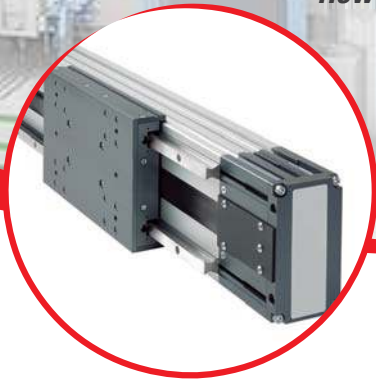


NINE TIPS FOR SPECIFYING AN ACTUATOR

How to choose the right actuator for an intended application



Introduction:

The task of selecting, sizing and applying linear actuators involves many variables, from stroke length and duty cycle to precision and accuracy requirements. Ultimately, matching the right actuator to the intended application requires a close look at all of the specifications involved and then, of course, working within the project's performance, time and budget constraints. **Actuators are useful in a wide range of industrial applications. Each application, though, has unique requirements.** Certain manufacturing operations are more rigorous than others, and require strong and reliable motion components. Here is a look at some of the most **important aspects to consider to select the right actuator for an intended application.**

Rollon is an international Group operating in the linear motion market in different industrial sectors such as industrial machines, packaging and logistics, medical and many others. The Group has a **strong focus on actuators** and, since January 2015, it has expanded its range of linear axes with the acquisition of Tecno Center, an Italian producer of linear actuators and components for **linear motion systems for industrial automation.**

PRECISION AND ACCURACY:

To select the right option it's essential to evaluate the level of precision, accuracy and repeatability required by the application. In the majority of applications involving actuators, **positioning repeatability to 50 µm** is acceptable, and achievable with a **belt or rack and pinion driving system**. Consider a 3-axis cartesian robot with a gripper sitting atop the vertical axis. The robot moves into various positions so that the gripper can pick up cases and move them onto pallets. Motion must be repeatable, reliable and fairly precise for the robot to do its job, though pinpoint accuracy is rarely needed in this scenario. However, for tasks requiring more precise positioning, ask your actuator supplier about the option of adding a linear encoder.

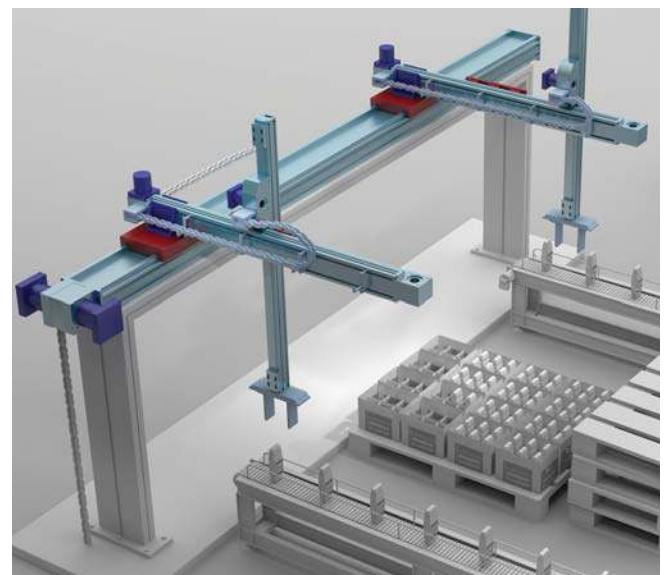


Fig. 1 - Cartesian system for end-of-line case packing: Rollon solutions for packaging.

LOAD CAPACITY:

Think about the loads, moments and forces that the actuator must handle. For **heavy-duty applications**, this will likely involve some fairly demanding dynamic load capacities. How much load can the actuator handle during high speeds and acceleration? Take a close look at the actuator's specifications for **thrust capacity, dynamic load capacity, and bending moments**. Load capacity is directly related to the internal construction of an actuator. While many linear actuators look similar from the outside, some are built to handle high loads at high speeds.

TRAVEL LENGTH AND SPACE:

Determine the required stroke length as well as the volumetric envelope the system must fit into. For example, will the actuator be used to move a robot into position? How far will the robot need to travel on its linear path? Or will several actuators be used to create a cartesian gantry system? In certain scenarios, it makes sense to build a 3-axis gantry system out of rigid heavy-duty actuators to handle heavy loads rather than using a robot with a more limited payload capacity. In many cases, a gantry system may require the same or less volumetric space than a comparable robot system. Moreover, in case of long strokes, the use of **rack and pinion driven actuators** is strictly advised to avoid any imprecision that may derive from the belt elasticity.

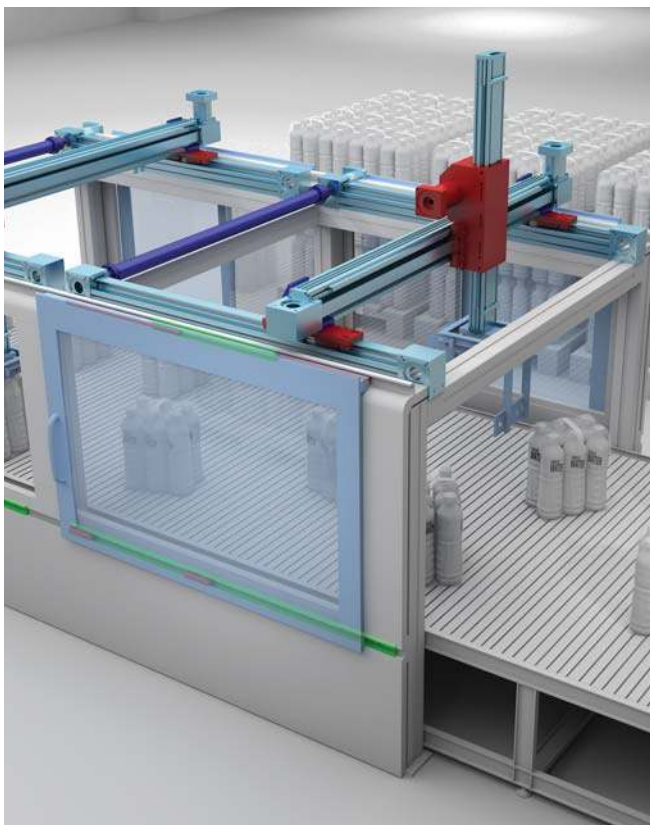


Fig. 3 - Cartesian system for water bundles: Rollon solutions for Packaging.

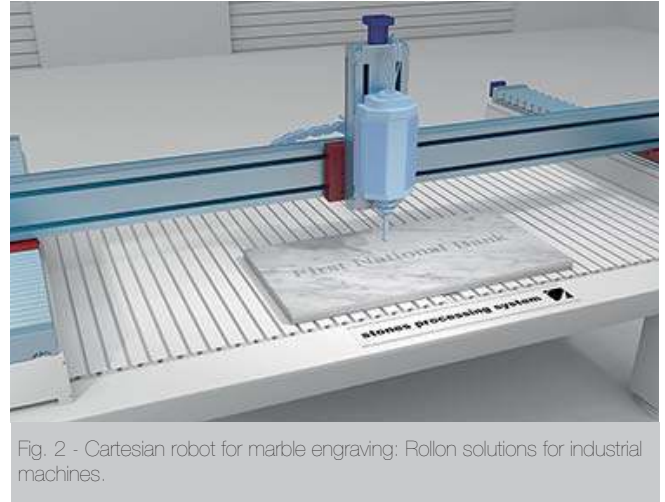


Fig. 2 - Cartesian robot for marble engraving: Rollon solutions for industrial machines.

DUTY CYCLE:

Consider the application's **motion profile, duty cycle, cycle time and dwell time** in addition to lifetime requirements. Many applications require nearly constant motion as actuators move back and forth between different positions. Be sure to ask your actuator supplier about **maintenance and lubrication schedules** as well. Some actuators only need relubri-cation after a service life of 20,000 km, while others demand more frequent attention.

OPERATING ENVIRONMENT:

What are the **working conditions** the actuator and larger system will be subjected to? Will **special seals or bellows** be required to protect the actuator's moving parts from **dust, moisture or other contaminants**?

SPATIAL ORIENTATION:

How will the **actuator** be oriented in the available space? How will **loads and forces** be oriented? Consider mounting options as well. Most operations call for **horizontal mounting**, though **vertical mounting** is often required in multi-axis systems. The more information provided to your actuator supplier in the early stages of system design, the more successful your application will be. In addition, consider the **linkages between actuators** in multi-axis setups. Some suppliers provide fittings such as brackets and cross plates designed to rigidly connect actuators to each other, while others leave these connection tasks to the end user. Improperly connected systems can lead to problems with misalignment, vibration, reduced accuracy and, ultimately failure.

ACTUATOR CONSTRUCTION:

As mentioned earlier, many actuators share a similar appearance at first glance. Most are made of **anodized aluminum extrusions** for high strength and low weight, but this is where the similarities often end. When specifying an actuator for heavy usage and demanding loads, it pays to look closer. One area of interest is the guide system. Look for **preloaded linear guides**, which help improve the accuracy, repeatability and stiffness of the entire moving system. **Rubber coated or plastic guide wheels** may work fine at the outset, but are not nearly as long lasting or rigid as preloaded guides. Consider the bearings as well. Pre-loaded **linear bearings** made of machine tool grade steel go a long way toward increasing system stiffness and accuracy. In the case of belt-driven actuators, another area to look at involves **shaft and pulley construction**. Look for steel pulleys for strength and longevity. Also consider how the **shaft and pulley assembly** is made: assemblies that are machined from one piece of steel mean that the pulley cannot slip on the shaft, in contrast to multiple component arrangements where the pulley is pressfit to the shaft. In addition, look for pulleys that use sturdy bolt-on flanges to guide the belt as opposed to lightweight flanges that are pressed on or formed in with the pulley. Finally, look for preloaded radial ball bearings on the pulley drive rather than plastic or bronze bushings. All of these details add up to a heavy-duty actuator that can handle the punishing loads of the most demanding applications.

SPEED AND ACCELERATION:

To select the proper actuator for the intended task, one must first know the travel speed in addition to the required **acceleration and deceleration rates**. Does the actuator need to quickly match the speed of a moving conveyor belt to be able to grab pieces at a certain point and then move them to a pallet? Perhaps a robot needs to be moved into position for a few seconds while it completes a pick-and-place motion and then must be retracted to its original position. These are the details your actuator supplier will need to know. Some heavyduty actuators can support high loads at speeds to 5 m/s while others are more limited in their speeds and load capacities.

GEARBOX AND MOTOR MATCHING:

When it comes to specifying high speed belt-driven actuators for demanding operations, more than 95% will require a **gearbox or speed reducer** for inertia matching and as a torque multiplier. Some actuator suppliers include integrated planetary gearboxes as part of a complete actuator assembly to make specification simpler. Another area to inquire about involves motor sizing data. Ask your actuator supplier if they can provide detailed application engineering data to your motor manufacturer so that the entire system is matched correctly to the intended application. Some suppliers offer this preengineering documentation as part of a comprehensive quote.

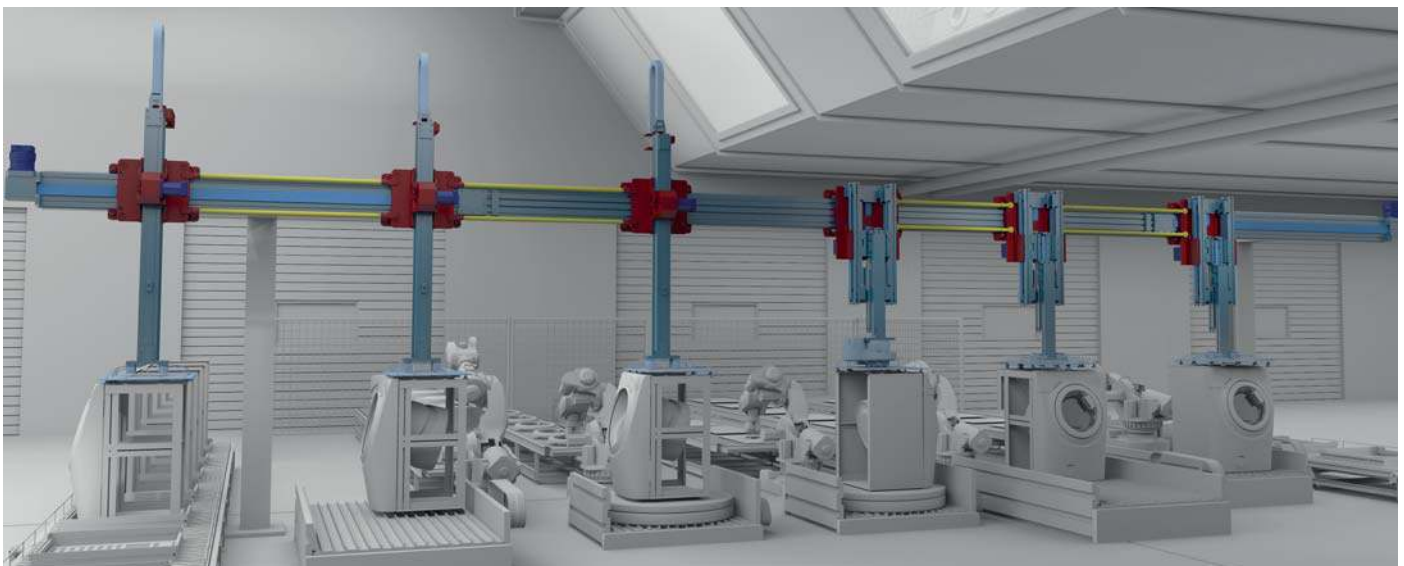


Fig. 5 - Rollon Actuator System Line for industrial automation: multi axes pick-and-place.

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