



Kollmorgen's Direct Drive Technology Improves the Precision and Productivity of Lithium-Ion Battery Coaters

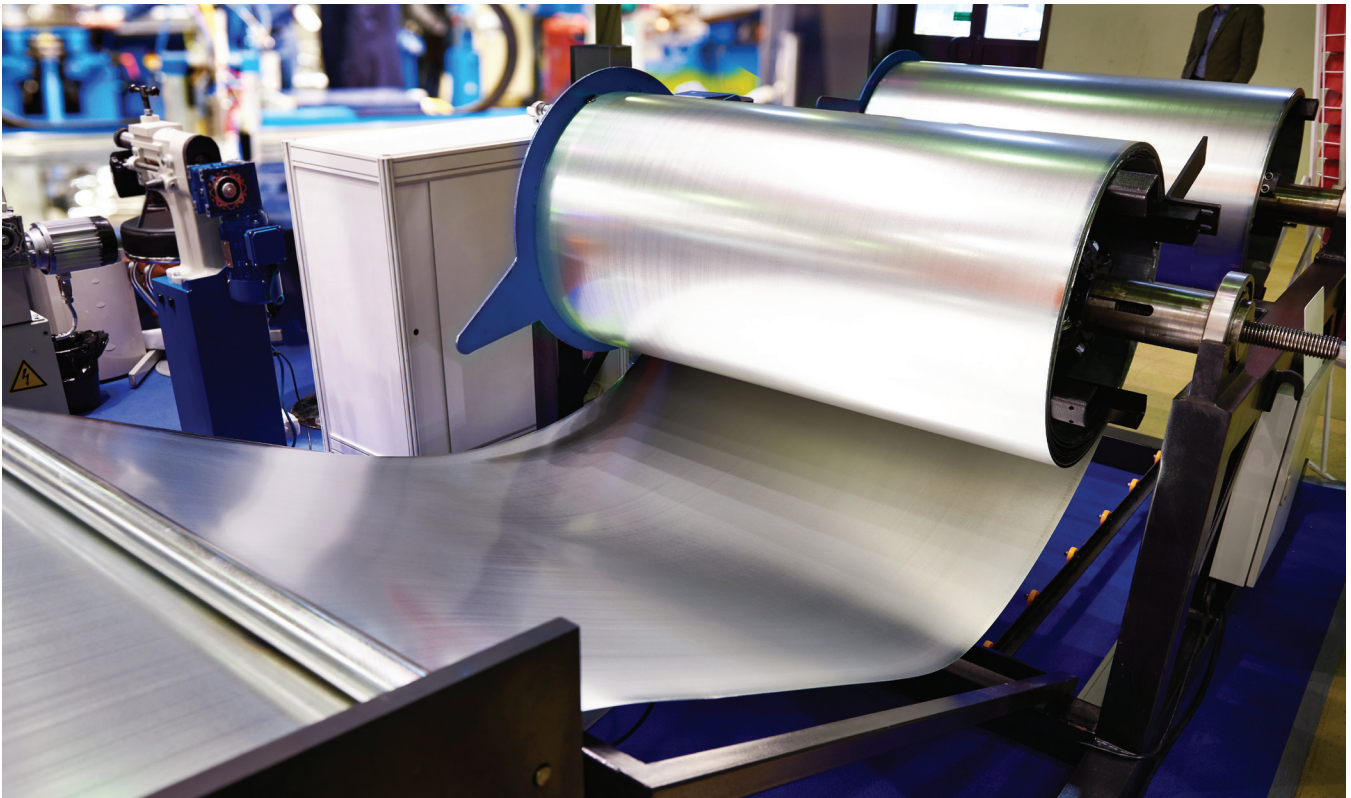
With rapid growth in the domestic lithium-ion battery industry, manufacturers are under pressure to continuously improve the quality of their battery production processes. The coating step is a key link in the process for manufacturing high-quality batteries employed in battery-electric vehicles and many other products. When a widely used coating machine used in the production of these batteries had the problem of large errors in pole density and accuracy, along with a low yield rate, Kollmorgen direct drive servo technology helped the manufacturer achieve substantial gains in accuracy, yield and throughput.

The coater application

The coating machine evenly distributes an electrode slurry on the surface of a metal foil and dries it to create positive and negative electrodes. Common coating machines employ extrusion and transfer coating processes. The working principle is to rotate the coating roller to drive the slurry, adjust the scraper gap to control the amount of slurry transfer, and then use the rotation of the back roller or the coating roller to transfer the slurry to the surface of the substrate. The coating layer thickness needs to be strictly controlled in the coating link to achieve the specified weight. At the same time, the solvent in the slurry is removed by heating and drying, so that the solid matter is well bonded to the substrate.

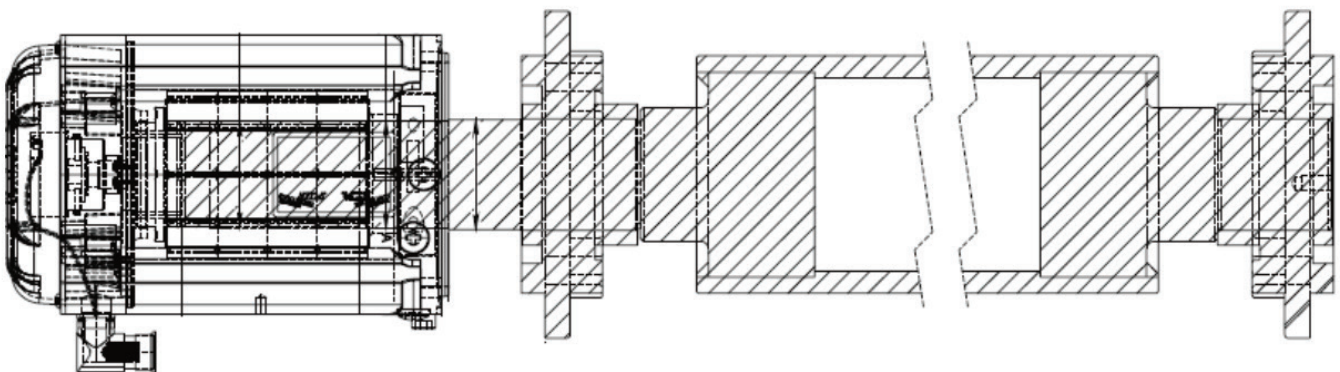
As the main roller of the entire coating machine system, the steel roller plays an essential part in the stability and transmission of the slurry, and the smoothness of operation directly affects the accuracy of the final coating. To improve the density and accuracy of the pole pieces and reduce the defect rate, precise motion control of the steel roller was required to reduce error values, shorten acceleration time and ensure position lock.

In addition, the normal production speed of the mainstream coating machine was 60 meters per minute, which cannot meet the production needs of today's lithium-ion battery manufacturers. This production speed urgently needed to be improved.



In order to increase the yield to 99% to meet the requirements of lithium-ion battery manufacturers, the coating machine manufacturer adopted Kollmorgen direct drive technology to modify the

machine's motion control, significantly improving the accuracy of the equipment to achieve a weight error of $\leq \pm 1\%$, a thickness error of $\leq \pm 1$ microns and production speed over 80 meters per minute.



Motor drive steel roller schematic

Improving coater performance with direct drive technology

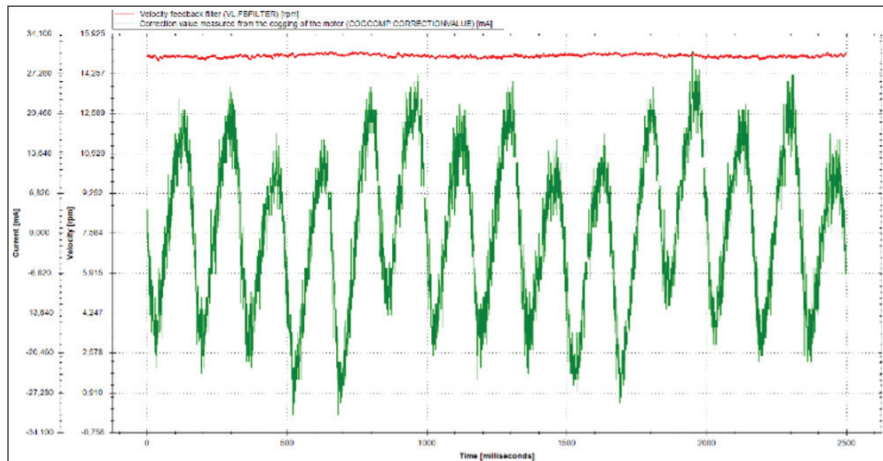
Kollmorgen's direct drive technology, implemented through the modular Cartridge DDR[®] servo motor controlled by the AKD servo drive, solves the technical issues of the coater's steel roller, practically eliminating defects in the production of pole pieces to achieve a yield rate higher than 99%.

- Because the speed fluctuation amplitude of the Cartridge DDR motor is not more than 0.4% under constant-speed operation, the stability of the steel roller during rotation is well controlled, significantly reducing errors in pole sheet density.

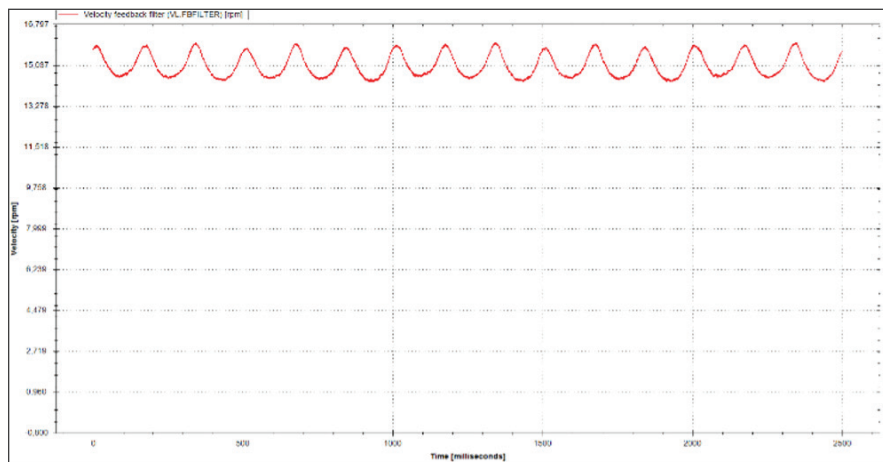
- The AKD servo drive includes an innovative cogging-compensation algorithm. To minimize any cogging effect in the motor, the drive provides additional feed-forward current, virtually eliminating speed fluctuations to make the slurry output more stable and uniform throughout the coating process.

- In a short travel range, the Cartridge DDR motor can achieve a variable speed from 0 to 80 meters per minute, significantly reducing the time required for acceleration and minimizing the raw materials consumed in the acceleration stage.

- To reduce scrap from the rotation of the steel rollers during shutdown, Kollmorgen motors can achieve reliable position locking.



Velocity waveform plot without cogging compensation



Cogging-compensated velocity waveform plot using AKD servo drive

The Cartridge DDR motor delivers up to 1,500 rpm, driving the steel roller to rotate at a high speed. AKD drives offer extremely high-performance, low-latency control loops with high response bandwidth, which can reduce setup time and improve machine productivity. With this solution, the coater production speed has been significantly increased from 60 to 80 meters per minute, greatly increasing the capacity of the coating process.

The use of Kollmorgen direct drive technology fully meets the performance requirements of the coating machine's steel roller, significantly improving coating accuracy and speed and helping to enhance the equipment manufacturer's competitive position. These optimizations in the production process also help lithium-ion battery manufacturers improve production efficiency and product quality while greatly reducing production costs and scrap.



The combination of Cartridge DDR servo motor and AKD servo drive creates an optimal modular direct-drive solution.

Ready to move forward?

[Contact Kollmorgen](#) to discuss your needs and goals with a Kollmorgen expert for manufacturing applications.

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.