White Paper

CURTISS-WRIGHT

Motion System Causing You Pain?

EXLAR®

Exlar® electric roller screw linear actuators, rotary servo motors, and integrated control solutions are used for motion control for a broad range of applications. Our roller screw technology provides an efficient electro-mechanical replacement for your hydraulic or pneumatic cylinders with forces up to 80,000 lbf, and linear speeds which surpass 60 inches per second. www.exlar.com

Exlar® actuators are a brand of Curtiss-Wright Sensors & Controls Division.

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Most industrial manufacturing processes include some form of motion control for moving parts, assemblies, and other materials from Point A to Point B. As new manufacturing technologies emerge and evolve, advances in factory automation equipment and processes continue to improve ROI through enhanced performance, greater precision/accuracy, flexibility, and reduced maintenance requirements. From complex pick-and-place motion systems to relatively simple but critical work-holding applications, each has a unique set of design and implementation challenges. Finding the optimal application-specific motion solution can present a number of pain points for application engineers.

At the heart of every motion system is the actuator, the device that provides the actual motion. Any pain points associated with this system-critical component can greatly affect final product quality and/or the total cost of ownership. Considering the current trend of electrifying motion systems, electromechanical actuators can greatly reduce or, in some cases, eliminate the pain points associated with non-electric systems. Key to the actuator selection process is making sure certain criteria meet or exceed baseline application requirements.

Performance Characteristics

The most important deliverable of a motion system actuator is the ability to meet the motion and force profiles required by the application. Lacking the capability to generate the appropriate force or speed, the actuator will either fail prematurely or the speed will not meet throughput goals, either of which represents a significant pain point. While many factors play into the motion control system sizing and selection process, cycle time, thrust requirements, life expectancy, and motion profile are a few of the major considerations system designers need to balance in machine design to meet the performance requirements.

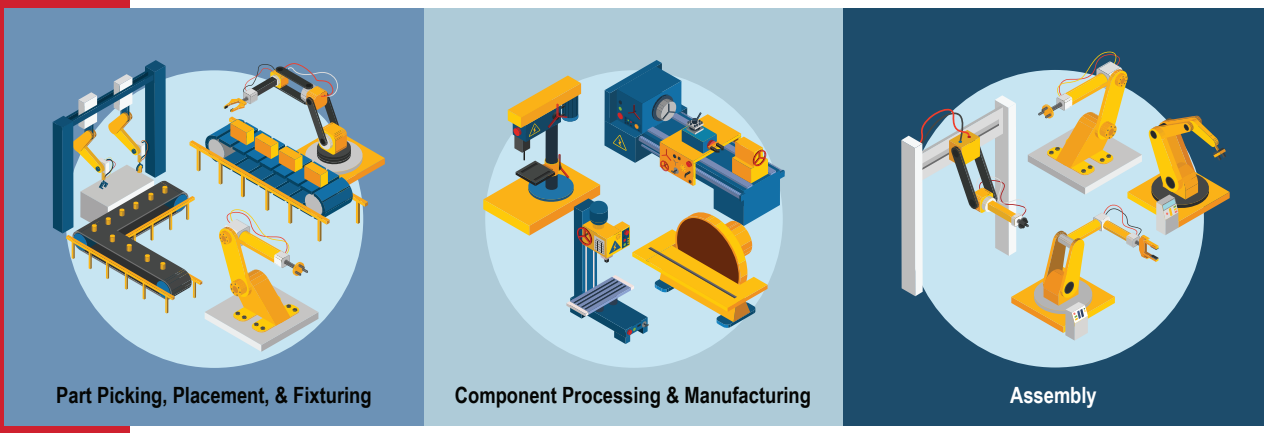
With competitive pressures on the rise, machine builders are taking a new look at the status quo. Thanks to recent technological advances, today's electromechanical actuators are faster, stronger, and smaller than ever before allowing manufacturers to develop innovative new designs. An example of this is the Exlar® integrated motor / actuator from Curtiss-Wright. By directly integrating an inverted roller screw inside the rotor of a servomotor, the company created an actuator package that delivers unmatched force density.

Precision and Accuracy

A key driver of quality is the application of reliable and repeatable processes to produce precise, accurate results. Whether metering, dispensing, clamping or performing any function, the absence of repeatability all but guarantees variation, an arch enemy of consistent

product quality. A machine producing parts that do not meet quality expectations can cause a manufacturer a lot of pain by missing shipments, accepting lower yield rates, performing excessive maintenance, basing capacity on expected fallout or even outsourcing production, all of which reduce profitability due to added cost.

Electromechanical actuators can run the same profile with digital precision and control for consistent, repeatable results. The importance of this capability can be found in the food packaging industry where volumetric filling machines must consistently meet established minimum contents. Too little volume means the product fails quality checks resulting in customer complaints or worse, government intervention. Too much volume means profits are shipped out the door or an overfill situation requires a line shutdown to clean up and make necessary adjustments.



Flexibility

System downtime is a common and frequent pain point for all manufacturers. Having to stop production to change tooling or machinery is production lost forever. Electromechanical actuator motion systems are easily programmable to accommodate changes in line requirements providing enhanced flexibility and potentially saving thousands of dollars in lost production time. A common application in which flexibility plays a key role is part positioning and clamping. As consumer demands change, so do component part configurations. In the past, a different part configuration would require a different clamp, resulting in lost time due to tooling changes. Installing a programmable electromechanical actuator onto a clamp allows an operator to easily change a program to modify the motion profile to adapt to the new parts. In addition to saving downtime during changeovers, this flexibility can save floor space and capital required by reducing the number of production lines required.

Maintenance

A common pain point for most manufacturing facilities is the need for preventive maintenance to maximize production efficiencies and extend machine life. Routine tasks such as seal replacement, tooling adjustments, and tooling wear all contribute to maintenance costs and can be planned. However, unplanned events such as seal failure, hydraulic leaks, and other unforeseen maintenance increase downtime and add cost. The workspace environment itself can add cost. Even the most well designed hydraulic and pneumatic systems are often a mess of

supply lines, hoses, pumps, valves, and other collateral that can get in the way and slow down worker progress. When maintenance costs become so excessive that they are costing more than they are saving or are occurring so frequently that a production line is down seemingly more than it is up, it may be time to change the technology.

Compared to fluid power motion systems, electromechanical solutions require much less maintenance and in many applications, actuators are maintenance-free. One blown hydraulic hose can shut a line down for hours due to cleanup and replacement. As every facility manager knows, equipment always seems to fail when it is pushed the hardest, usually during peak production cycles. With electromechanical systems, on the other hand, most repairs are of the plug-and-play variety with virtually no clean up and minimal downtime required.

Energy efficiency

While energy consumption may not be a top priority for systems designers and integrators, rising energy costs have always been and will continue to be an important consideration for facility managers in keeping operating costs to a minimum, thus helping to keep prices competitive in the markets they serve. Electric actuators are designed for highly efficient operation, even under load, and draw only the power needed for actual production. In addition to the upfront cost of plumbing fluid power systems, high fluid pressure requires pumps and other controls to be in an always-on state whether used for actual production or not.

Example: In the plastic molding industry, molds come in a variety of shapes and sizes, but in most applications one thing is common – the relatively high amount of force required to hold molds closed during the molding process. With fluid power systems, this requires a hydraulic cylinder to provide the required force over an extended period of time. An integrated servo-controlled electromechanical actuator drawing only the power needed to hold the mold closed can reduce energy costs by as much as 50% when compared to a traditional fluid power system.

Conclusion

There are myriad questions that need to be considered when planning a facility's infrastructure and production requirements, some obvious some not so much.

- Which is the most cost effective, a hydraulic and/or pneumatic manufacturing ecosystem or all-electric?
- Can increased performance or additional flexibility allow a line to be used for multiple operations or parts?
- If maintenance costs and associated downtime are reduced to near negligible levels, does that help remove machine bottlenecks?
- How do operations and maintenance costs affect end user pricing?
- Could improvements in quality parts due to reliable machinery increase throughput while also drastically reducing scrap costs?

These and other critical decisions must be made, it is wise for all teams – operations, finance, sales and others – to consider the total cost of ownership before making long term commitments. Regardless of whomever is in a position to feel the pain of a process or machine, root cause analysis will often show that the technology applied may not be the right choice or is not properly applied. Planning and implementing a system that meets current and future requirements is always a challenge, especially when it involves a paradigm shift related to technology. Curtiss-Wright's application engineers can provide guidance to optimize system performance, eliminate premature wear, increase production, improve quality, and ultimately reduce costs.

About Curtiss-Wright/Exlar Automation

Curtiss-Wright Exlar electromechanical actuators provide some of the most compact and lightest actuator solutions available. Exlar's unique roller screw technology delivers higher force in a smaller package than comparable ball screw technology, as well as greater flexibility, higher efficiency, and lower overall maintenance than traditional fluid power solutions. Exlar actuators are being used in thousands of applications around the world, improving efficiency and throughput.