K-UTEC SALT TECHNOLOGIES

From Sodium Sulphate Waste To Premium SOP

A proven glaserite-based platform to convert industrial Sodium Sulphate (Na_2SO_4) waste into high-value fertiliser.

Sodium sulphate is a growing by-product across lithium refining, battery recycling, pulp and paper, viscose fibre, and chemical manufacturing. Traditionally treated as waste, it represents a powerful circular-economy opportunity.

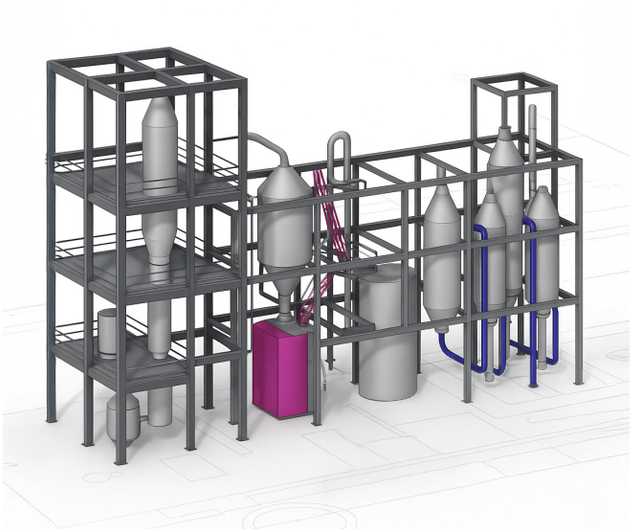
K-UTEC's proven Glaserite process converts sodium sulphate (Na_2SO_4) and potassium chloride (KCl) into premium sulphate of potash (SOP) and saleable sodium chloride (NaCl), transforming regulated waste streams into profitable, ESG-aligned products.



From Compliance Burden to Revenue Platform

A powerful circular-economy opportunity!

FROM WASTE TO VALUE



/ “From Waste to Value”–Turning Sodium Sulphate Waste Into Premium SOP

Sodium sulphate waste streams are becoming a major challenge across the battery supply chain, chemical manufacturing (including methionine and silica), and industrial and fiber production (such as pulp and paper, viscose fiber). K-UTEC’s proven process transforms this waste into high-value sulphate of potash (SOP) and industrial-grade sodium chloride (NaCl), unlocking new revenue opportunities amid growing ESG requirements and regulatory pressures.

With strong global demand and premium pricing, SOP represents a highly attractive market. K-UTEC supports a low-disruption transition by leveraging existing infrastructure wherever possible and offering flexible commercial models, ranging from feedstock supply to fully integrated SOP production. Backed by unmatched technical expertise, K-UTEC is the partner to turn this opportunity into reality.

/ SOP: High-Value Potassium for High-Value Crops

SOP (K_2SO_4) is a premium potassium fertiliser used in high-value agriculture. It delivers essential potassium without added chloride, making it ideal for crops that are salt-sensitive or grown in saline-prone soils.

- Chloride-Free Advantage: SOP contains no chloride, unlike MOP (Muriate of Potash), which makes it suitable for delicate crops like fruits, vegetables, and nuts.
- Premium Crop Performance: Enhances plant quality, boosts disease resistance, and improves taste, colour, and shelf life.
- ESG-Aligned Product: SOP supports sustainable farming by reducing salinity risk and improving soil health.
- Target Crops: Commonly used on grapes, berries, citrus, avocados, coffee, tea, tobacco, leafy greens, and flowers.
- Higher Market Value: Commands a price premium over MOP due to its crop-specific value and lower environmental impact.

/ Commercial Drivers

Sodium sulphate is a common by-product in lithium refining, battery recycling, pulp and paper, and chemical manufacturing — often managed as waste under increasing compliance pressure. In parallel, demand for SOP is rising, driven by:

- Premium pricing and market stability
- Agricultural needs (e.g. chloride-sensitive crops)
- Tightening regulatory limits on waste discharge

K-UTEC’s SOP-from-Na_2SO_4 solution helps producers, capture SOP margin uplift, meet ESG targets by valorising regulated waste, and enhance NaCl output as a value-added by-product.

/ K-UTEC Credentials

- Decades of leadership in salt, potash, and brine processing, from feasibility to production.
- Trusted partner on global SOP projects, including pilot plant design, process optimisation, and start-up support.
- Process development including bench and pilot scale testing
- ISO 9001-certified QA; in-house ISO 17025-accredited analytics.
- Global project footprint across industrial brines and salt waste streams, with deep integration experience.



/ Proven SOP Process, Engineered for Waste Valorisation

K-UTEC's SOP-from-Na_2SO_4 solution applies a proven, industry-standard process based on the well-established Glaserite route, combining sodium sulphate (Na_2SO_4) and potassium chloride (KCl) to produce high-purity sulphate of potash (SOP) and saleable sodium chloride (NaCl) as a by-product.

The process is environmentally efficient, modular, and engineered for flexible integration with existing industrial sites, including lithium refineries, battery recycling facilities, paper mills, and chemical plants. It maximises integration with available infrastructure and offers a practical, low-disruption pathway to valorise regulated waste streams.

/ Estimated Consumption Metrics

Indicative utility and reagent consumption per tonne of SOP produced:

		Low-Yield	High Yield
Input Na_2SO_4	$t_{Na_2SO_4}/t_{SOP}$	0.82	0.82
Input KCl	t_{KCl}/t_{SOP}	0.90	0.86
Output - NaCl	t_{NaCl}/t_{SOP}	0.69	0.67
Water Requirements	t_{water}/t_{SOP}	3.40	3.52
Energy Requirements	kWh/t_{SOP}	200	
Steam Requirements	t_{5bar}/t_{SOP}	0.1	
Evap.	t_{vapour}/t_{SOP}	3.20	3.34
Fresh Water Feed	$t_{water\ add.}/t_{SOP}$	0.20	0.18
Recoveries	Potassium	95,5%	99.3%
	Sodium	99.1%	99.6%

/ Utility & Infrastructure Requirements

The SOP plant requires a stable and modest utility setup:

Power

A reliable power supply is essential, and some sites may need upgrades to existing electrical infrastructure.

Steam

A compact boiler provides steam for drying and granulation.

Water

Fresh water use is limited, mainly for washing and conditioning. Existing water systems can often be used.

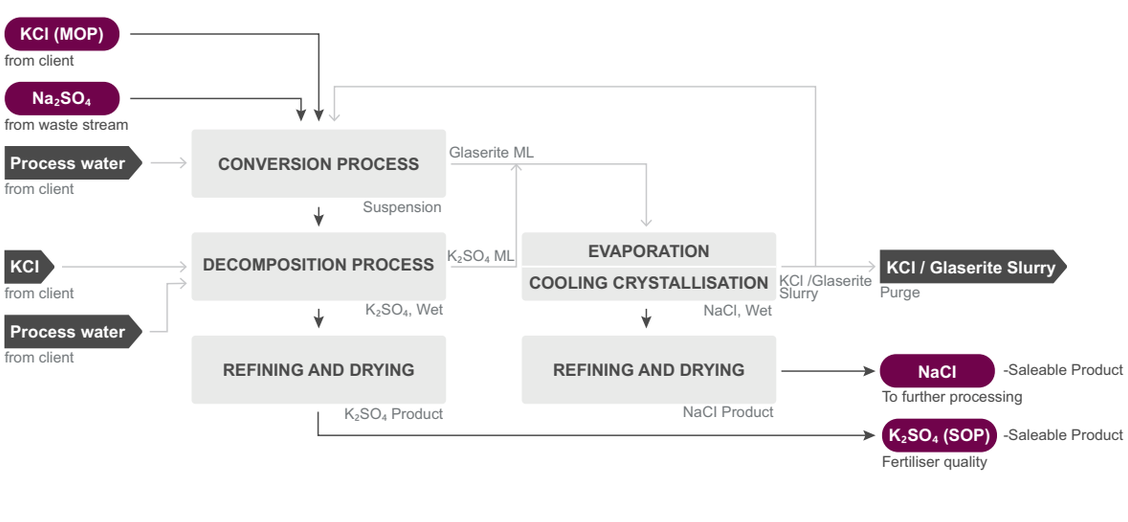
Cold & Chilled Water

Will be used for temperature control and recycling condensate to minimize fresh water consumption.

/ Core Process Steps

- **Raw Material Preparation:** Suitable Na_2SO_4 and KCl are dosed, dissolved, and mixed using screw conveyors and belt scales.
- **Glaserite Formation:** In loop reactors, Na_2SO_4 and KCl react under special process parameters to form Glaserite ($Na_2SO_4 \cdot 3K_2SO_4$).
- **Solid-Liquid Separation:** The resulting slurry is centrifuged to separate the Glaserite solids. Mother liquor is collected for further treatment or NaCl recovery.
- **SOP Conversion:** Glaserite is reacted with additional KCl in a second-stage reactor. A leaching step removes remaining NaCl and improves SOP purity.
- **Final Separation and Polishing:** SOP undergoes clarification and polishing. Leaching and washing steps reduces chlorides and enhances quality.
- **Drying and Packaging:** SOP is dried, compacted, and dispatched. Packaging options include 20kg bags, 1-tonne bulk bags, or direct bulk export.

/ Process Of Na_2SO_4/KCl Input To SOP & NaCl Output.



Case Study | SOP from Sodium Sulphate Waste

10,000 tonnes per annum (tpa) SOP – No Evaporation Route

/ Process & Site

- **Integrated SOP plant** co-located with an existing sodium sulphate waste stream (e.g. chemical processing, battery materials, pulp & paper, lithium refining).
- **Feedstock:** Sodium sulphate (Na_2SO_4) waste or by-product stream, currently disposed or sold at low value.
- **Process route:** Direct conversion to SOP using K-UTEC's refined Glaserite-based flowsheet (no solar evaporation or pond infrastructure required).
- **Utilities:** Grid power; low-pressure steam for washing, drying, and granulation.
- **Water:** Minimal freshwater intake; closed-loop process water with high internal recycle.
- **Footprint:** Compact, modular plant suitable for industrial sites.

/ Capital Intensity (Indicative)

- **USD 600-1,100 per annual tonne SOP**
- Range reflects production scale, feedstock characteristics and process configuration
- Lower end assumes containerised design excluding NaCl evaporation circuit
- Higher end reflects conventional glaserite capital benchmarks

/ Operating Cost & Margin Potential

- **Estimated cash operating cost: USD 220–280 /t SOP**
- **SOP price assumption: USD 650–900 /t** (granular, export parity)
- **Indicative gross margin: USD 370–650 /t SOP**

This cost structure benefits from:

- Zero or negative-cost feedstock
- No evaporation ponds or large land requirements
- Low energy intensity compared to Mannheim SOP routes

/ Financial Outcomes (Indicative)

Using preliminary engineering and mid-range capex and opex assumptions:

- **Annual SOP production:** 10,000 tpa
- **Annual EBITDA: ~USD 5–8 million**
- **Pre-Tax NPV (8%): ~USD 20–35 million**
- **IRR: 20-25%**
- **Payback period: ~4–5 years** from start of operations

(Results sensitive to SOP pricing and site-specific utility costs.)

/ Key Sensitives

Financial outputs are sensitive to:

- Sodium Sulphate waste feedstock type
- SOP market price assumptions
- Location
- Access to logistics infrastructure

/ Key Value Drivers

- **Waste-to-Value Upside:** Converts regulated sodium sulphate waste into premium fertiliser.
- **Feedstock Advantage:** No mining, no brine fields, no evaporation — industrial waste as input.
- **Low-Carbon SOP:** Avoids Mannheim furnace emissions and reduces lifecycle CO_2 intensity.
- **Fast-to-Market:** Compact plant enables short development timelines.
- **ESG & Regulatory Alignment:** Reduced waste disposal, circular resource use, improved environmental compliance.
- **Scalable Platform:** Proven pathway to expand capacity or replicate across multiple waste streams.

/ UNLOCK VALUE FROM SODIUM SULPHATE WASTE

Leverage underutilised sodium sulphate streams with a **proven SOP conversion process**, modular plant design, and support from **K-UTEC's global salt and potash specialists.**

For feasibility assessments, costed process designs, or investment structuring:

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