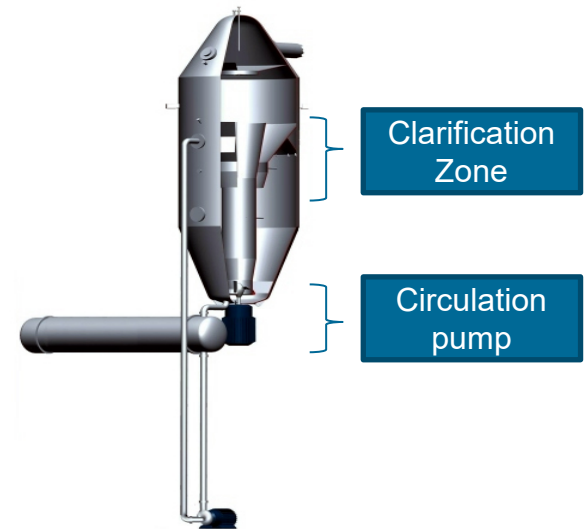
Crystallization is a highly selective separation process.



- ✓ Nuclei (Crystals)
- ✓ Supersaturation

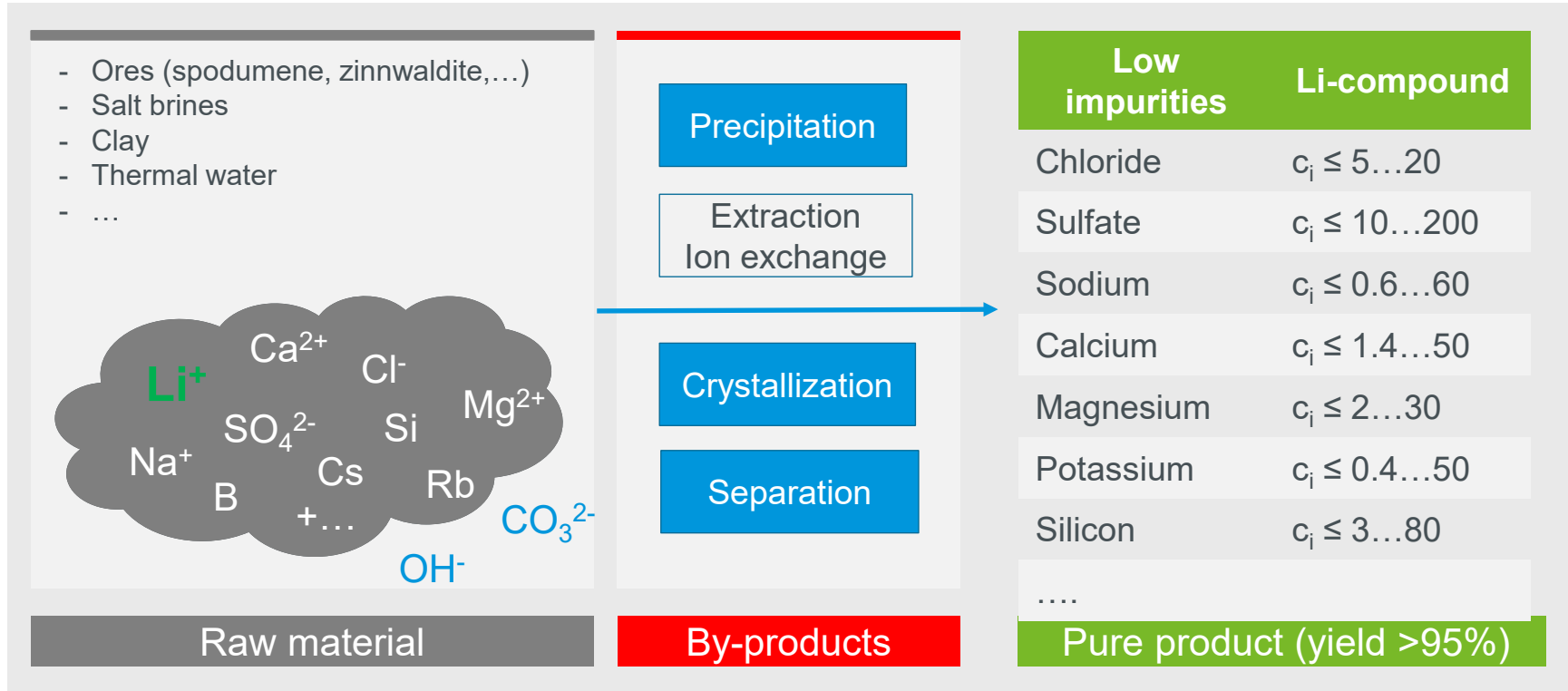


Forced Circulation Crystallizer



Draft Tube Baffled Crystallizer

# Production of ultra-pure battery-related compounds



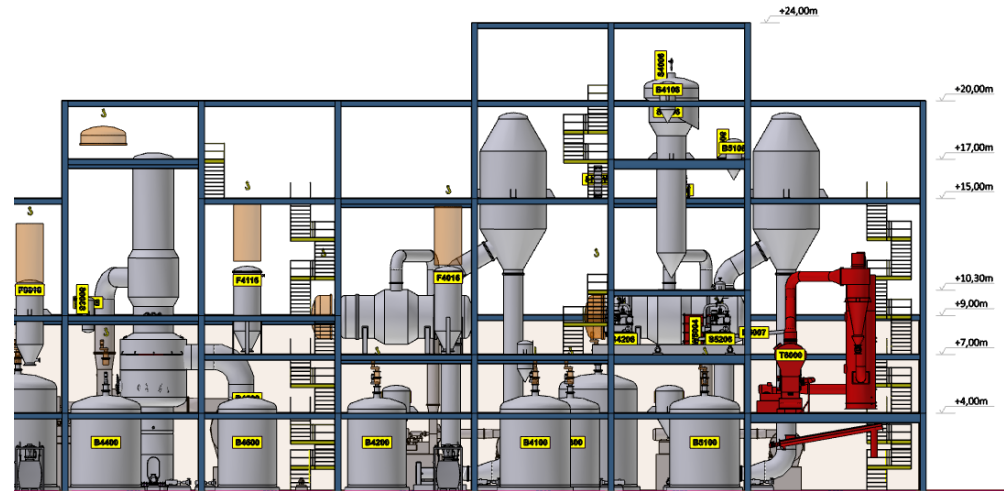
# Case study - $\text{LiOH} \cdot \text{H}_2\text{O}$ from Western Australia



Kwinana, Perth, Australia:  
Lithium Hydroxide Refinery

Owner: Tianqi Lithium / IGO  
Crystallization: GEA Messo, Total project: MSP

From:  
IGO Diggers Dealers Mining Forum Presentation, 02.08.2021

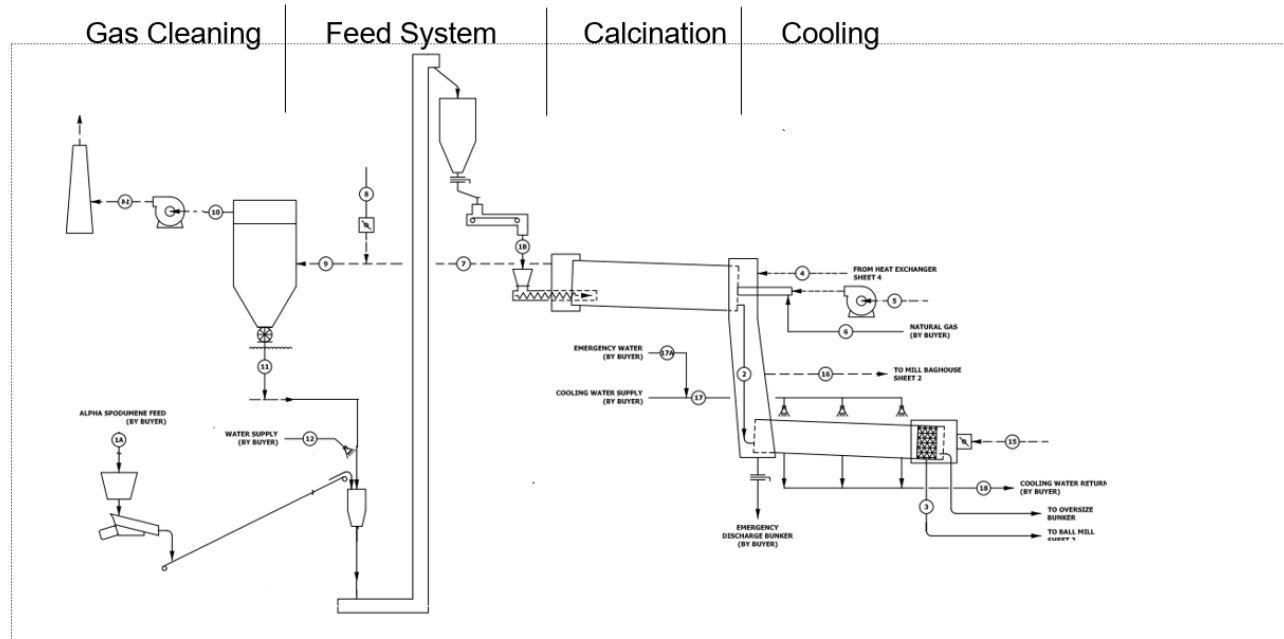


3D-model of one line (in total 2 lines of each 20,000 t/a capacity)

# Case study - $\text{LiOH} \cdot \text{H}_2\text{O}$ from Western Australia

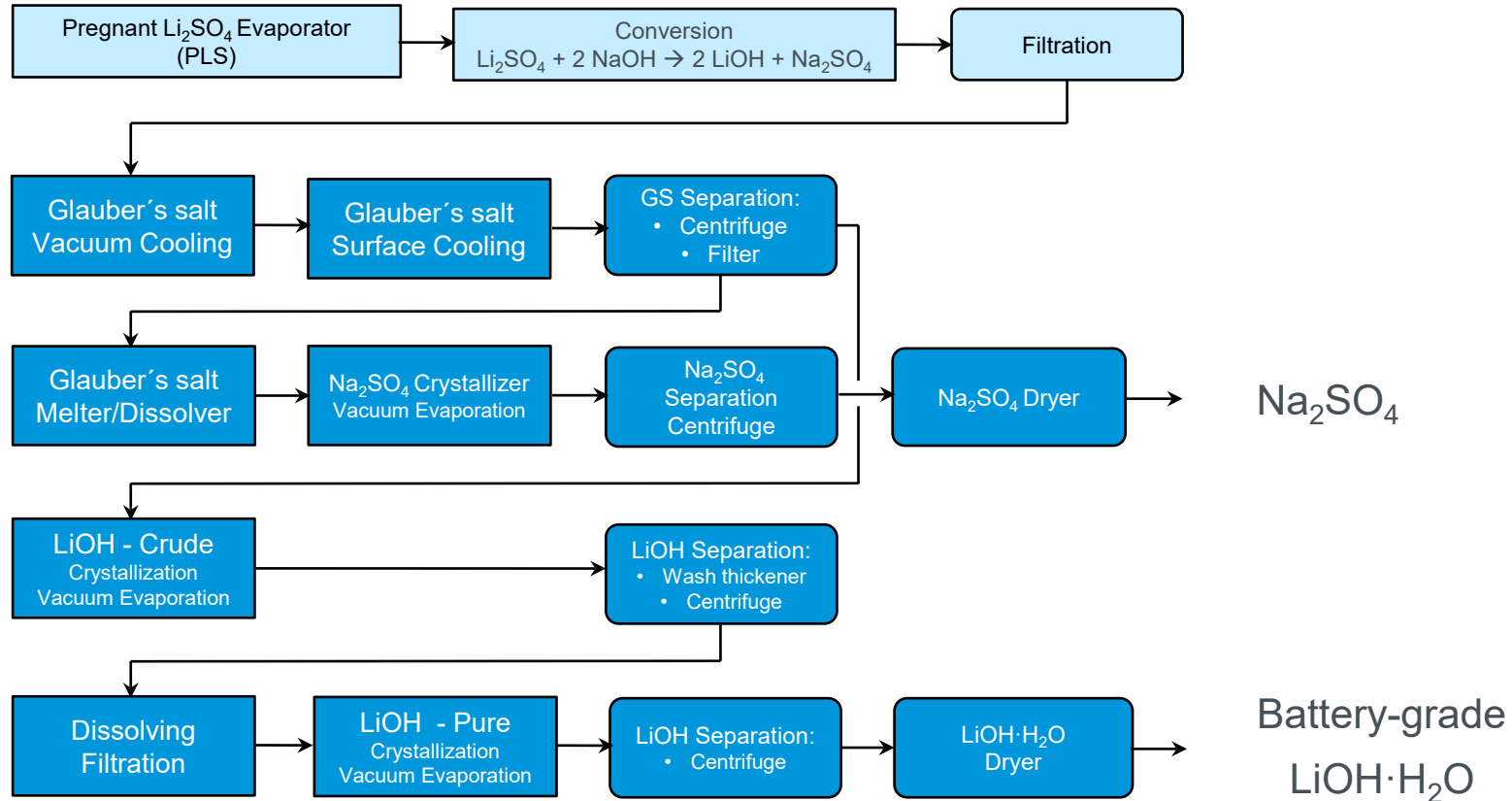
- Calcination:

- Thermal treatment of ore to unlock and allow lithium recovery via structural phase change,  $\alpha \rightarrow \beta$
- Calcination temperature > 1000 °C



Information from Metso:Outotec

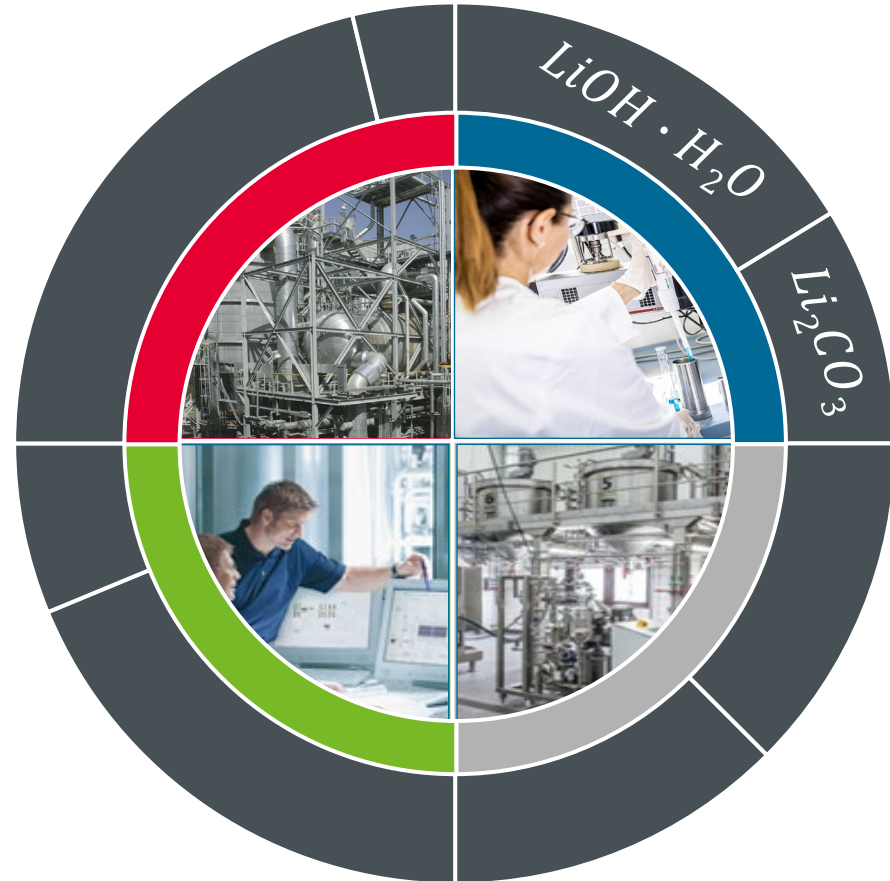
# Case study - $\text{LiOH} \cdot \text{H}_2\text{O}$ from Western Australia



# Innovation meets experience

- Main aspects are purity and yield
- Extensive knowledge/ experience
- Security by warranties

Lab developments	20
Pilot plants	2
Basic Engineering	4
Industrial plants	6



# Examples on references for lithium compounds

## Pilot Plant for <100 kg/h battery grade $\text{LiOH} \cdot \text{H}_2\text{O}$



Falling Film Evaporator



Shell&Tube Heat exchanger

FC Crystallizer  
Evaporation chamber



GEA Process Engineering Pty. Ltd.  
Melbourne, Australia



GEA Messo GmbH  
Duisburg, Germany

- Robert Buchfink
- Product Manager – Solution Crystallization
- 10 years experience as Sales & Technology Manager
- Please challenge me with your questions!

