Highly dynamic transport for battery cells

How QuickMOVE Evolution enables cycle times of less than one second

Challenges and initial situation

In the manufacture of battery cells, the central task was to achieve cycle times of less than 1.0 second. To achieve this goal, not only the actual machining process but also the transport task had to be fundamentally rethought. What was required was a system that could reliably transport all cell types at a very high cycle frequency and at the same time offer high availability.

The high demands on synchronization, acceleration, and precision led to the early realization that a classic conveyor system design would reach its limits. In order to reduce moving masses and minimize dynamic effects such as cushioning or vibrations, the idea arose to specifically reduce the size of the track. The required accuracy and repeatability were achieved not through additional sensors, but through a consistently well-thought-out mechanical design of the track.

The focus is on preparing the battery cells for later module packaging. All cells must be absolutely uniform for this purpose, as even the smallest deviations can negatively affect the performance of the finished modules. For this reason, 100% performance measurement is absolutely essential.

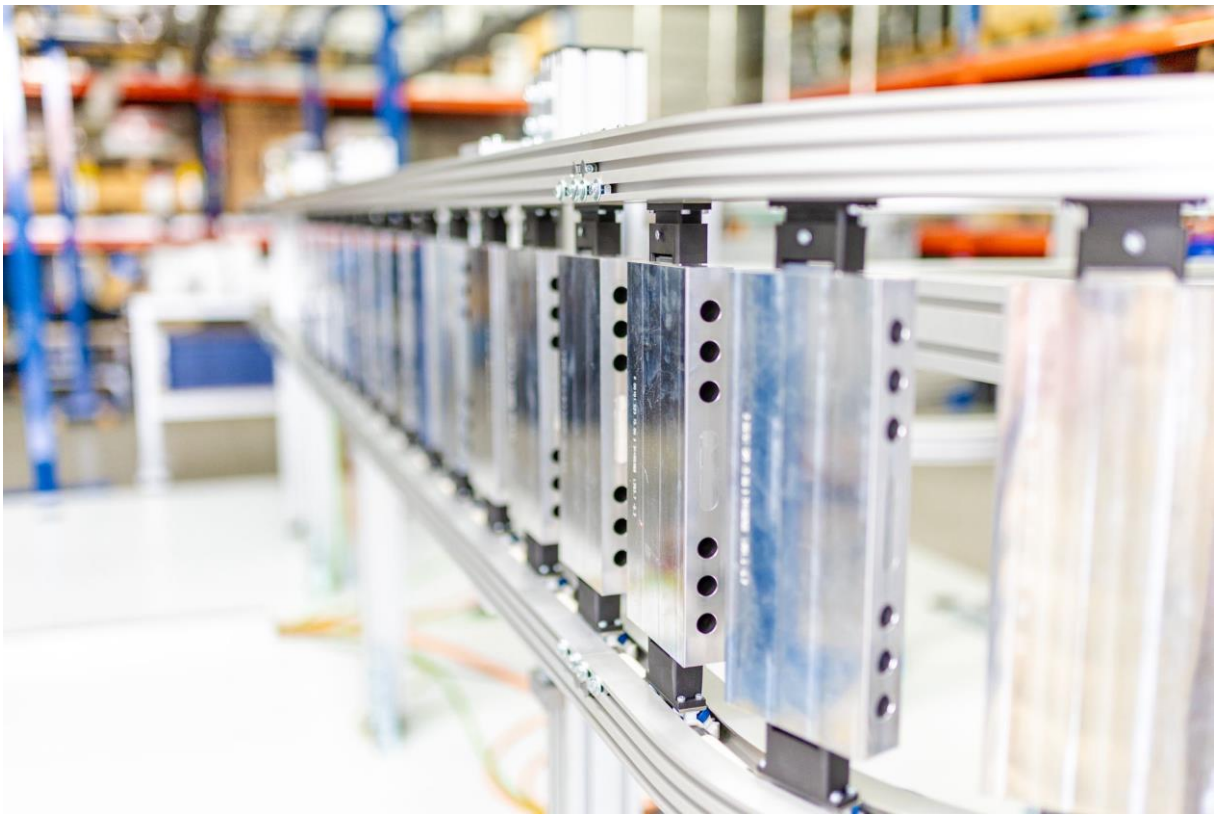

Image: QuickMOVE Rail with cell grippers

The solution

The individual battery cells are measured contactlessly and completely during the ongoing process. It is not necessary to stop the cells, which means that there are no additional cycle losses. Prismatic cells are picked up simultaneously from above and below and transported between two synchronously running conveyors.

The system is designed so that any length of distance can be achieved, allowing different process steps to be flexibly connected with one another.

These include, among others:

- Non-contact measuring processes
- Application or spraying of media
- Loading and unloading of cells
- An integrated repair loop for the targeted replacement of individual cells

To further reduce cycle times, several processing units are synchronized. The respective processes are carried out during ongoing transport without stopping the cells. Trains are used for this purpose, which run precisely synchronized from above and below and are precisely designed for the respective module size. The trains can run directly behind each other without any distance between them.
The maximum speed is 0.5 m/s with a cell spacing of approximately 150 mm. Depending on the application and process, higher speeds are also possible.

Image: QuickMOVE electronical synchronzed drives

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The QuickMOVE Evolution (QE) represents a consistent scaling of the established QuickMOVE system (QM). From the outset, the design was implemented entirely in 3D, supplemented by the use of CAE tools for early validation of the mechanical properties. During the development phase, 3D-printed chains and profiles were also used to quickly test geometries and dynamics iteratively.

Close cooperation with established partners enabled the product to be transferred from an individual concept to the first series production plant. As with the original product, all components are now produced using series tools and are also used in other applications in logistics, packaging, automotive, and biotechnology.

Future Outlook

The technology has already been presented at various trade fairs and in several presentations in Germany and the EU. Thanks to its modular design and scalable system architecture, QuickMOVE Evolution is particularly suitable for future high-dynamic applications in battery cell production and related industrial sectors.

Contact

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