

► cast film lines

SML
EXTRUSION LINES – ENGINEERED TO PERFORM ►

► ***LiBSF* LITHIUM ION BATTERY
SEPARATOR FILM**



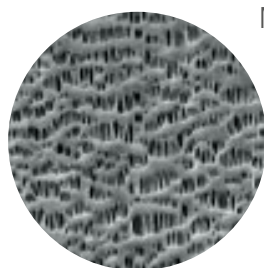
**Extrusion lines –
engineered to perform**

Meeting highest requirements

Lithium-ion battery separator films manufactured on SML's extrusion lines are particularly suitable for high power densities. Our technology is based on a dry process which ensures excellent chemical and thermal stability, tensile strength as well as low film thickness. It enables a cost efficient and eco-friendly production.

Battery separator film

The battery separator membrane is a microporous film that is inserted between the positive and the negative electrode in a liquid, electrolyte gel, or molten salt battery. Its function is to prevent physical contact between the positive and negative electrodes, while serving as an electrolyte reservoir to enable free ionic transport.

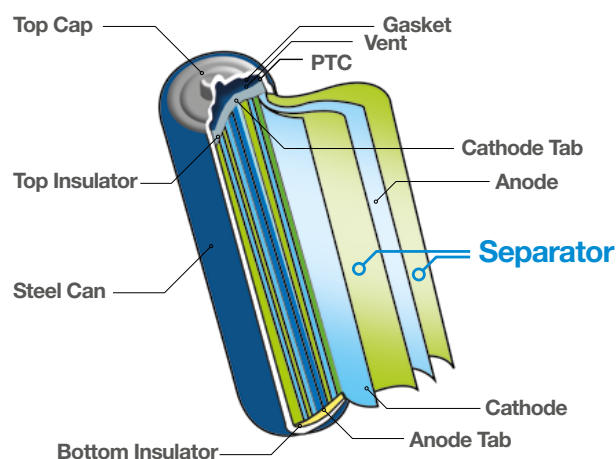


Microporous membranes are characterised by their thickness (between 10 and 40 μm), small pore size ($<1 \mu\text{m}$) and low porosity ($\sim 40\%$). Either a dry or wet production process is used, both of which include an extrusion step to create a thin film and employ one or more orientation steps to generate the pores. SML provides dry process extrusion lines for the production of mono-layer or co-extruded battery separator films.

Fundamental film properties are needed

- Porosity of more than 40 percent
- Uniform pore size
- Excellent quality and thermal stability
- Tensile strength
- Low shrinkage

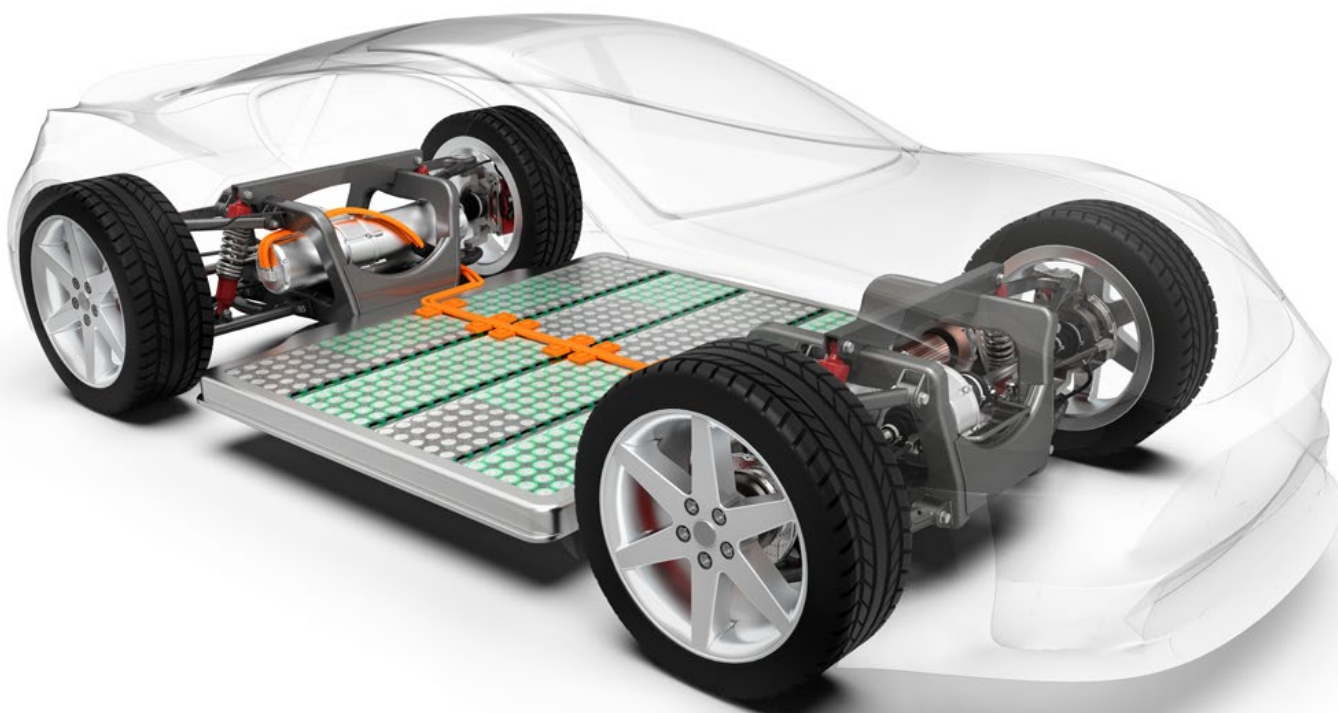
Battery structure

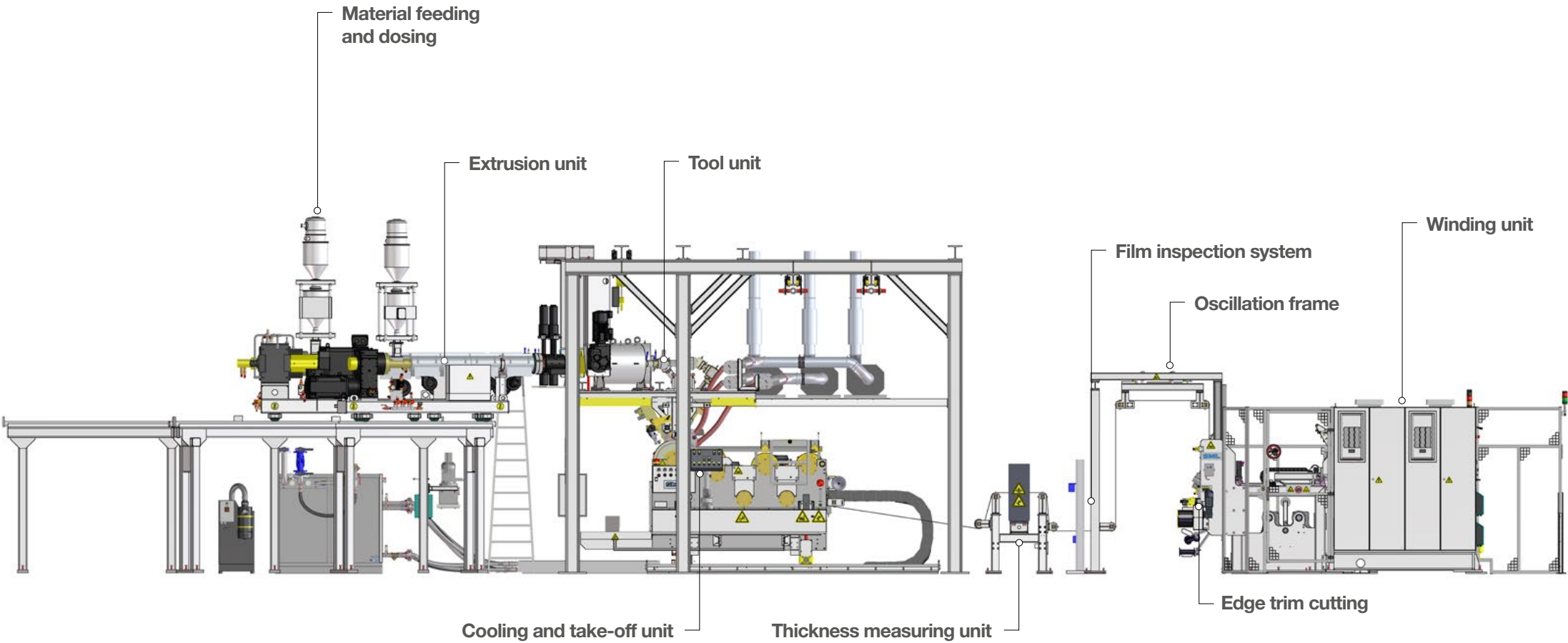




Step into a growing market

Lithium-ion battery separator film is used in rechargeable batteries for mobile phones, laptops, e-vehicles and hybrid cars.





Dimensions:

H 6 m
L 29 m
W 10 m

Future trends are moving in two directions.

The first involves a reduction in film thickness, which is necessary for small, high-capacity rechargeable batteries like those used in mobile phones. The second relates to thicker separators, which are required for applications such as e-vehicles.

There are three main products on the market:

1 PP-BASED MONO-LAYER FILM

2 PP-PP-PP BASED THREE-LAYER FILM

3 PP-PE-PP THREE-LAYER FILM



EXTRUSION UNIT

- ▶ Fully integrated extruder mounted gravimetric dosing system
- ▶ Single screw extruders or twin screw extruders
- ▶ Hydraulic piston filter, melt pump and disk or candle filter
- ▶ Inline die splitter for easy die cleaning
- ▶ Automatic single manifold or 3-layer multi-manifold die
- ▶ Dual chamber vacuum box with two exhaust fan

TAKE-OFF AND ANNEALING STATION

- ▶ Electrostatic and pneumatic edge pinning system
- ▶ 6 to 10 annealing and cooling rolls, individually driven and temperature controlled
- ▶ Rubberised nip roll at each annealing and cooling roll

THICKNESS MEASURING UNIT

- ▶ Frame with Beta sensor or IR-sensor or X-ray-sensor
- ▶ Automatic profile control system
- ▶ Film inspection system

WINDER

- ▶ Fully automatic turret winder W1050
- ▶ Integrated edge trim cutting
- ▶ S-wrap for tension separation
- ▶ Ultra-light carbon-fibre dancer roll
- ▶ Contact and gap winding mode
- ▶ Low winding tension and low contact pressure adjustable
- ▶ Shaftless core clamping
- ▶ Cross-cutting with twisting knife

► Take advantage of our global leadership in extrusion technology.

**ANALYSES
DEVELOPMENT
PRE-TESTED PERFORMANCE
DELIVERY ON TIME
SERVICE SUPPORT
CUSTOMER SATISFACTION**

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