K-UTEC AG SALT TECHNOLOGIES

COMPETENCE IN SALT

POSTER COLLECTION ACHEMA 2022

K-UTEC AG Salt Technologies
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SALT TECHNOLOGIES

ENGINEERING SERVICES

Raw Material Examination

Development of Process Routes

Economic Project Evaluation

Process Design

Basic Engineering

CAPEX / OPEX

Support in Plant Installation

Commissioning

Training of Staff

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SALT TECHNOLOGIES

TECHNOLOGIES

Solution mining

Solar evaporation of seawater, natural salt lake brine and utilization of bittern

Steam evaporation and crystallisation

Beneficiation of crystallised salts

Cold and hot leaching of raw salt

De-watering and drying

Compacting and post treatment of products

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SALT TECHNOLOGIES

PROCESS DESIGN

Hot & Cold Leaching

Brine Processing

Crystallization & Precipitation

Flotation

Solar & Thermal Evaporation

Solid-Liquid-Separation

Drying & Compaction

Packing

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SALT TECHNOLOGIES

BASIC ENGINEERING

P&ID & Process Layout

Mass- & Energy Balances

2D & 3D - Drawings

HSE Concept

Capex & Opex Estimation

Preparation of Tender Documents

Preparation of Approval Documents

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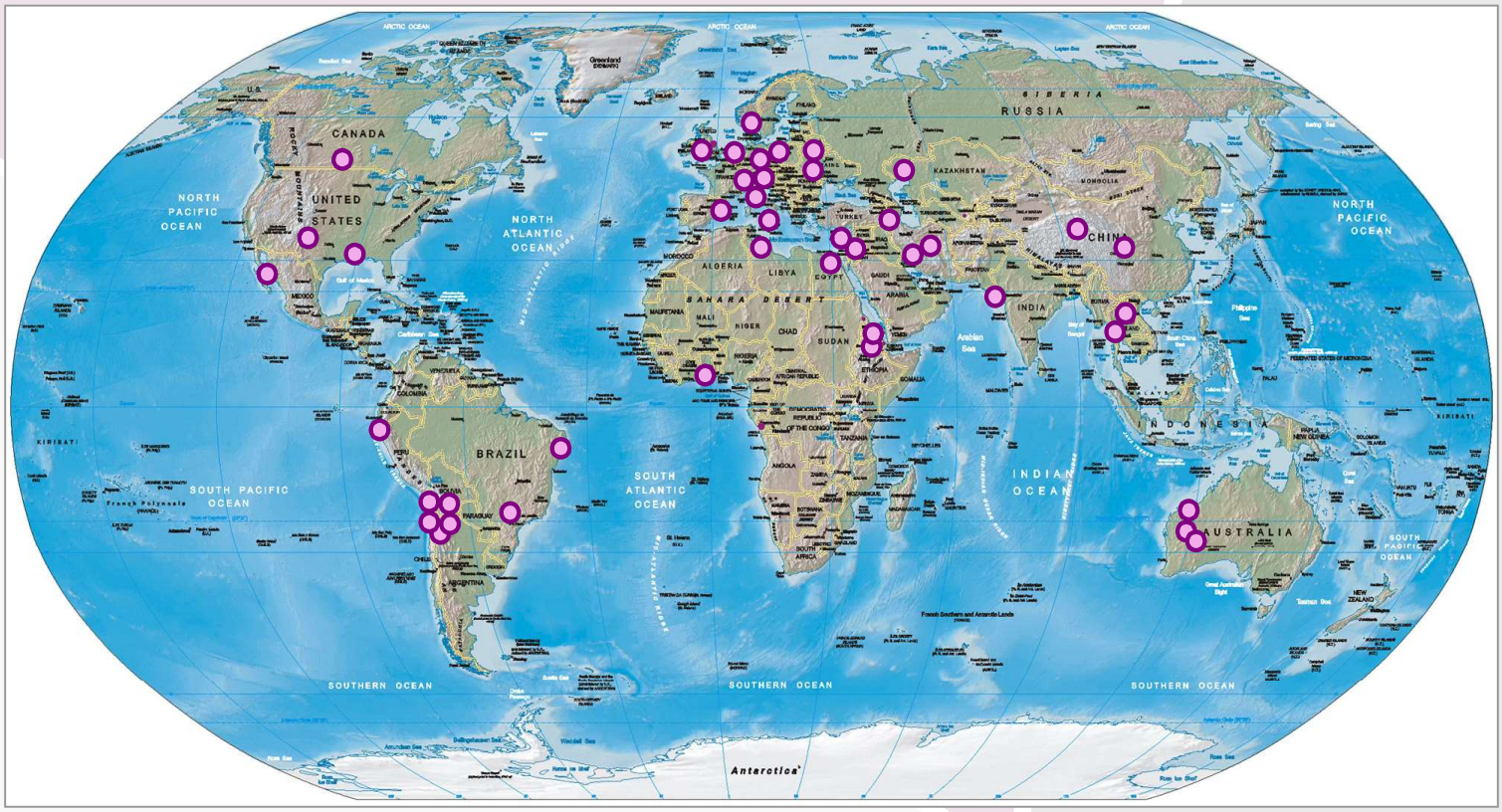
Projects Around the World



Chile Bolivia Brazil Peru
Argentina Mexico China Thailand
Laos India Iran Tunisia Egypt
Ghana Eritrea Ethiopia USA
Russia Australia

K-UTEC SALT TECHNOLOGIES

PRODUCTS OF DESIGN

$NaCl$ Na_2SO_4

KCl K_2SO_4

$MgSO_4$ $MgCl_2$

$CaSO_4$ $CaCO_3$ CaO

MgO $Mg(OH)_2$ $MgCO_3$

$Ni(OH)_2$ $NiSO_4$

$BaSO_4$ $BaCl_2$

Borax Borates

$LiCl$ Li_2CO_3 Li_2SO_4

Bromine

Double salts

etc.

in well defined

crystal and particle size

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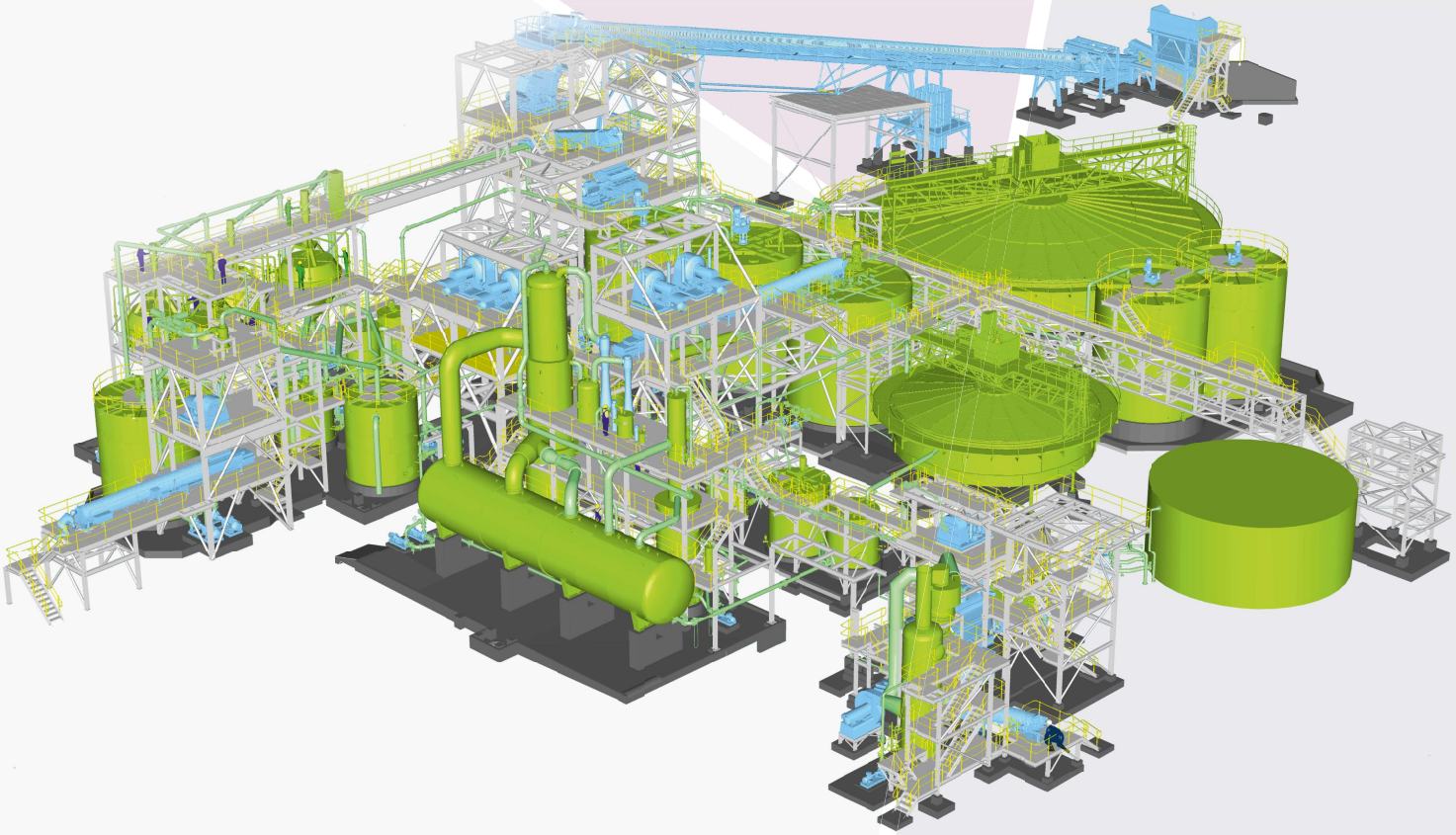
SALT TECHNOLOGIES

SOP - First SOP Production in Australia

SOP from Kainite Type Mixed Salt

Project Owner:	Kalium Lakes Limited (KLL)
Project Location:	East Pilbara region of Western Australia AUSTRALIA
Raw Material:	Natural brine
Capacity:	16 t/h resp. 120 kt/y SOP
Technology:	Conversion of KTMS to SOP via Schoenite
Project State:	Commissioning



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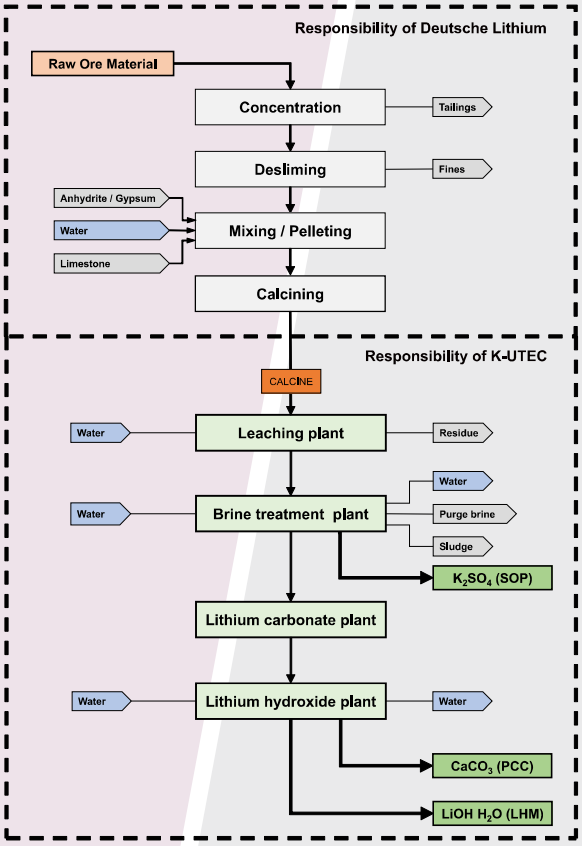
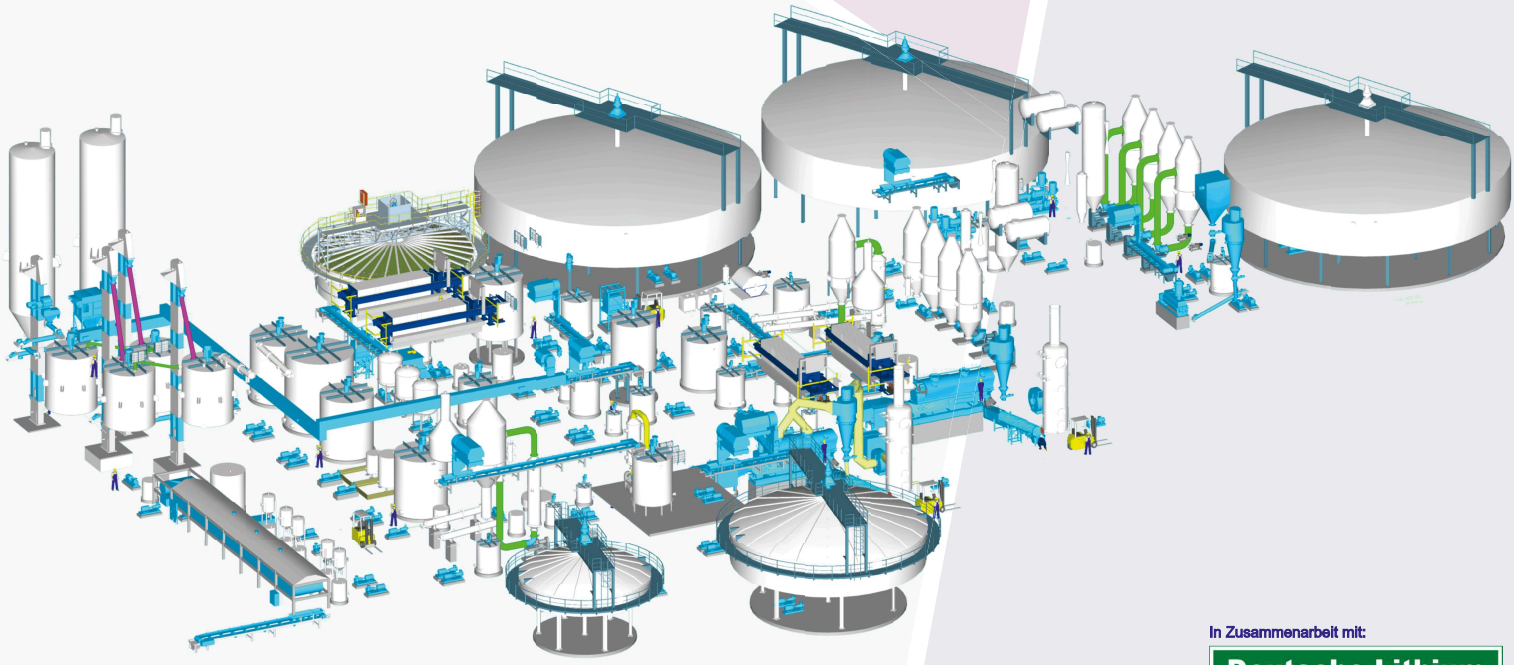
LiOH - Production Based on Calcined Zinnwaldite

LiOH from Calcined Zinnwaldite

Project Owner:	Deutsche Lithium GmbH
Project Location:	Mining and mechanical treatment in Germany Calcination / hydrometallurgical processing in Germany
Raw Material:	Calcined Zinnwaldite (Calcine)
Capacity:	1.5 t/h resp. 12.0 kt/y $LiOH \cdot H_2O$ 7.0 t/h resp. 55.0 kt/y SOP 2.0 t/h resp. 15.7 kt/y $CaCO_3$
Technology:	Leaching of Calcine Treatment of Leach Brine Precipitation of Li_2CO_3 mixed salt Conversion of Li_2CO_3 into LiOH, SOP and $CaCO_3$
Project State:	Extended Process Design

Process Flow Scheme





In Zusammenarbeit mit:

Deutsche·Lithium

K-UTEC SALT TECHNOLOGIES

Li_2CO_3 - from Hectorite Containing Ore

Li_2CO_3 from Hectorite Containing Ore

Project Owner: Western Lithium Corporation

Project Location: Kings Valley Deposit
Nevada / USA

Raw Material: Calcine

Capacity: 13 kt/y Li_2CO_3
46 kt/y K_2SO_4 (SOP)
72 kt/y Na_2SO_4

Technology: Leaching of Calcine,
Evaporation and Glaserite crystallization,
Decomposition to SOP,
Li_2CO_3 precipitation and
Glauber's Salt crystallization from mother liquor

Project State: In operation since 2006

Belt Filter

Plant Arrangement at K-UTEC AG's Facilities

Leaching Station

K-UTEC's Scope of Work

Process Design for Production Plant

Design, Engineering, Construction and Operation
of the Demonstration Plant at K-UTEC AG's Facilities

Capacity: 3 kg/h Li_2CO_3
11 kg/h K_2SO_4 (SOP)
12 kg/h Na_2SO_4

Sample Taking

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MOP - Based on Brine from Solution Mining

Full-scale Industrial Complex

Brine Field Pumping Station

Well Head and Piping

Evaporator and Surface Condenser

MOP – Treatment of Brine from Solution Mining

Project Owner:	Sinohydro Mining (LAO) Co., Ltd
Project Location:	Thangone Deposit near Vientiane Lao
Raw material:	Brine from Solution Mining
Capacity:	17 t/h / 120 kt/y KCl (MOP) 6 t/h / 40 kt/y NaCl
Technology:	Hot Solution Mining and Brine Processing
Project State:	Commissioned in 2011

K-UTEC's Scope of Work

Process Design and Basic Engineering

Supply of Blanket Control System

Support in Commissioning and Start-up

Training of Owner's Personnel

K-UTEC SALT TECHNOLOGIES

SOP and Thenardite - Utilisation of Bittern

SOP and Na_2SO_4 from Bittern

Project Owner: Botswana Ash (Pty) Ltd

Project Location: Sua Pan / Makgadikgadi pans complex
North East of Botswana

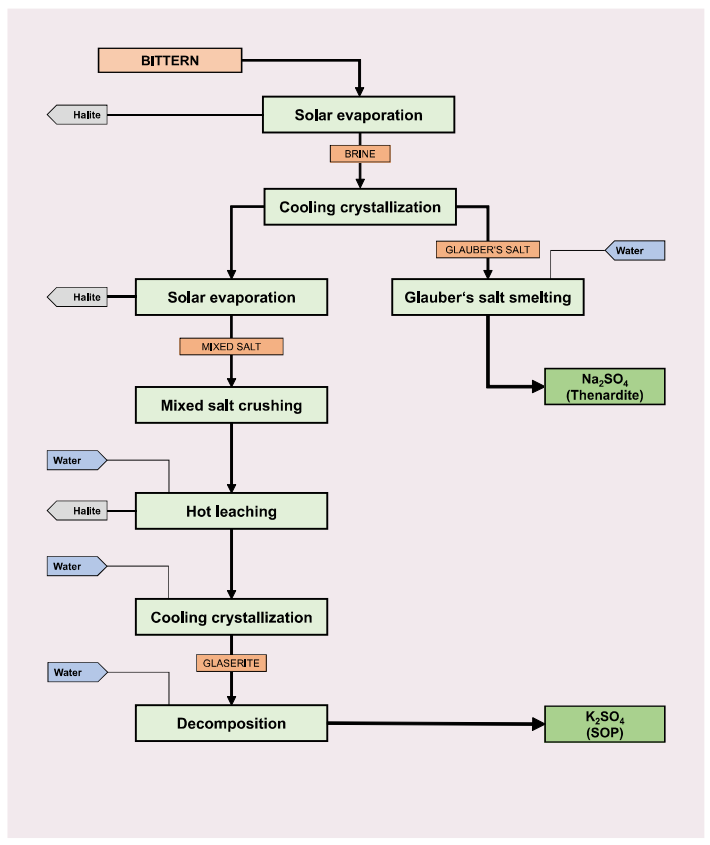
Raw Material: Bittern resulting from existing salt and soda ash plant

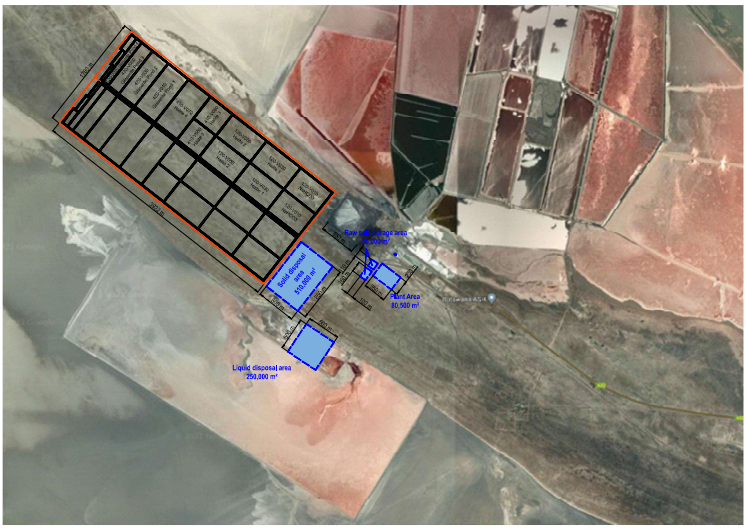
Capacity: 11.9 t/h resp. 80 kt/y K_2SO_4
27.5 t/h resp. 195 kt/y Na_2SO_4

Technology: Production of Thenardite by cooling crystallization of brine and smelting of Glauber's salt,
Hot leaching and cooling crystallization of Glaserite,
Decomposition of Glaserite to SOP

Project State: Extended Process Design

Process Flow Scheme





Layout plan

Brine sample

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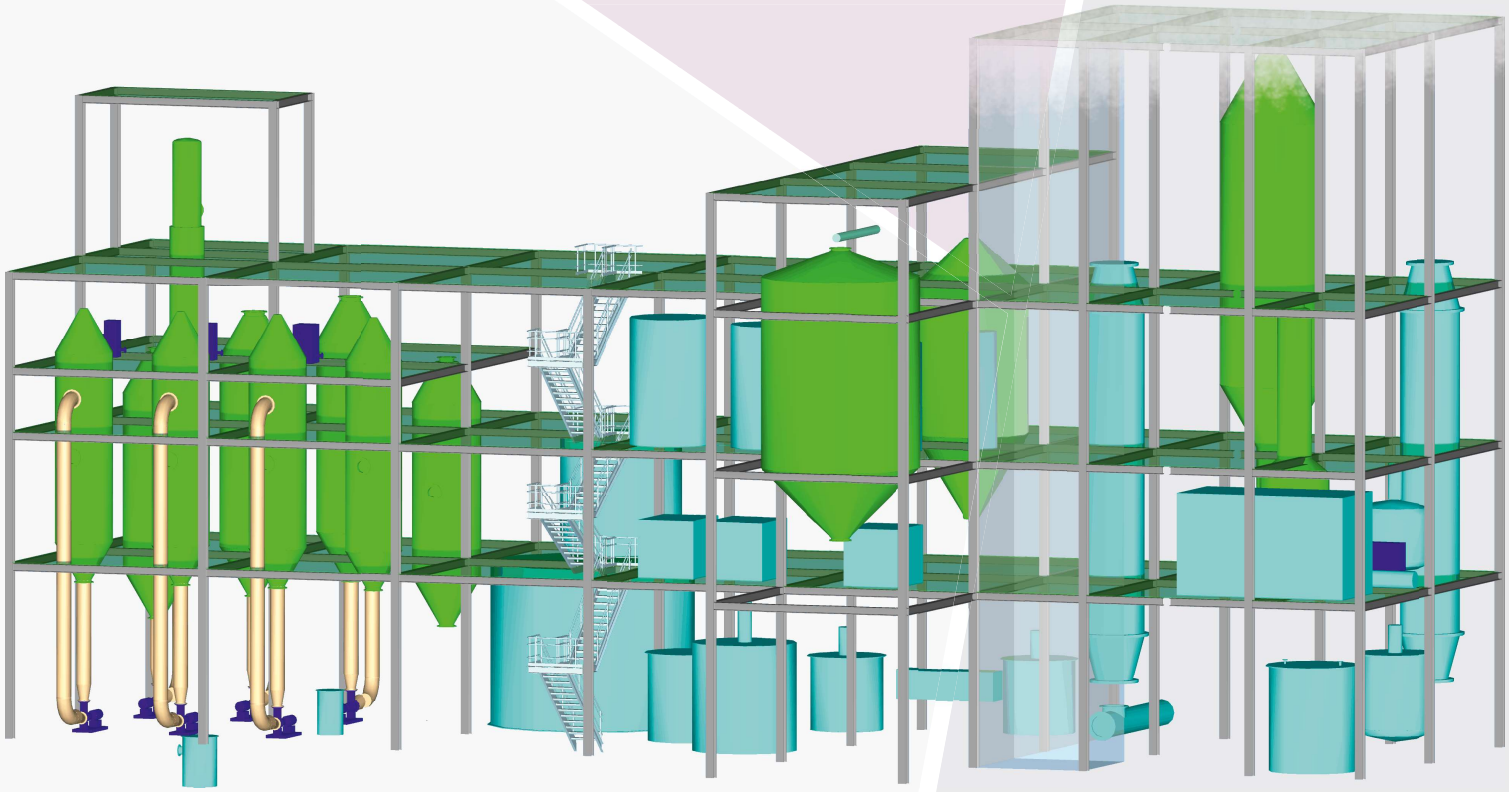
SOP - Production by Treatment of Mother Liquor

SOP by Treatment of Mother Liquor

Project Owner:	Salinen Austria AG
Project Location:	Ebensee / AUSTRIA
Raw Material:	Mother Liquor from Salt Production
Capacity:	2.2 t/h resp. 20 kt/y SOP
Technology:	Cooling Crystallisation of Glaserite; Conversion of Glaserite to SOP
Project State:	In operation since 2006



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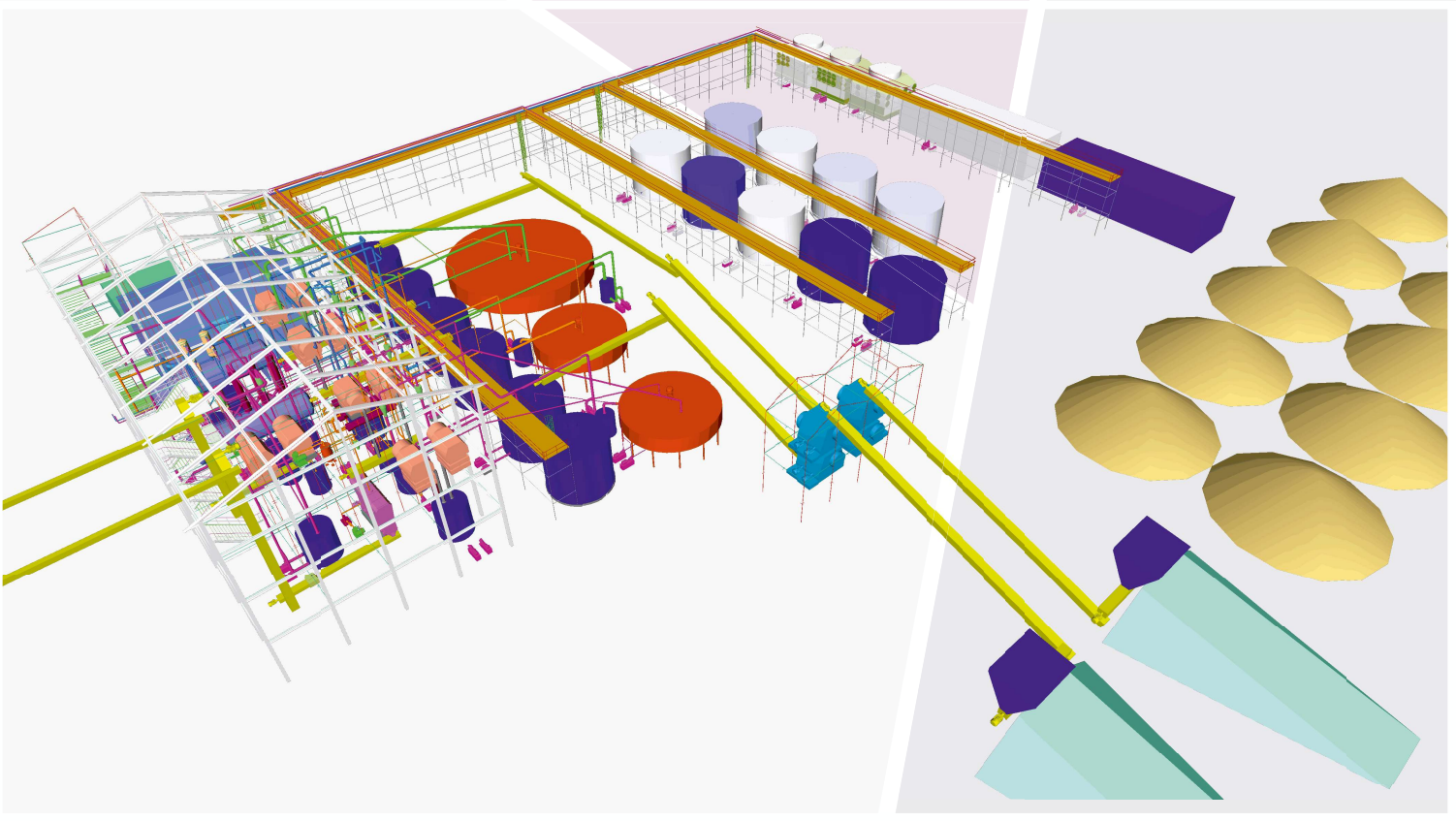
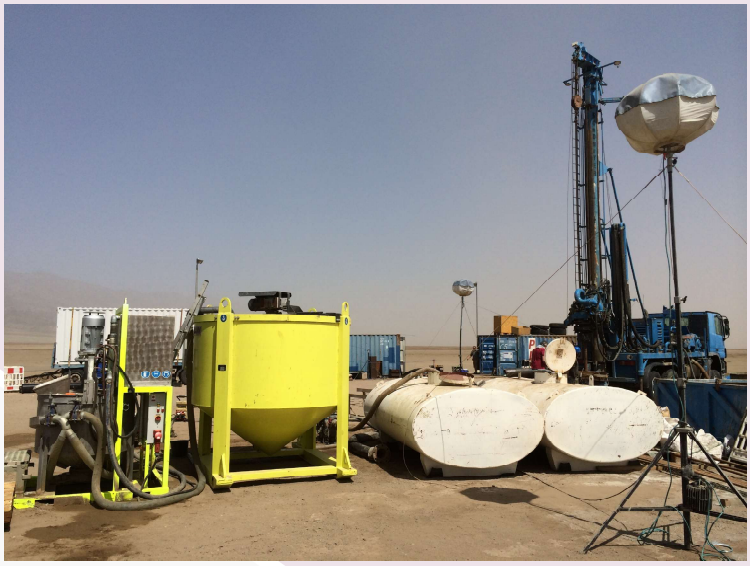
SOP - Production in India from KTMS

SOP from Kainite Type Mixed Salt

Project Owner:	Archean Group
Project Location:	Greater Rann of Kutch Gujarat / INDIA
Raw Material:	KTMSalt (Kainite Type Mixed Salt)
Capacity:	20 t/h resp. 100 kt/y SOP
Technology:	Conversion of KTMS to SOP via Schoenite
Project State:	In operation



SOP Production Based on Kainite Typed Mixed Salt



Pilot Plant for Solution Mining

Project Owner:	Circum Minerals Limited
Project Location:	Danakil Depression / Ethiopia
Capacity:	2,000,000 t/y KCl (MOP) 750,000 t/y K_2SO_4 (SOP)
Technology:	Solution Mining Solar Evaporation SOP Production MOP Production
Project State:	Feasibility Study in 2014 Detailed Feasibility Study for 750,000 t/y K_2SO_4 (SOP) in 2018

K-UTEC's Scope of Work

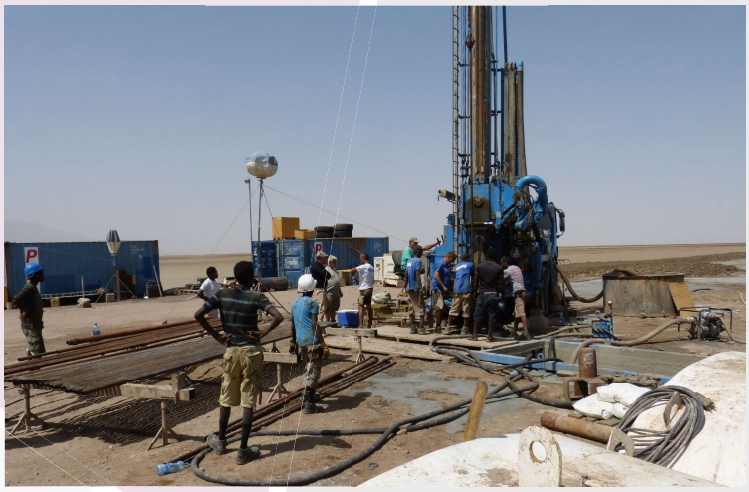
Feasibility Study with Process Design

Preliminary Basic Engineering

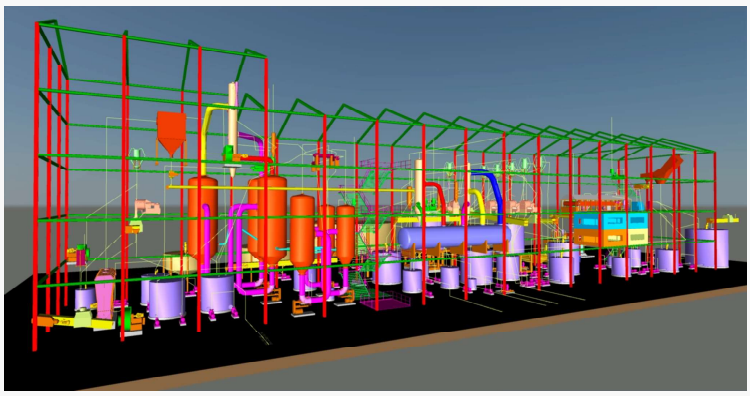
Cost Estimation and Economic Assessment

Bench Scale Solution Mining Tests

Bench Scale Solar Evaporation Tests



Work on Bore Hole

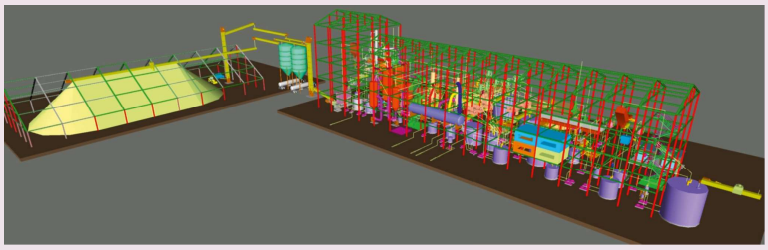


3D Model for SOP Plant

3D Model for MOP Plant

K-UTEC SALT TECHNOLOGIES

SOP Production Based on Kainite Typed Mixed Salt



3D Model of SOP Plant

Project Owner:	Salmueras Sudamericanas S.A.
Project Location:	Reservorio de Cañamac / Peru
Capacity:	100,000 t/y K_2SO_4 (SOP) 60,000 t/y MgO 110,000 t/h DiCal 10,000 t/y Bromine
Technology:	Brine winning and solar evaporation, SOP via Kainite and Schoenite, Utilisation of resulting bittern for extraction of Bromine and production of MgO and DiCal
Project State:	Basic Engineering finalised in 2013

K-UTEC's Scope of Work

Brine Winning Test

Bench Scale Tests for Solar Evaporation and Process Steps

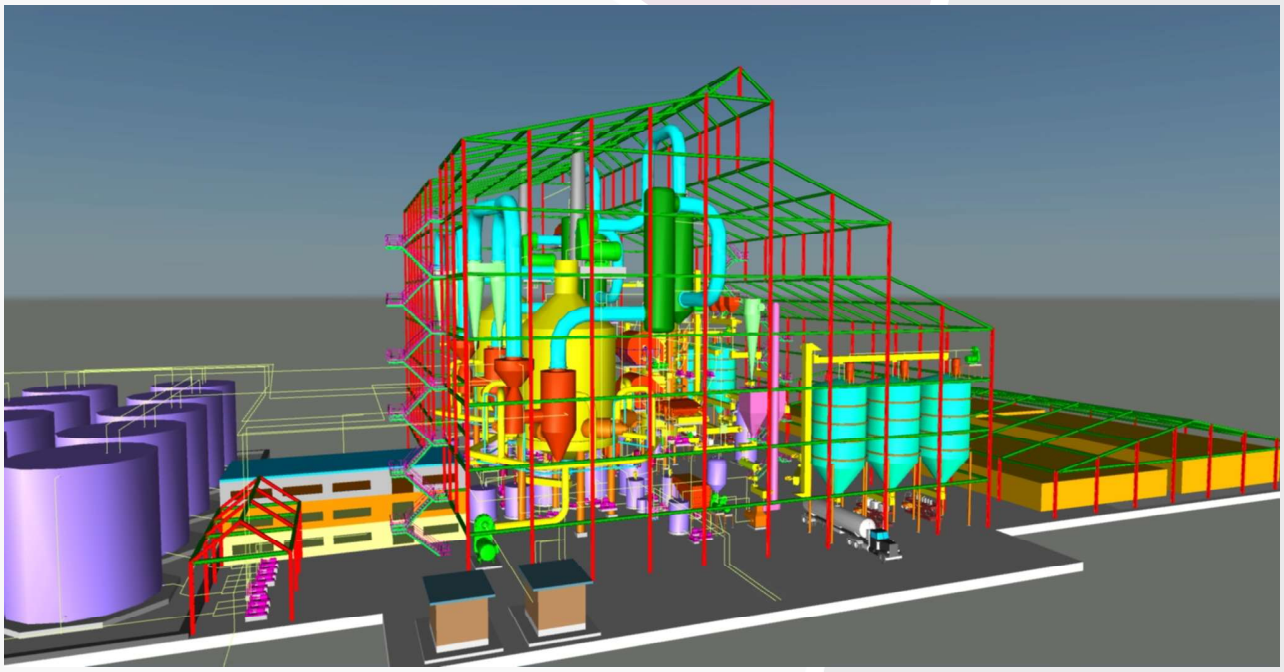
Feasibility Study with Process Design

Basic Engineering

Cost Estimation

Economic Assessment

Solar Evaporation Test Field



3D Model of MgO Plant

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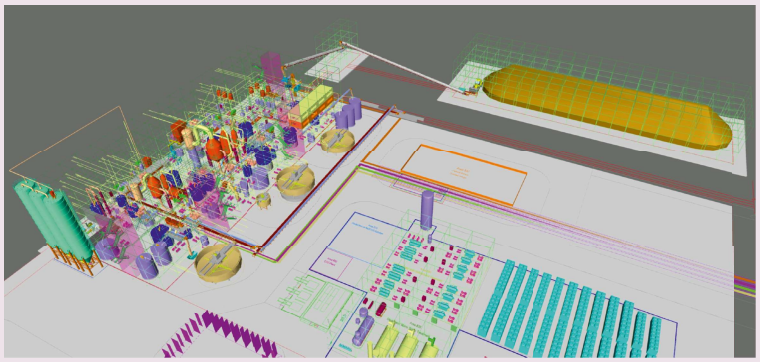
Li_2CO_3 Production Based on Mixed Salt



Industrial Plant Complex

Project Owner:	Corporación Minera de Bolivia Gerencia Nacional de Recursos Evaporiticos
Project Location:	Salar de Uyuni / Bolivia
Capacity:	15,000 t/y Li_2CO_3
	Quality: 99.6 % Li_2CO_3 Plant recovery: 80 %
Technology:	Leaching of mixed salt and crystallisation of Li_2CO3 in battery quality
Project State:	Detailed Engineering finalised in 2017

K-UTEC's Scope of Work

Test Works to Confirmation the Process

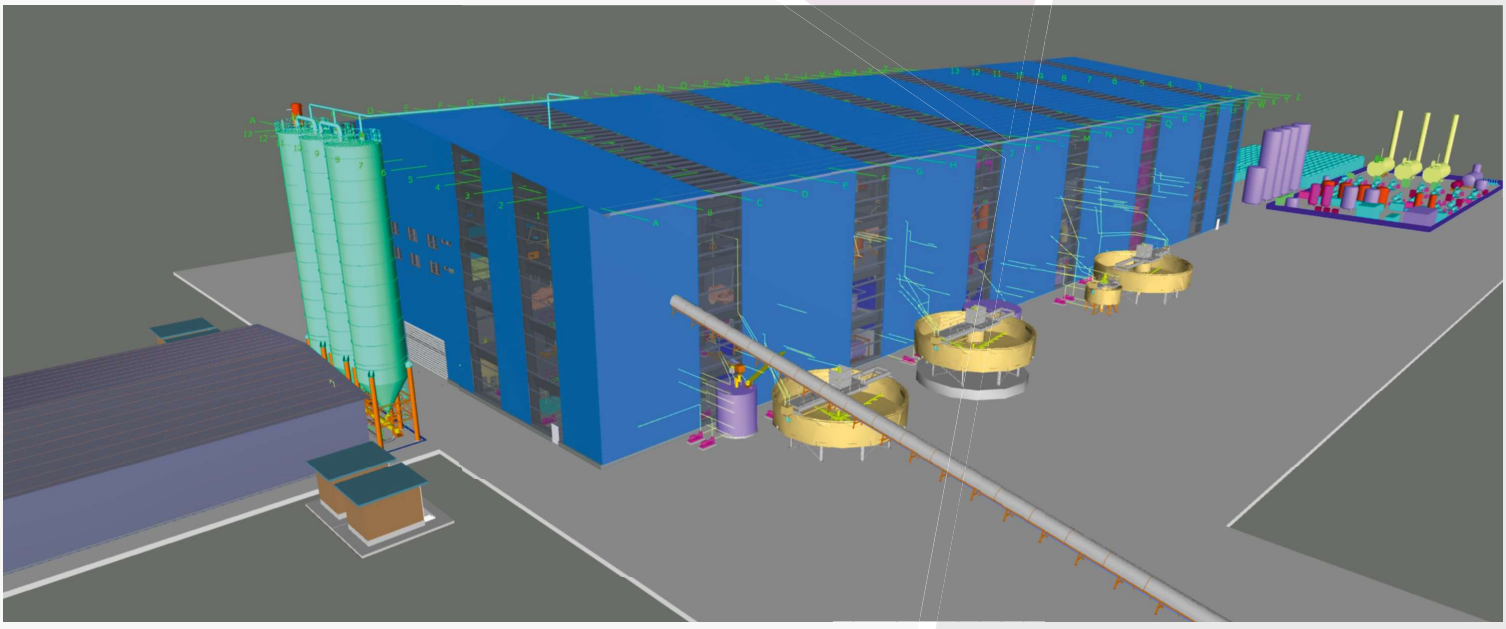
Process Design and Basic Engineering

Detail Engineering

Civil Engineering

Cost Estimation and Economic Assessment

Solar Evaporation Field



3D Model of Li_2CO_3 Plant

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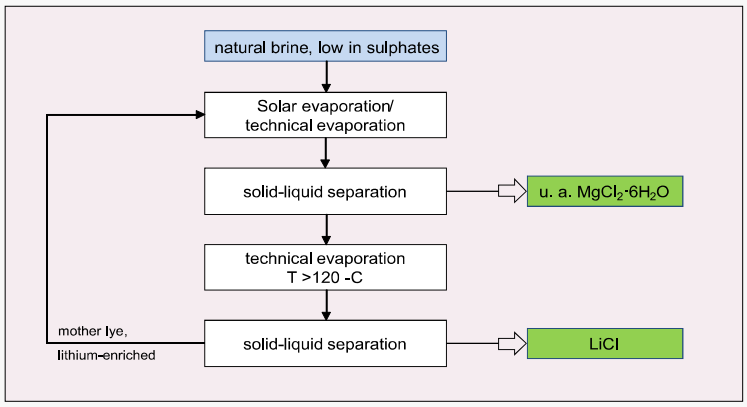
Resource-efficient Lithium Production

gefördert durch
DBU
Deutsche Bundesstiftung Umwelt
www.dbu.de

Excavation in the area of Mina Daniela

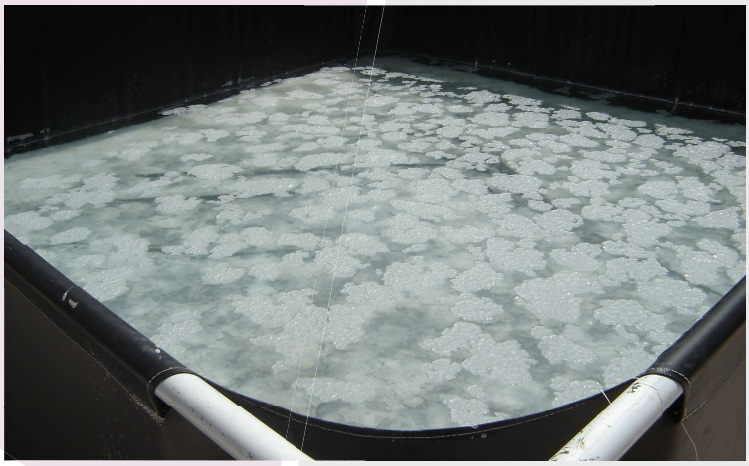
Battery quality achievable

With the help of solar evaporation and technical processing steps, lithium chloride with a purity of 99 % could be obtained. A plant operating in this way can be operated economically and in a more resource-efficient manner. The transfer to other natural brines containing lithium chloride is possible but requires a sufficiently high starting concentration of lithium.



Schematic representation of the main process steps

Lithium is regarded as a key raw material for the coming decades. The reason for the growing demand for lithium and lithium components is above all its importance in storing energy using lithium-ion batteries, which have become indispensable for example in mobile phones and laptops. Currently, lithium compounds are extracted from minerals and from a few salt lakes in Chile and Argentina, while large quantities of lithium remain unused.



Crystallization of the salts in the evaporation ponds

Fractionated crystallization

The aim of a research project of K-UTEC AG Salt Technologies was the development of a resource-saving process for the direct extraction of easily soluble lithium salts, lithium chloride and lithium sulphate from natural brines. The core step of the process is fractional crystallization: lithium salts are extracted directly from natural brines – here, for example, from the salt lake Salinas Grandes (Argentina) – by intelligent process control and separation of the crystallized salts. This is saving energy- and raw material-intensive processing steps.

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