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BONSAI TECHNOLOGY

MAKE LiB POSSIBLE

Tabless Cylindrical Cell – Free Guide

Cylindrical Cell – Introduction

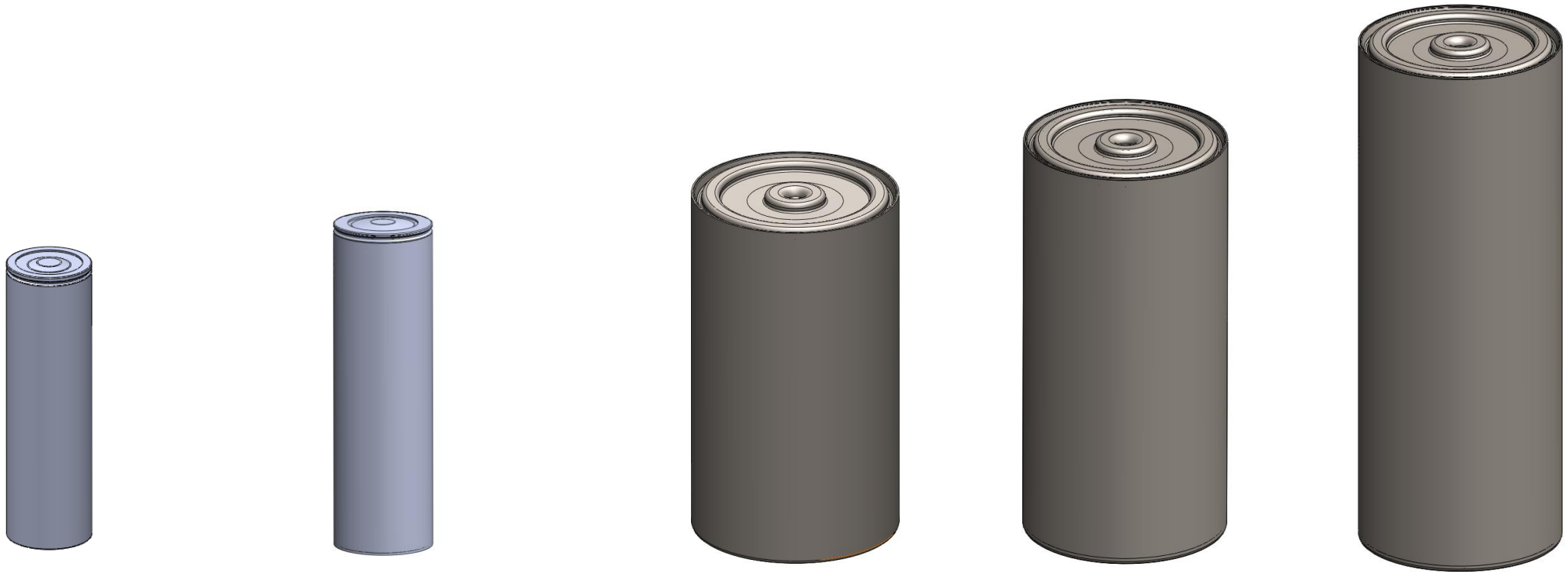
The Lithium-ion battery industry has seen a major innovation in recent years with the development of the Tabless Cylindrical Cell. Currently, only Tesla is producing this high-tech and super-efficient battery cell, while other major players like LG ES, Samsung SDI, BMW, and others are working on developing their own tabless cell design. This guide aims to provide all the necessary information to understand the basics of the tabless cylindrical cell manufacturing process and explain why this design is so revolutionary.

It is important to note that very few people worldwide are aware of this new product design, and yet it has the potential to revolutionize the battery industry. The tabless cylindrical cell design eliminates the traditional tab used to connect the electrodes to the cell's external terminals, allowing for a more efficient flow of current and a reduction in resistance. This design also allows for a larger volume of active materials, which increases the battery's energy density and overall performance.

The manufacturing process for tabless cylindrical cells involves a unique assembly process that eliminates the need for the tab, resulting in a simpler and more streamlined manufacturing process. This innovative design has the potential to significantly reduce production costs while also improving battery performance.

In conclusion, the tabless cylindrical cell is a game-changing innovation in the Lithium-ion battery industry, with the potential to significantly improve battery performance and reduce production costs. This guide provides a comprehensive overview of the manufacturing process and the benefits of this revolutionary design.

Cylindrical Cell – Formats



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Cylindrical Cell – Formats

Two mainly macro groups of cylindrical batteries are existing:

- With tab, welded in the JR
- Without tab welded in the JR, even called tabless cells

The first one represent a mature tachnology, the tabless cells, after Tesla Battery day in 2020 have been started to be popular and provide many advantages compared to previous technology.
The main difference between «With Tab» and «Tabless» cells, are the presence of «Tab» or «current collectors» welded in specific point of electrode material before winding process. Else, the electrode in «With Tab» battery has intermitted coating with no coated zone called «free zone» where the Tab is welded; the Tabless cells are composed by continuous coated electrodes.

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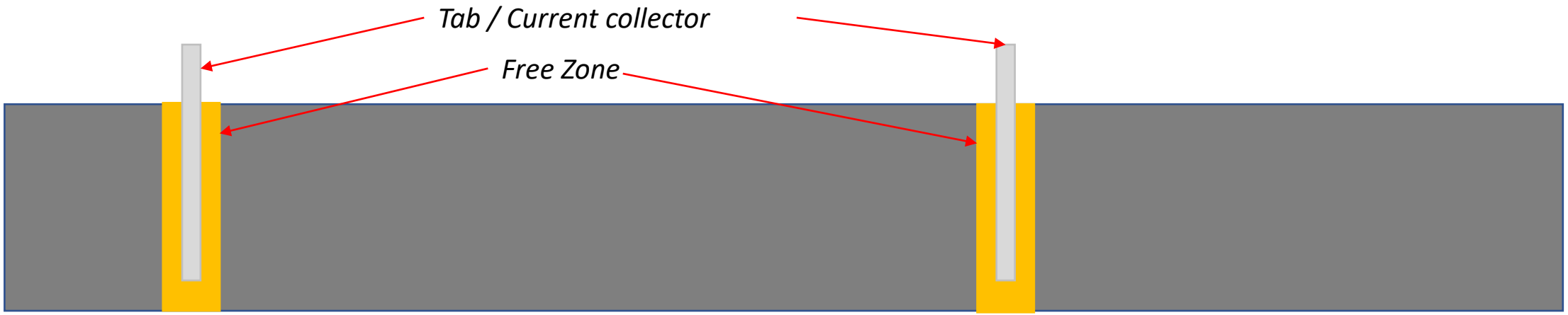


Cylindrical Cell – Formats

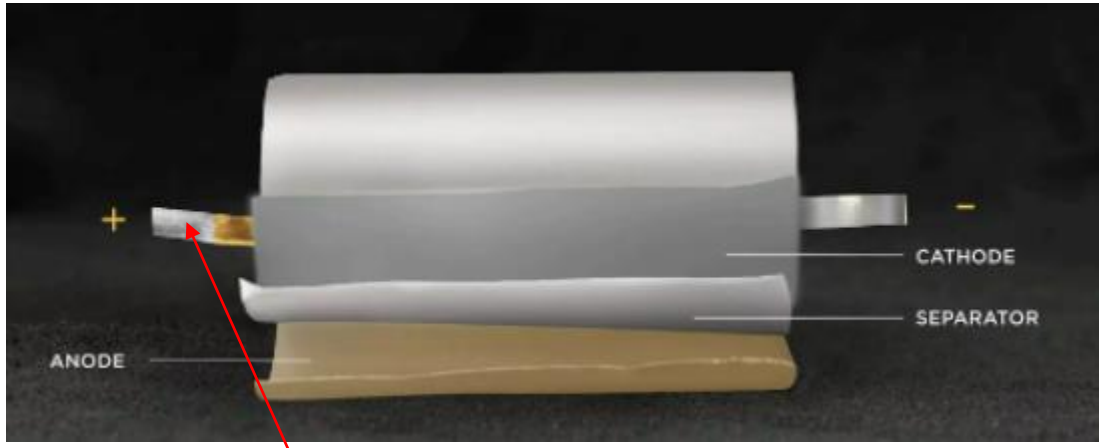
In tabless battery, the electrode has continuous coating. So the Copper or Aluminum for is completely covered on both side by active material, except for a portion on lateral side as shown velow.

Since in tabless battery cells, the «Tab» welding process is winding machine is not needed, this represent a big advantage in term of machine throughput and automation complexity: less process mean less mechanical and electrical parts and less waste due to process failure.

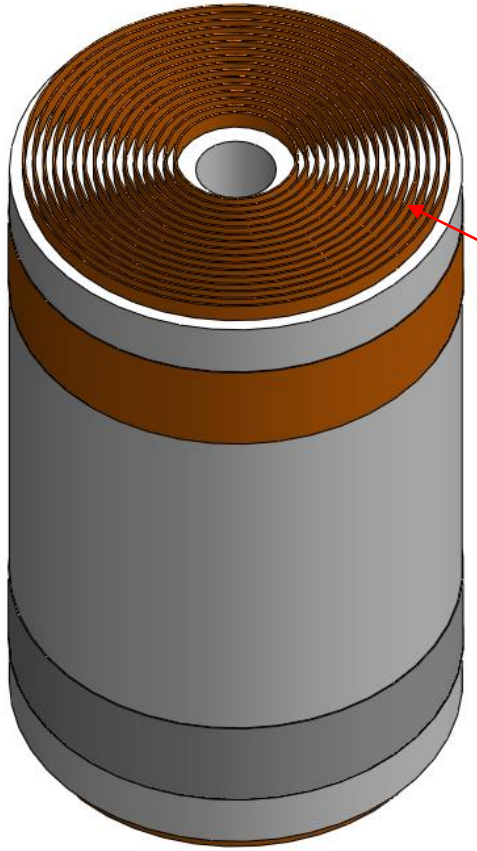
Cylindrical Cell – Formats

Once, the wound element (Jelly Roll) is obtained due to winding process, the difference between «With Tab» and «Tabless» technologies become much more evident.

If in cell with Tab, the current pass through only 2 or 3 current collectors of anode and cathodes, in Tabless design, the current can pass through the aluminum/copper foil of each coil of JR.



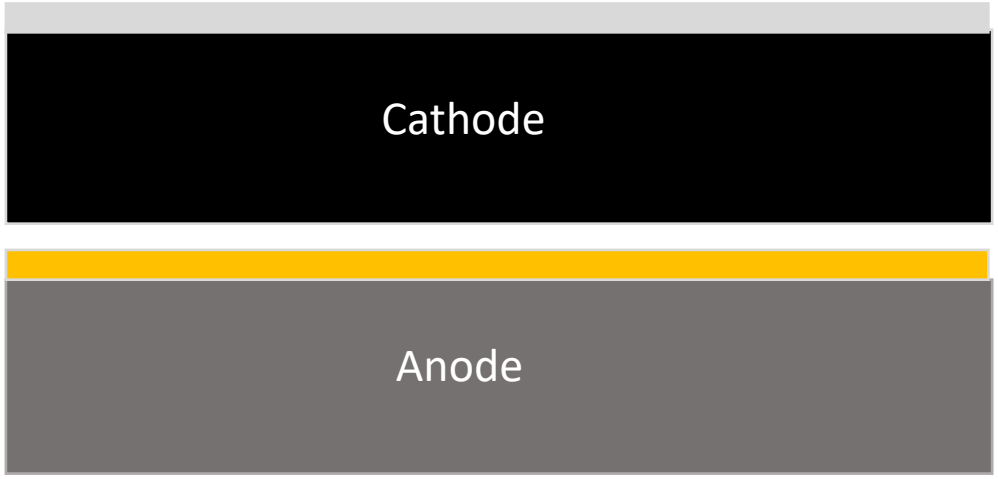
Just one contact point for the current to pass through.



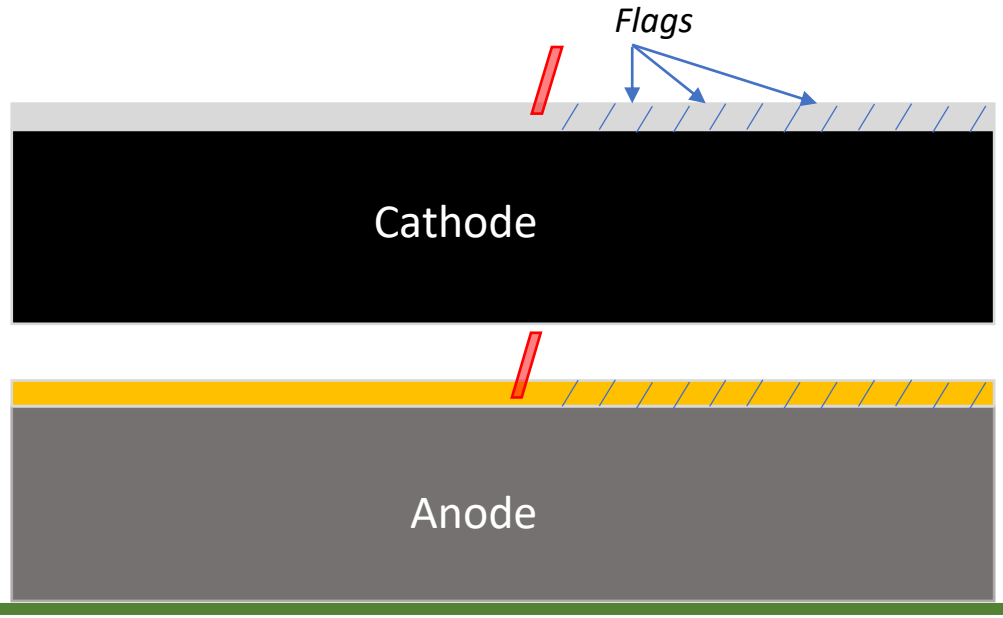
Each coil of electrode metal foil (copper/aluminum), represent a contact point, so a point where the current can pass through.

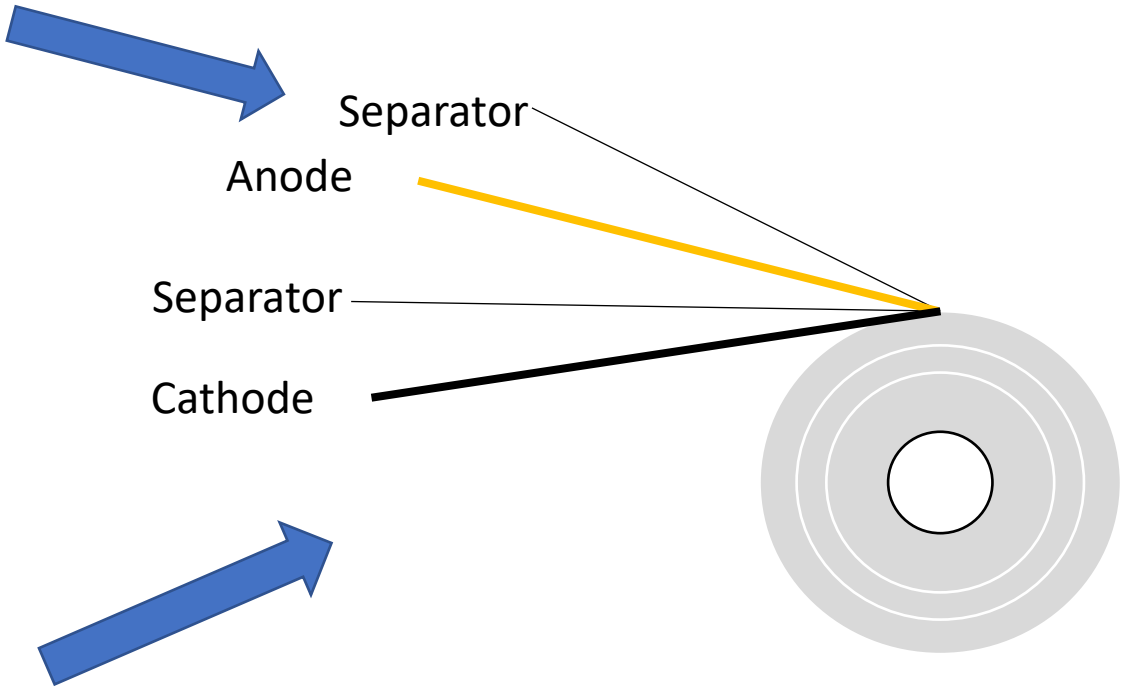
Cylindrical Cell – JR

Winder



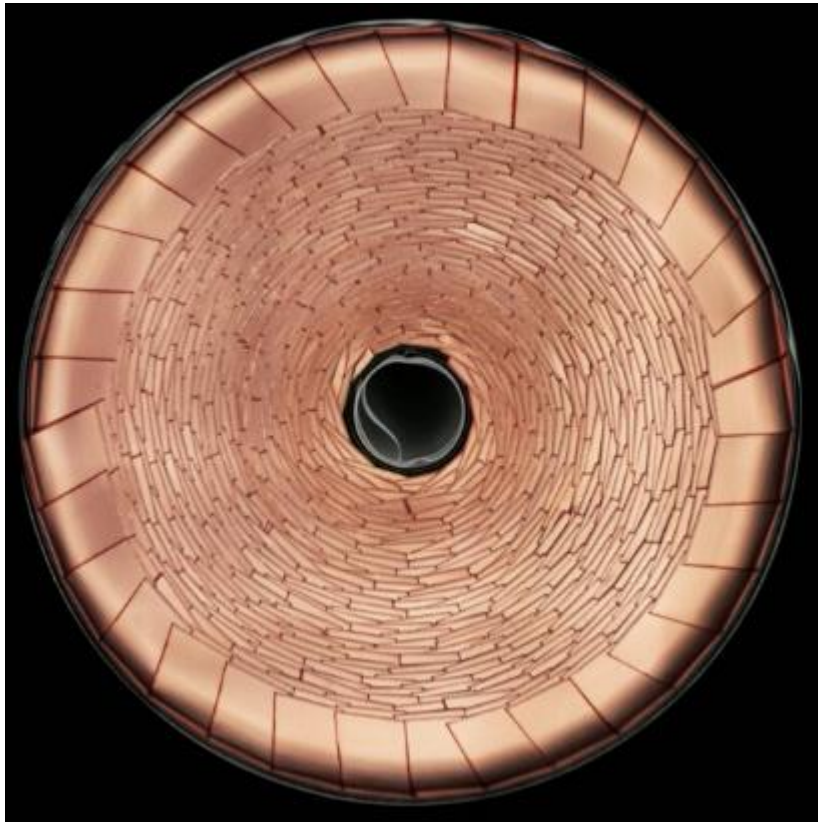
Laser Winder





Cylindrical Cell – JR

Tabless cylindrical cell: NO Flags

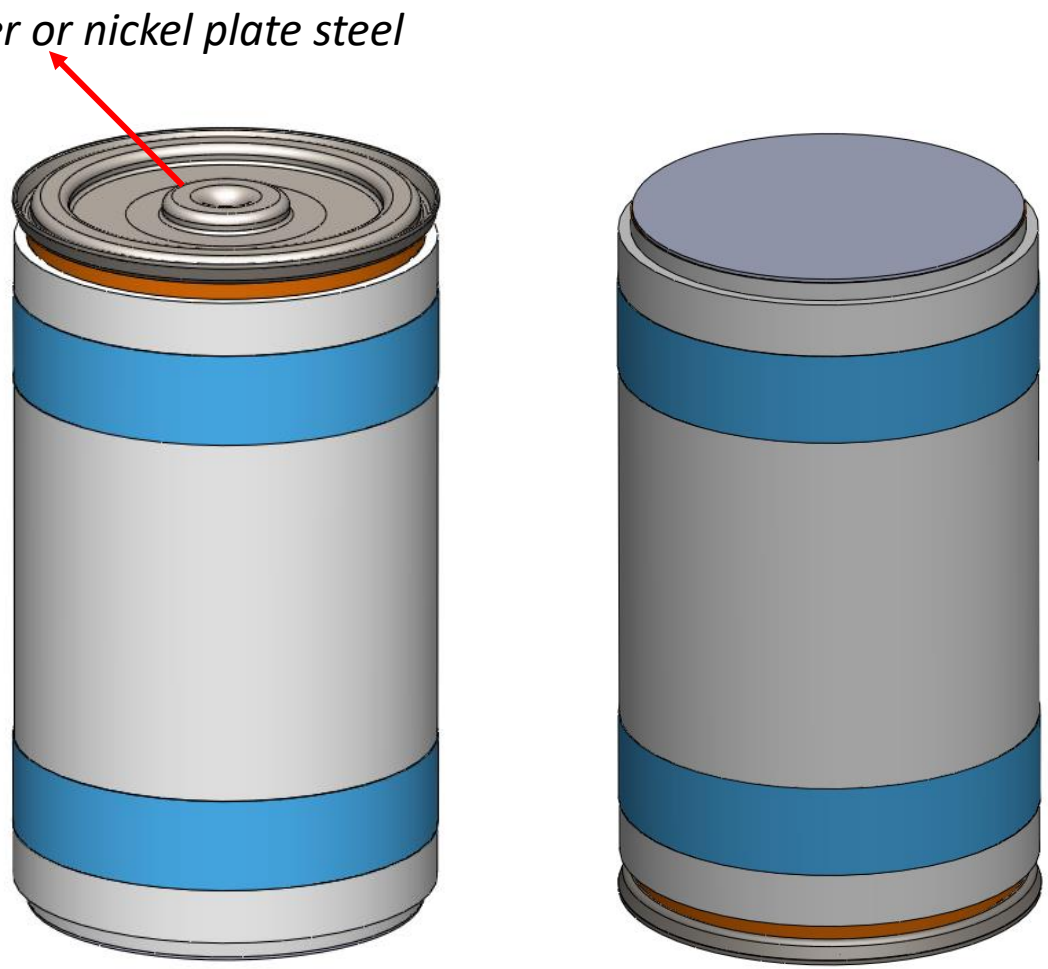


Tabless cylindrical cell: WITH Flags

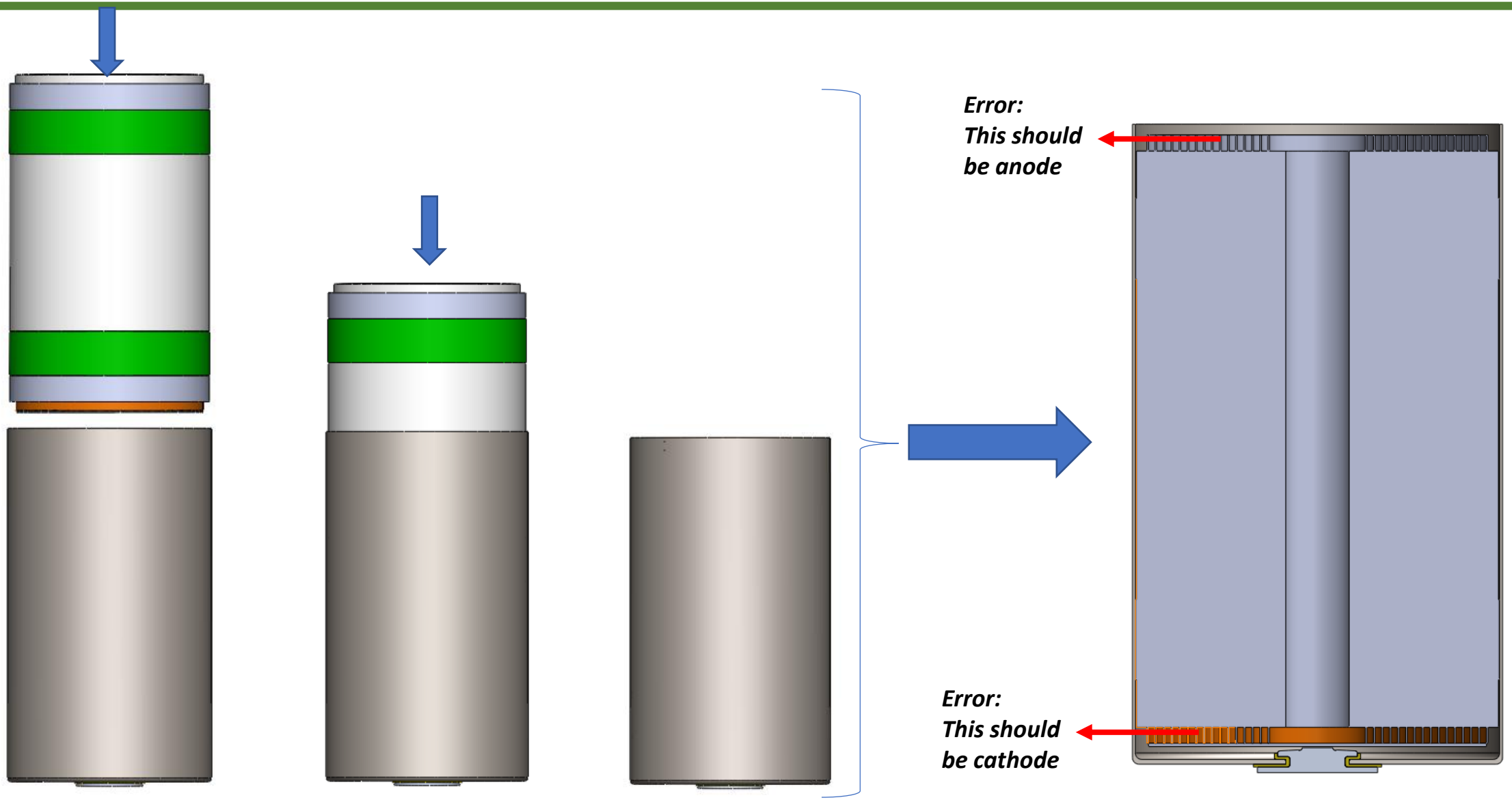
Cylindrical Cell – Disc welding

The welding technology used is Laser. Due to tak time and flexibility, systems up to 3kW with IR or Green laser are used.

- Usually for cathode the disc is made of aluminum;
- For anode the disc is made of copper or nickel plated steel (depends on cell design)
- Cathode disc thickness 0,2-0,4mm
- Anode disc thickness 0,2mm a 0,6m: depends on material.

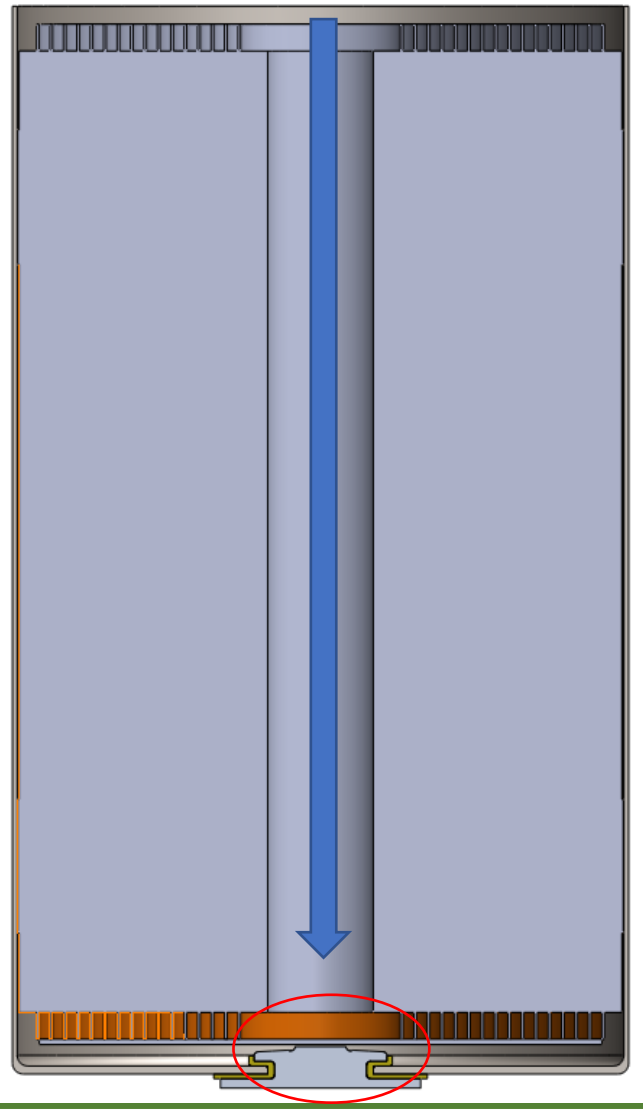


Cylindrical Cell – JR insertion



Cylindrical Cell – JR insertion

Once the JR is inserted inside the metal can, the cathode disc must be welded to the cathode terminal which is placed on bottom side of the can (se the picture on right side).



The welding technologies adopted are:

- Torsional Ultrasonic welding
- Spot Resistance welding
- Laser welding

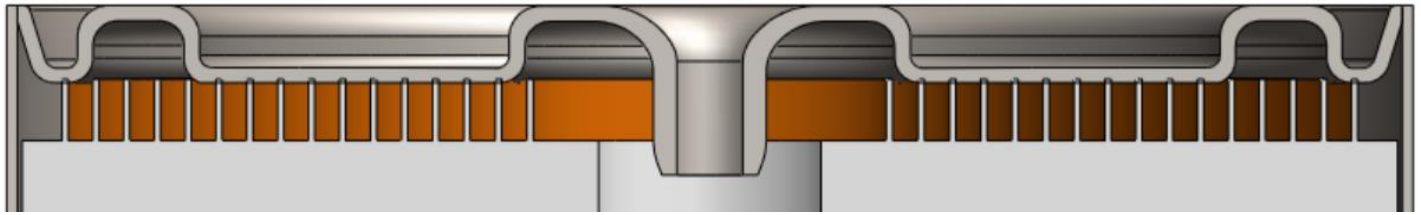
Each of them shows pro and cons:

- **Torsional ultrasonic welding** shows a poor working life of welding tools. If the JR height increase, the welding tool (horn/sonotrode) design become more complicated to maintain high degree of reliability: the thin design shows poor stiffness which results in poor welding efficiency.
- **Spot resistance welding** can show sticking problems due to pure aluminum alloy of the welding elements.
- **Laser welding:** difficult to focus the laser beam through the JR inner diameter. Some battery makers are working on different design which allows to weld from the bottom side (the laser beam hit the cathode terminal from the eternal side, on the bottom)

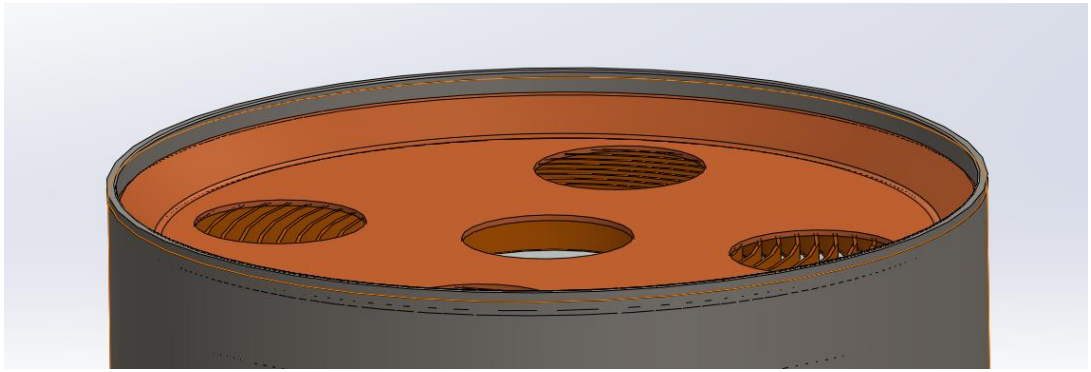
Cylindrical Cell – Closing

After the cathode disc welding, there is the Lid to can closing.
Closing process can be done:

- By laser welding



- First by can Necking (grooving) and then by can crimping, resulting in mechanical deformation of can. This solution is not the best one in order to maximize the JR volume occupancy inside the can; else this solution produce many particles which must be removed and managed to avoid cross contamination.



Do you want to know more?
Here you can find the full guide with all details regarding Lithium battery tabless cylindrical cell

Link:
Tabless Cylindrical Cell: From ZERO to HERO