

How can Electromechanical Actuation Benefit the Food & Beverage and Packaging Industries?

EXLAR[®]

Exlar[®] electric roller screw linear actuators, rotary servo motors, and integrated control solutions offer forces exceeding 80,000 lbf, and linear speeds which surpass 60 inches per second. www.exlar.com

Exlar[®] actuators are a brand of Curtiss-Wright Actuation Division.

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Author: Karl Knutson, Strategic Account Manager

With an increasing market desire for energy efficient solutions, a demand for increased production and quality, an increasing awareness of environmental impacts, and new safety concerns amidst a global pandemic, electromechanical actuation (EMA) offers a beneficial alternative to traditional fluid power technologies (both hydraulic and pneumatic).

EMA offers superior:

- **Precision and Speed** – Increases throughput, increases quality, and reduces waste with accurate and repeatable positioning and force.
- **Power Density** – Provides high force and speed in a compact design.
- **Flexibility** – Programmable servo-driven units allow for changes to motion profiles at the touch of a button, without having to change out tooling.
- **Total Cost of Ownership (TCO)** – Lowers TCO by being energy efficient and less costly to support over their installed life as compared to fluid power alternatives requiring filters, oil/compressed air, and more frequent maintenance.

The table below further demonstrates the differences between EMA and pneumatic technologies. Compared side by side, it's clear that EMA can provide many industry benefits over pneumatic actuation.

	EMA/Exlar Roller Screws	Pneumatic Cylinders
Speed	Very high	Very high
Motion Profile Adaptability / Flexibility	Very High	Low
Accuracy / Repeatability	Very high	Moderate
Stiffness	Very high	Very low
Load ratings	Very High	Low
Efficiency	>90%	<50%
Relative Space Requirements	Minimum	High
Noise	Very low	Very High
Lifetime	Very long, many times greater than ball screw	Can be long with proper maintenance
Maintenance	Very low	High
Acceleration	Very high	Very high
Shock Loads	High	High
Friction	Low	Moderate
Installation	Compatible with standard servo electronic controls	Very complex; requires servo-valves, plumbing, filtering, compressors linear positioning & sensing

Electromechanical Actuators come in many forms and can manage various applications

Electromechanical linear actuators (EMA) come in various forms. Most commonly, EMA's consist of a motor and screw mechanism combination. The screw converts the rotary motion of the motor into linear motion at the load point. Motors can vary depending on the application, from small to large, AC to DC, and simple induction to servo based. The screws can also vary, but the most common are roller screw, ball screw, and ACME.

While there isn't one solution that completely fits all applications, Exlar® has found that a brushless DC servo motor combined with a high precision crafted roller screw fits a wide variety of industry needs.



The brushless servo motor provides scalable speed and variable positioning while maintaining pinpoint accuracy and repeatability and high reliability with lower maintenance.

The roller screw provides the highest reliability and precision, greatest efficiency, and offers the longest life compared to other screw technologies, i.e., ball screw and ACME screw.

Exlar found that integrating those two components together provides the best linear electromechanical actuation package for many high cycling, high force, precision applications in industrial markets – including the Food & Beverage and Packaging industries.

Three Types of Electromechanical Actuators

In a complete EMA solution, a motor, screw mechanism, and motor controller / amplifier are required. Those three pieces can be supplied in several combinations to suit a variety of needs, but the three most common are laid out in the table below.

	Build Combination	Benefit
Motor + screw (universal) + Drive	The motor is coupled to the screw with a traditional inline or parallel mount. The drive is connected to the motor through cabling.	The universal actuator allows for flexibility in motor and drive selection and allows for long stroke lengths while utilizing a traditional screw.
Motor / Screw (integrated) + Drive	The motor and screw are integrated into a single package without external coupling. The drive is connected to the motor/ screw through cabling.	Eliminates a failure point by removing the need for a mechanical coupling between the motor and screw by wrapping the motor around an inverted roller screw, which also streamlines the package and takes up much less space than the traditional motor + screw described above.
Motor / Screw / Drive (intelligent)	The motor, screw, and drive are all integrated into a single package with no mechanical coupling or cabling.	Combines the added benefits of the motor/ screw (integrated) + drive option and reduces the need for cables and a drive panel by mounting the servo drive onto the actuator, also known as decentralized or distributed control architecture.

Reducing Total Cost of Ownership with Exlar EMAs

The factor that often gives those considering EMA technology pause is cost. EMAs typically cost more than pneumatic actuators, when looking only at the component acquisition cost. However, life-cycle costs of EMAs are typically lower and more beneficial when considering energy efficiency, lower maintenance costs and down-time, and production efficiencies with higher machine cycles and precision.

Unnecessary component costs can be eliminated when considering Exlar's range of standard and custom product options. Consider the material an actuator is composed of, for example. An EMA made with anodized / coated aluminum can cost up to 50% less than one made with stainless steel. Further, lead times for anodized aluminum are significantly less – up to 16 weeks shorter.

The Food & Beverage and Packaging industries can meet regulatory and safety compliance while affording investment in EMA technologies. Many of Exlar's customers have realized more cost-effective EMA solutions by purchasing an anodized / coated aluminum actuator and building a stainless-steel enclosure or shield to function as a barrier. This barrier would protect the actuator from corrosive contamination, while also adhering to regulatory and safety requirements in areas of potential product contamination.

Exlar EMAs and Food & Beverage and Packaging Industries

In a market that is increasingly working towards lowering one's carbon footprint and thinking about safety more dynamically amidst a global pandemic, adopting EMA technology can help the Food & Beverage and Packaging Industries work towards realizing those goals. EMA is cleaner operating, more powerful and precise, and offers more flexible solutions than pneumatic technology. Further, the TCO can be recouped over the installed life or even more quickly when unnecessary component costs are eliminated.