

Current state of development of Fraunhofer FFB cell designs

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The Fraunhofer Gesellschaft (FhG) is setting up a "Research Institution for Battery Cell Production" (FFB) in a multi-stage project, in which new battery cell concepts and processes are to be combined and researched with digitalised, flexible and modular production methods. The aim is to reduce the development effort for the highly scaled production and to significantly decrease the risk for industrial partners in transferring novel cell concepts and production technologies to large-scale production, combined with qualification of skilled personnel.

Cell designs

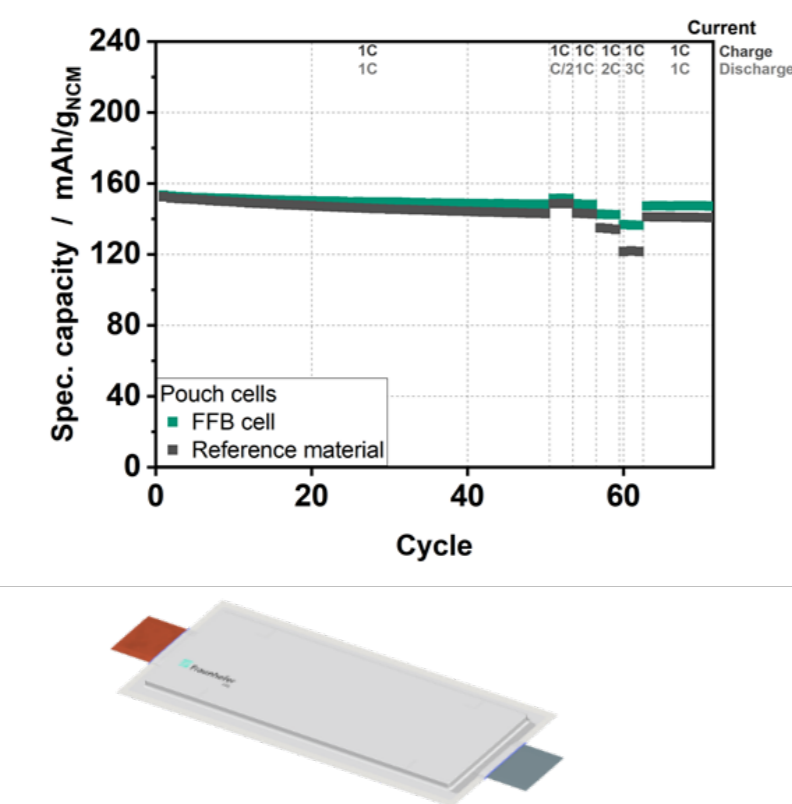
The cell design significantly determines the properties of the battery. For example, the energy and power density, but also ageing and safety behaviour depend on the cell design. Cell geometry (i.e. cylindrical and prismatic and pouch format) as well plays an important role*.

Pouch cell

Counter tab (CT) and one-sided tab (OST) standard designs with different cell chemistries for high power and high energy are being developed. The focus of the "FFB Large" cell is on its longevity.

Advantages and disadvantages

- Flexibility and costs
- Performance and stability



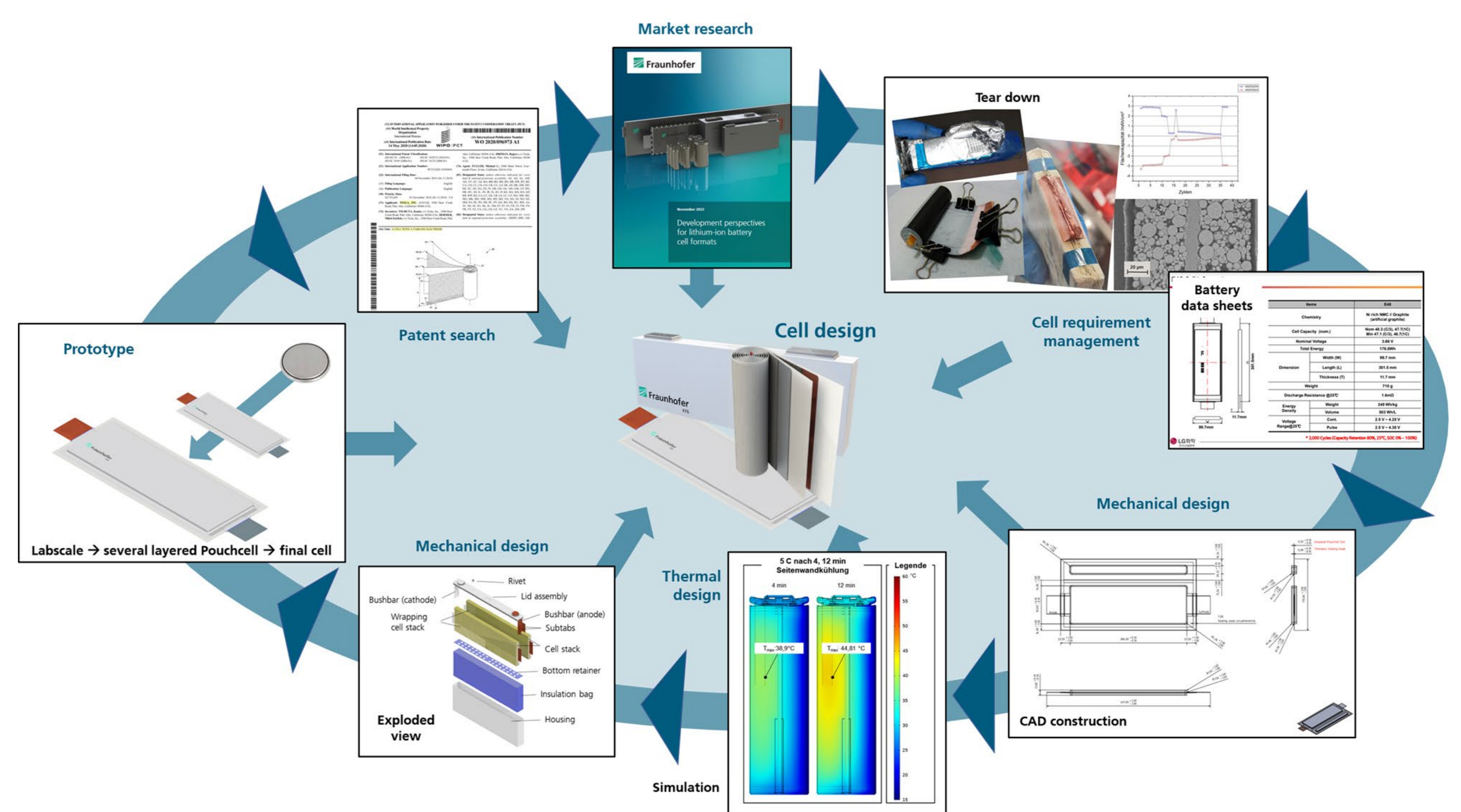
Prototyping of FFB Pouch cells – current status.

Cylindrical cell

The FFB cells have a 21700 format and are developed with a high power and high energy design. A special feature is the planned production line of the "FFB-Fab", as the entire production line will be carried out in mini-environments.

Advantages and disadvantages

- Energy density and manufacturing costs
- Packing density and thermal management



Procedure for development of Fraunhofer FFB cell designs.

Prismatic cell

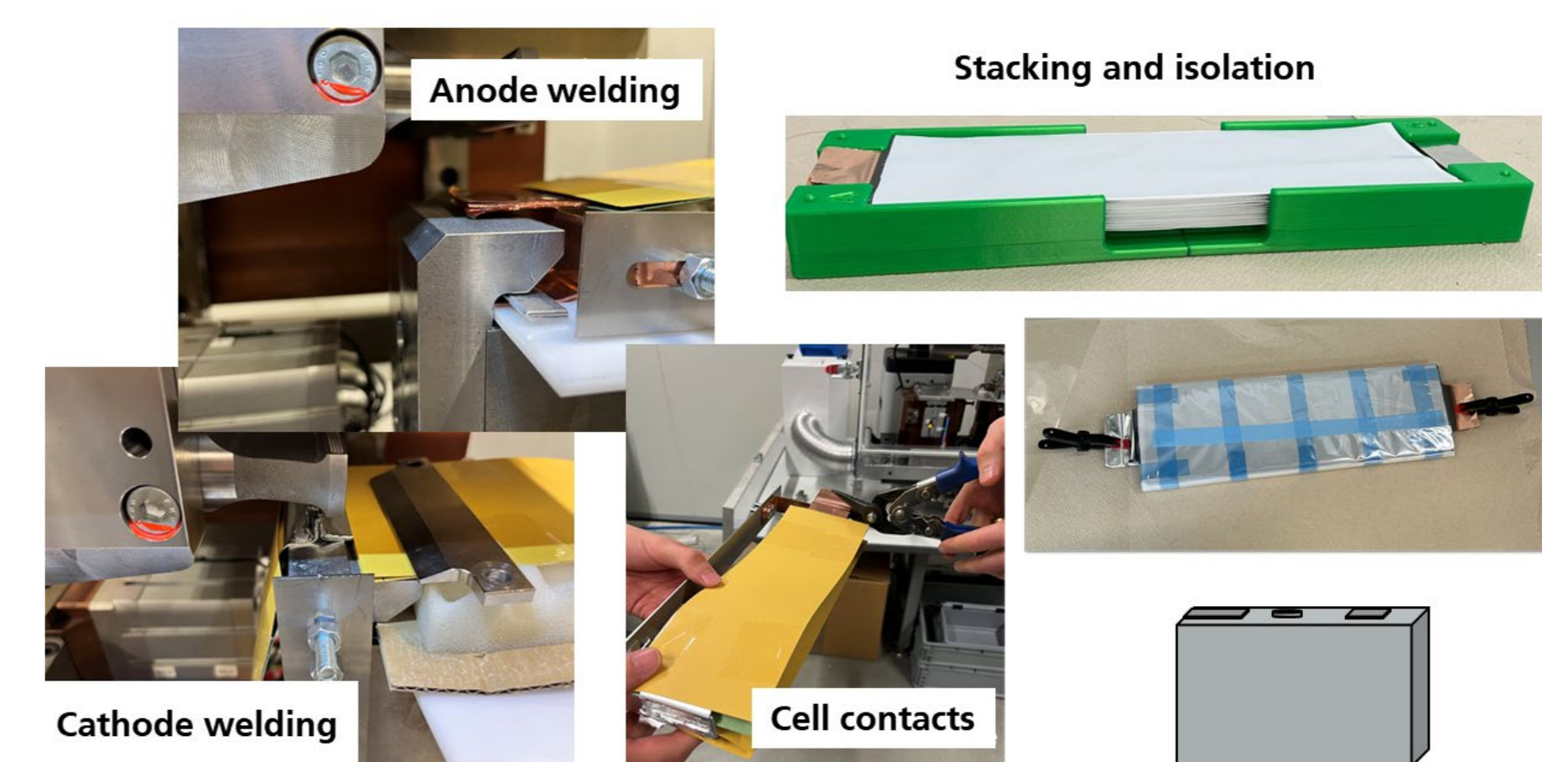
Cell designs with different external dimensions (in length and thickness) are being developed for high power and high energy applications. The longer cell is well suited for automotive applications while the shorter cell is preferably used in stationary storage. Current designs include a wounded or stacked layout.

Advantages and disadvantages

- Safety and thermal management
- Power and energy density

A synergy between pouch cell and prismatic cell enables the production of cell stacks in the pouch line.

* Development perspectives for lithium-ion battery cell formats, November 2022, Fraunhofer ISI, ICT, FFB and IPA.



Prototyping of prismatic FFB cells – current status.

Outlook and next steps

The prototyping will continue in several phases to finalise the cell designs and plant specifications.

Developed cell designs at the FFB and their theoretically determined cell parameters

Cell parameters	Cylindrical 21700 High Power	Cylindrical 21700 High Energy	Pouch cell OST ¹ /CT ² High Power	Pouch cell OST ¹ /CT ² High Energy	Pouch cell Large Long Life	Prismatic cell Medium High Power	Prismatic cell Medium High Energy	Prismatic cell Large High Power	Prismatic cell Large High Energy
Outer dimensions / mm	height: 70 diameter: 21	height: 70 diameter: 21	OST: 317:134:13 CT: 333:125:13	OST: 317:134:13 CT: 333:125:13	574:142:11	200:100:26.5	200:100:26.5	300:100:30	300:100:30
Cell chemistry	NMC622 / Graphite	NCA / Graphite-SiO _x	NMC622 / Graphite	NMC811 / Graphite-SiO _x	LFP / Graphite	NMC622 / Graphite	NMC811 / Graphite-SiO _x	NMC622 / Graphite	NMC811 / Graphite-SiO _x
Nominal capacity ³ / Ah	3.25	4.8	45	55	74	56	68	100	123
Spec. energy ³ / Wh kg ⁻¹	170	250	206	272	190	153	199	163	213
Vol. energy ³ / Wh L ⁻¹	480	710	486	596	413	386	465	402	493

¹ One-sided tab, ² counter tab, ³ State: 23.10.2023