



Direct Drive Helps Improve the Production Speed and Quality of Electric Vehicle Batteries

The demand for battery-electric and plug-in hybrid electric vehicles is rapidly growing, thanks to increasing manufacturing capacity, large-scale promotion, and widespread recognition of the urgent need to reduce greenhouse gas emissions. Blade batteries have become the most popular choice for these new-energy vehicles due to higher safety performance, longer cruising range and faster charging speed compared to other lithium-ion battery technologies.

Challenge

The lamination process is essential in the production of blade batteries, and the efficiency of the entire lamination stacking machine is limited by the feeding and slicing station. At present, the production efficiency of mainstream cutting and stacking equipment is 240–300 pieces per minute, with a slicing accuracy of ± 0.15 millimeters, but these figures cannot meet the growing demand.

To fill the need, manufacturers of cutting and stacking equipment must quickly adopt retrofit and upgrade solutions that improve production accuracy, efficiency and yield. For a major equipment manufacturer in China, failure to achieve these goals would have ripple effects that could slow the production and increase the price of lithium-ion blade batteries and the electric vehicles that use them. Success, on the other hand, would give the manufacturer a competitive advantage while aiding the transformation to a greener world.

“Kollmorgen’s DDL direct drive linear motors and AKD drives deliver the thrust, acceleration and precision we needed to substantially improve the performance of our double-station slice-feeding solution. We’re helping electric-vehicle battery manufacturers fill an important global need with greater quality and productivity.”

—Kollmorgen Customer

Solution

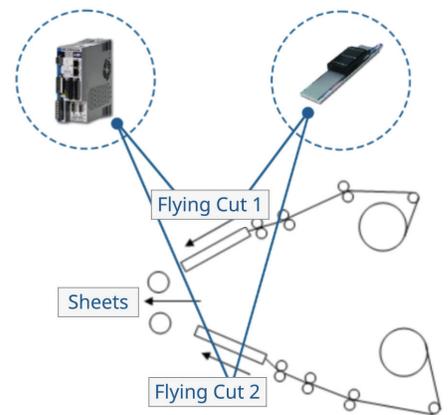
To significantly increase the accuracy and throughput of the of its double-station slice feeding equipment — improving the quality and throughput of the entire lamination process — the manufacturer chose to implement direct drive technology. Kollmorgen's DDL linear motor and AKD servo drive are at the heart of the solution.

Due to space and structural design constraints, the two flying cutting/feeding angles are each oriented at about a 40° angle above and below horizontal, as illustrated. These are driven by two sets of Kollmorgen direct drive systems, a technology that optimizes the overall efficiency of the equipment.

The DDL linear motor responsible for slice feeding can reach a peak thrust of 3,152 N. This easily meets the output requirements of 2.5 g acceleration and ensures continuous stability when feeding slices at the previous typical rate of 240–300 pieces per minute while also greatly improving the maximum achievable rate.

The faster the cycle, the faster the slicing and feeding process. Control of the motor speed is particularly important in the slicing and feeding phases to achieve high speeds in a stable manner. The speed command, position command filtering and delay functions of Kollmorgen's high-performance AKD servo drive effectively ensure the rigidity of the motor while reducing overcharge of the equipment, greatly improving stability to maximize the yield rate.

The AKD servo drive also provides leading control-loop speeds and high-bandwidth response, effectively doubling the machine's accuracy when slicing the material at high speeds.



Results

With rapid growth and continuing innovation in lithium-ion battery manufacturing, Kollmorgen is committed to working with customers to solve the industry's most demanding motion control challenges.

By adopting Kollmorgen's direct drive technology solutions, this manufacturer of lithium-ion battery lamination equipment achieved significant improvements in efficiency and performance. The machine's maximum stable rate is now as high as 450 pieces per minute. The solution also increases high-speed cutting accuracy to ± 0.075 millimeters from the previous 0.15 millimeters, greatly improving the energy density and safety of the blade batteries.

At the same time, direct drive technology reduces the need for transmission components in a compact, low-noise, no-maintenance system that helps the manufacturer save costs and enhance its competitive position.

About Kollmorgen

Kollmorgen, a Regal Rexnord Brand, has more than 100 years of motion experience, proven in the industry's highest-performing, most reliable motors, drives, linear actuators, AGV control solutions and automation platforms. We deliver breakthrough solutions that are unmatched in performance, reliability and ease of use, giving machine builders an irrefutable marketplace advantage.