

Geared vs. Belt Parallel Drives on Linear Actuators

Customers occasionally raise questions regarding power transmission systems on actuators with an externally mounted motor, such as Exlar FT Series or K Series actuators. Often the first question is the most obvious; what is better, gears or belts?

Exlar has successfully employed a synchronous belt transmission as our standard design for over 15 years. Our solution utilizes a synchronous, polymer reinforced belt driving timing pulleys. Each belt drive is designed to meet or exceed the capacity of the given actuator in a given application to provide reliable and continuous service throughout the expected life of the actuator.

Belts have several advantages over gears, not only in durability, but ease of use and their maintenance-free operation. In choosing a transmission system, Exlar considered the following advantages of a belt driven system over geared:

- Belts provide a wide power range (speed x force), making them a viable option in a wider range of applications.
- Belts offer higher operational speed and with nearly no speed variation and no backlash.
- Belts provide a wide range of available reductions, greatly expanding motor configuration options and enabling optimal motor selection for a given application.
- Belts are extremely quiet throughout their speed range.
- Belts offer a low acquisition cost and no routine maintenance.
- Synchronous belts with their high modulus tensile cords minimize dynamic elongation providing positioning accuracy of .002" to 0.15" for motion control applications. Belt re-tensioning is not necessary unless the motor has been removed or adjusted.
- Belts are highly resistant to abrasion and many corrosive substances.
- When properly installed, synchronous belts offer a near constant 98% efficiency over their useful life.

In addition, gears suffer the following disadvantages:

- Gears require periodic lubrication, a time-consuming process requiring a significant amount of machine downtime.
- Gears wear and gear lubrication breaks down. Gear failure results in locking up the transmission and therefore the actuator, or stripped gears which allows the transmission to freewheel.
- Gears wear over time increasing backlash and noise. This wear also can create slack in the system that negatively impacts machine performance. This gradual wear ultimately reduces productivity.
- Although some cycloidal gears approach 97% efficiency, most gears are only 85 – 90% efficient. Some, such as worm gears, are as little as 60% efficient. Lower efficiency means more torque; and therefore, more power is required to perform the same amount of work.

Exlar has standardized on synchronous belt drives as our preferred power transmission for parallel motor mounting based on the cost savings, reliability, ease of use and overall performance benefits relative to geared solutions.

With over 15 years of experience, Exlar has yet to experience a single belt failure when the actuator is operated within its rated specifications and proper belt tensioning and alignment has been maintained.

Information sources include Gates® and Dodge® documentation.