

Automated dismantling of electric batteries

How Liebherr automates the disassembly of electric vehicle batteries with the servo-pneumatic position controller CMAD from Festo

Manual disassembly of end-of-life batteries in electric vehicles is now a thing of the past: Liebherr has developed a system that automatically removes the battery cover screws - regardless of whether they are attached horizontally or vertically to the battery housing. The CMAD servo-pneumatic position controller from Festo, which makes position-independent unscrewing possible in the first place, plays a major role in this automation solution.

An electrician with additional high-voltage qualifications needs several hours to completely dismantle an electric car battery. "In view of the shortage of skilled workers and the millions of used batteries expected in the coming years, this is time that a recycling company does not have," emphasizes Viktor Bayrhof, Product Manager at Liebherr-Verzahntechnik in Kempten.

Every screw under control

Liebherr has therefore developed a robotic disassembly system that can even cope with the often wild mix of screws, whether Torx or hexagonal. The automated unscrewing system of the "LHDismantle" has an automated tool changer on board and disposes of the screws using a pick gripper or extraction system. "The system operators do not even need to have any knowledge of robotics or automation, as operating the system does not require any knowledge of programming or teaching," explains Daniel Reischmann from Technical Sales Automation E-Mobility at Liebherr. The company can integrate the robot cell as part of a system to completely dismantle the components of a battery pack.

No vision system is required for operation: the patented unscrewing process with tactile setting stage makes the unscrewing tool robust against dirty or damaged screws. Festo's CMAD servo-pneumatic position controller controls the gripping tool's clamping jaws. It gives the gripping system the characteristics of an electric gripper. At the same time, the gripping system is considerably lighter and more robust, making it ideal for this end-of-arm application.

Precise force control in every position

With the servo-pneumatic position controller CMAD, robot grippers can exert a given force with an accuracy of 0.2 mm in both horizontal and vertical orientation. Thanks to the integrated position detection in space, the CMAD position controller can maintain a constant force even if the position in space changes. Liebherr also makes use of this property in the LHDismantle, as the bolts of a vehicle battery are not only installed vertically, but also horizontally. In the future, this solution will also enable the automation of other bolting processes, for example as part of complete vehicle disassembly.

Pneumatic drives are particularly popular for use with robots and at the front end. With their low weight in combination with high power density, they are virtually predestined for these end-of-arm applications. The fact that pneumatic drives could only be operated in open-loop

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mode limited their use in the past. The CMAD with its piezo valves now makes it possible to operate even small pneumatic cylinders in a controlled manner.

This gives it the position control characteristics of an electric system - but with much less weight. The piezo valves can be operated in both position and force control mode. The CMAD position controller is flanked by the VEAB proportional pressure control valve with its precise controllability at low flow rates, the VTUX flexible valve terminal and many pneumatic cylinders.

Valuable tests at the Festo Experience Center

"The development of the CMAD position controller came at exactly the right time, so that we were able to dispense with the previously used, not always reliable vision system during the further development of the system," explained Jan Pollmann, Head of Development at Liebherr. "The experts at the Festo Experience Center FEC Esslingen, with whom we were able to put the planned solution through its paces, helped us a great deal."

By using the automated LHDismantle system from Liebherr, battery recycling companies are well prepared for the future, as the pressure to act is great: the amount of used batteries from electric vehicles in the EU is expected to increase more than tenfold by 2030. This will make it possible to recover valuable raw materials such as lithium, cobalt and nickel and, thanks to automation, electric vehicle manufacturers will be able to meet the recycling quotas required by the EU at an acceptable cost.

Festo at the Battery Show Europe: Hall 3 Stand E10

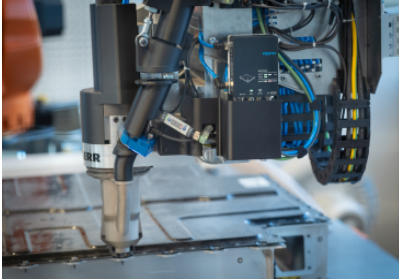
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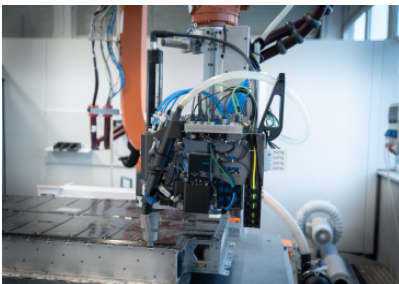
Liebherr LHDismantle

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CMAD position controller

The servo-pneumatic position controller CMAD from Festo: It makes position-independent unscrewing on the LHDismantle possible in the first place. With the CMAD servo-pneumatic position controller, robot grippers can exert a given force with ...



Unscrewing system

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Viktor Bayrhof, Product Manager at Liebherr

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"The experts at the Festo Experience Center FEC Esslingen, with whom we were able to thoroughly test the planned solution, helped us a lot."



Daniel Reischmann, technical sales at Liebherr

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About Festo

Festo is a global player and an independent family-owned company with headquarters in Esslingen am Neckar, Germany. Festo has set standards in industrial automation technology and technical education ever since its establishment, thereby making a contribution to sustainable development of the environment, the economy and society. The company supplies pneumatic and electrical automation technology to 300,000 customers of factory and process automation in over 35 industries. Digitalization, AI and the LifeTech sector with medical technology and laboratory automation are becoming increasingly important. The products and services are available in 176 countries. With about 20,600 employees in over 250 branch offices in around 60 countries worldwide, Festo achieved a turnover of around €3.33 billion in 2025. More than 8% of this turnover is invested in research and development. In this learning company, 1.5 % of turnover is invested in basic and further training. Festo Didactic SE is a leading provider of technical education and training and offers its customers worldwide comprehensive digital and physical learning solutions in the industrial environment.