GORE® Tubular Back-Pulse Filters
For Lithium Extraction Applications

LITHIUM SEPARATIONS WITH GORE'S TUBULAR BACK-PULSE MEMBRANE FILTRATION TECHNOLOGY

Lithium is a critical mineral in the transition to clean energy, crucial to everything from electric cars to solar or wind power. However, lithium production requires the removal of impurities like magnesium, calcium, and sodium species, which can be challenging to separate due to corrosive conditions, high solids loading, or sticky solids compressibility. Conventional filter media can amplify production costs if fine particles pass through the filter leading to increased downstream separation needs and recycling streams. Same is true if particles embed themselves within the filter, bottlenecking flow and leading to excessive downtime for chemical cleaning. As producers scale operations up, maintaining quality separations at high throughput will be key for achieving economical lithium production.

Lithium Extraction: How to Improve Lithium Concentration During Recovery

Gore is working to develop filtration solutions that ensure efficient lithium extraction to support a sustainable transition. Gore's tubular membrane back-pulse filters operate like a liquid baghouse. Short filtration cycles overcome high solids build-up and sticky metal hydroxide challenges. These candle filters deliver submicron filtration for feeds anywhere from 1 ppm to over 12 wt% solid loadings at flow rates from 100 gpm to over 2000 gpm.

The microstructure of the Gore filter membrane mitigates fine particle penetration of the filter media, allowing:

- Quick back pulsing of thin, dense filter cakes
- Avoidance of any flocculant, pre-coat, or body aid.

Gore's back-pulse filters turn three steps into one:

- **Eliminate clarifiers, sand, and polish filters.**

The unique microporous structure of Gore's surface filters, overall geometry, and filter operation expertise offers a highly efficient and cost-effective means of eco-friendly lithium brine filtration.

How is lithium separated from brine?

Lithium refining utilizes aqueous lithium solutions from various sources, such as natural brines, hard rock or battery recycling leachate. Impurity profiles can vary significantly, even for samples taken from two points in the same brine source. Refining steps must adapt to resource characteristics to optimize separation efficiency. As brines progress through processing, unit operations may alternate between removing impurities and increasing concentration. Impurities are removed through precipitation using temperature or reagents and through selective separation steps like direct lithium extraction (adsorption, ion exchange, solvent extraction, membrane nanofiltration). Streams can be concentrated through effective elution of direct lithium extraction, heating/evaporation, reverse osmosis, or electrodialysis. Recycling streams recover lithium caught in impurity flows and freshwater for reuse.

Once impurities are mostly removed, ion exchange columns polish residual magnesium, calcium, or boron, and the lithium solution is converted to the desired end product through reagent or electrochemical methods. End products could include, but are not limited to, lithium carbonate, lithium hydroxide monohydrate, lithium chloride, or lithium phosphate.

Gore's tubular back-pulse filters improve lithium purity during the recovery process

Gore’s back-pulse filters efficiently remove fine solids from brine and provide effective cake release. With higher solids concentration in the underflow, de-watering burden decreases.

Efficiently removes solid impurities from brine

Effective cake release with sticky impurities

Performs in corrosive and high temperature environments

Potential energy savings depending on application

Enables higher solids concentration in product collection

More environmentally friendly lithium brine separation

The unique microporous structure of Gore's surface filters, overall geometry, and filter operation expertise offers a highly efficient and cost-effective means of separating fine solids:

- Lower pump energy consumption
- Avoidance of pre-coat or body aids
- Reduced contamination
- Effective cake release, allowing metal hydroxides to settle quickly at the bottom of the filter vessel instead of redistributing

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