

Servomotors and drives speed robot performance

Eliminating the gearbox means fast starts and high reliability.

When it comes to high-speed handling operations, time is money. In plastic injection-molding operations, for instance, high productivity often depends on a fast, reliable robot to remove parts from the mold. Shaving a tenth of a second off the removal time can impact productivity significantly.

That was the focus for Automated Assemblies Corp., Clinton, Mass., in designing a new three-axis robot to remove parts from injection-molding machines. The company sought high-performance servocontrols to speed production and improve system reliability. The resulting design, leveraging high-speed brushless servomotors and digital servodrives from Moog Industrial Controls, East Aurora, N.Y., has reduced the part-removal time on a 50-in. vertical round-trip cycle (including a simultaneous 2-in. strip-stroke move) to 0.22 sec — a 21% improvement over previous designs.

To accelerate end-of-arm tooling that can weigh as much as 7 lb to more than 15 g, engineers used a direct-drive rack-and-



A new controller and motor configuration allows high-speed handling of injection-molded parts.

pinion configuration for the vertical axis. Eliminating the gearbox allows designers to take full advantage of the servosystem's high-acceleration capabilities while boosting overall reliability. Also, without the backlash inherent with mechanical gearing, the system benefits from higher control-loop gains to minimize settling time. The direct-drive configuration cuts total system cost as well.

A motor with a custom winding and a

High output torque in a compact, low-inertia design allows G400 Series motors to accelerate and decelerate rapidly, speeding part removal.



G400 Series motor specs

	X, Y AXES	Z AXIS
Continuous stall torque (Nm)	2.6	26
Peak stall torque (Nm)	6.50	78.2
Nominal power (kW)	0.95	5.1
Maximum speed (rpm)	8,000	4,300
Inertia (kg-cm ²)	1.55	19.4*
Mass (kg)	3.6	17.4*

* Data includes integral holding brake.

torque levels three times the continuous torque rating. The motors are available with integral holding brake and include a lightweight design to reduce loads on the X and Y axes.

The T200 includes digital control loops with high bandwidth response and advanced signal-processing

high-power T200 Series digital servodrive control the vertical axis. Standard catalog motors and the L180 digital servodrive power the less-demanding traverse axes, further reducing system costs.

In this high-speed application, vertical movements are most critical to overall system performance. The vertical axis executes a triangular motion profile — switching from maximum acceleration to maximum deceleration. With a fully laminated low-inertia rotor, high-pole-count design, and high-grade SmCo magnets, the G400 Series motor features a high peak torque-to-inertia ratio which, in turn, delivers fast positioning. The vertical axis operates at a relatively low duty cycle (less than 10%) compared to the entire process, providing high overload capability and permitting the motor to deliver intermittent

algorithms to deliver high dynamics. A conservative thermal-management design, next-generation IGBT switching modules, and a multitiered fault-protection scheme combine to offer reliable operation in harsh industrial environments. Integral motion control, servoamplifier, brake relay, EMC filters, and fieldbus connectivity — all integrated within the compact enclosure — reduce wiring costs and free up valuable cabinet real estate. The Windows-based interface includes automated self-tuning, virtual oscilloscope, data logger, and system-diagnostics support to simplify setup and commissioning. ■

Information for this article was provided by Automated Assemblies, Clinton, Mass., and Moog Industrial Controls Div., East Aurora, N.Y.