

## Technology Brief

Conversation with Paul Coughlin, Technical Support Team Lead at Kollmorgen with over 30 years in motion control technologies.

### If extensive wiring in your application is proving to be a difficult issue, then stepper motors are the best choice as they require a significant small number of wires.

Kollmorgen [stepper motor technology](#) greatly simplifies machine design and generally enables OEMs to connect only four wires and a ground. In contrast, a typical servomotor can have as many as six to 17 additional wires, and that is just in the feedback mechanism. The relative simplicity by stepper motors in wiring brings a number of benefits.

Stepper motors wired incorrectly may rotate in the opposite direction if a phase is reversed or simply does not move. On the other hand, a servomotor wired in error may take off unexpectedly at higher speeds because the feedback control is missing or incorrect.

*Stepper motor technology allows for the use of an open-loop controller – simplifying machine design and lowering total cost while compared to a servomotor system.*

Another aspect about stepper motors is their ease-of-setup as no tuning is required, which is not necessarily found with other alternatives. Stepper motors are also simpler to manage during the project design

phase. Normally, they are sized for peak torque along with a safety factor that ranges from 50 to 100 percent. Other motor technologies may involve more complicated calculations during the design phase, bringing acceleration, deceleration, slew rate, RMS torque, dwell time and other factors into consideration.

The simplicity offered by stepper motors results in a lower cost because they run about half the expense of a servomotor and its associated control mechanism. For an application appropriate for an open loop system, such as bottles being directed one way or another by a lane diverter, a stepper can be the best choice to deliver optimal results and cost savings.

Microstepping technology has made the decision to go with a stepper motor easier in circumstances where smooth motion is desired. The standard for stepper motors used to be movement of 1.8 degrees or 200 steps per revolution. That approach resulted in a jerky start and stop as early steppers went from having no movement to an immediate speed of 200 steps per second (60 RPM) or vice versa.

The standard 1.8 degrees with microstepping is further subdivided by a factor of as much as 250. The result is smoother motion as well as the increased ability to move through and within the low end resonance speed region. Microstepping technology also allows more precise and repeatable positioning, when used with an encoder for auto-correction. That precision is repeatable if the motion is always in the same direction and if the system is not powered down. *NOTE: If both situations are not the case, then a stepper motor will need the encoder feedback for confirmation and to correct positioning.*

Kollmorgen high-performance, brushless, maintenance-free [stepper motors](#) provide precise, extremely cost-effective motion control. The 2-phase motors inherently move in exact 1.8° increments (200 steps per revolution), with no need for expensive, complicated feedback devices. When using a microstepping drive, each 1.8° step can be broken into even smaller increments to achieve practically servo-like positioning performance.



[POWERPAC® K and N Series](#)  
POWERPAC® hybrid stepper motors deliver more power in a smaller package. These rugged NEMA 34 and 42 (90 and 110 mm) motors combine optimal magnetics in a housingless frame with a large diameter rotor and innovative rotor-stator design to produce more torque and smoother microstepping.

## ABOUT KOLLMORGEN

Kollmorgen is a leading provider of motion systems and components for machine builders around the globe, with over 70 years of motion control design and application expertise.

Through world-class knowledge in motion, industry-leading quality and deep expertise in linking and integrating standard and custom products, Kollmorgen delivers breakthrough solutions unmatched in performance, reliability and ease-of-use, giving machine builders an irrefutable marketplace advantage.