



# Lithium Carbonate Production from Spodumene

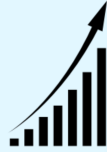
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## Background

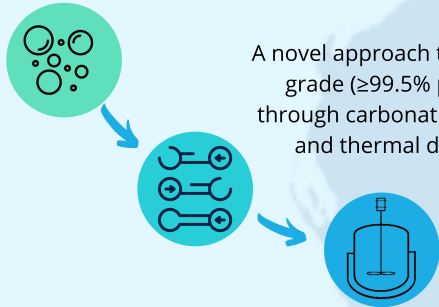


Lithium carbonate ( $\text{Li}_2\text{CO}_3$ ) is a key component of the cathode in lithium-ion batteries.

The battery grade  $\text{Li}_2\text{CO}_3$  market is expected to grow to \$5.33 B USD by 2025.



The capacity of the proposed plant is 15,250 tonnes per year, which is 7.8% of the 2019 global  $\text{Li}_2\text{CO}_3$  market or 3.7% of the projected 2025 market.



A novel approach to produce battery grade ( $\geq 99.5\%$  purity)  $\text{Li}_2\text{CO}_3$  is through carbonation, ion exchange, and thermal decomposition.

## Environmental Assessment

Our Plant

### Combustion Emissions



4.6 tonnes  $\text{CO}_2$ /hr

### Tailings Disposal



1 km x 1 km Tailings Storage Facility

### Slurry Waste Treatment



7.9 tonnes of sulphates/hr

## Process Overview

6% Spodumene Ore



### Calcination and Acid Roasting



$\alpha$ -spodumene is converted to  $\beta$ -spodumene in the calciner.  $\beta$ -spodumene is roasted with  $\text{H}_2\text{SO}_4$  in a kiln to form  $\text{Li}_2\text{SO}_4$ .

### Precipitation and Impurity Removal



Wet solids are neutralized, leached, and filtered to remove the major impurities. Mg and Ca are precipitated out.

### Lithium Carbonate Crystallization



$\text{Li}_2\text{CO}_3$  crystals are formed by adding  $\text{Na}_2\text{CO}_3$  and concentrating the slurry in a MEV.  $\text{Li}_2\text{CO}_3$  crystals are filtered and re-diluted.

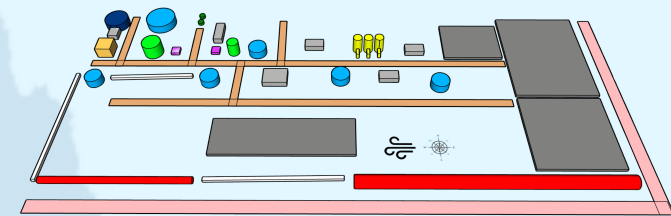
### Carbonation and Decomposition



$\text{Li}_2\text{CO}_3$  is converted to  $\text{LiHCO}_3$  using  $\text{CO}_2$ . Ion exchange removes trace impurities.  $\text{Li}_2\text{CO}_3$  is reformed and dried.

99.95% Battery Grade Lithium Carbonate

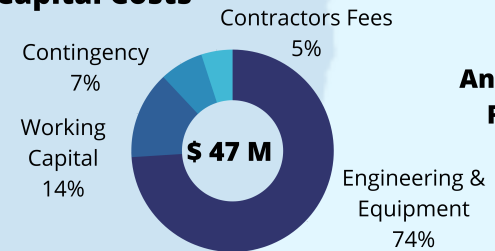
## Plant Layout



- Kilns
- Mixing Tanks
- Dryer
- Reactors
- Ion Exchange
- Blowers
- Boiler
- MEV
- Filters
- Admin/Facilities
- Conveyors
- Fire Lane

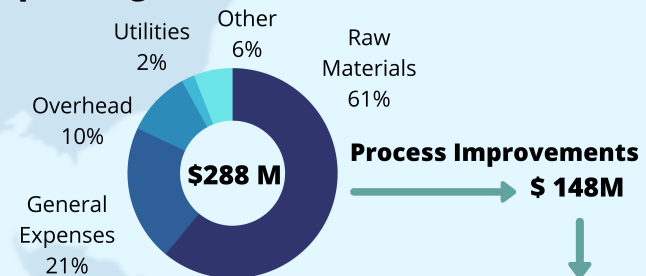
## Economic Analysis

### Capital Costs



**\$ 198M Annual Sales Revenue**

### Operating Costs



**Process Improvements \$ 148M**

**14% IRR, 2 year Payback Period**