

SMC Expert Article – Cobots

Cobots and end effectors team up for affordable flexible solutions

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While robotics led the way for the rapid growth of automation, we see cobots as the democratisation of robotics technology. They eliminate the cost and complex programming that robots usually require while providing much greater flexibility.

Sharing the expertise of collaborative robot manufacturers and end effector suppliers will allow manufacturing processes to acquire not only that flexibility, but also the improvements in versatility and productivity so much needed nowadays. The way we see it, gripping technology provides cobots with the same application flexibility that the cobot brings to the production process.

Why Cobots? From myths to a simpler and more cost-effective reality

The market for collaborative robots is expected to experience robust and exponential growth in the coming years. A report from Interact Analysis predicts the collaborative robot market will be worth \$7.5 billion by 2027. This would equate to roughly 29% of the global industrial robot market.

Once industry looks beyond the myths about cobots, it will begin to reap the benefits of what they really bring to the shop floor. For example, assisted by advances in edge computing, collaborative robots do not require the complex set-up of traditional industrial robots. These used to require at least a week of training, but some cobot manufacturers now make it possible to get up and running in as little as a half-hour.

The economic benefits they bring to manufacturing are very appealing when compared to robots, as they require a much lower initial investment and a highly reduced implementation cost. By some estimates, payback time for a typical cobot is between one and two years and can be as short as six months, according to the experience of some of our customers. These two major benefits make cobots an attractive investment, but what makes them a really exciting technology is the flexibility they provide.

Flexibility – The cobots' answer to ever-changing market demands

Cobots adapt easily to multiple applications, unlike traditional robots that generally are designed to perform just one task. Their light weight and more compact dimensions, coupled with the easier reprogramming, translate into a huge level of mobility so they can be placed easily where the production process demands. Cobots make it easy to automate, even for short production runs, and to change lines frequently.

Their contribution to versatility is as varied as each process reality. For example, companies not working on a 24/7 workflow can set up cobots to load machines that run at night while the factory is closed. By morning, when it reopens, a production run has been completed. In

other cases, cobots can replace workers when the task is demanding, dangerous, or just tedious, freeing time for the workers to perform more productive and creative duties.

The possibilities are really endless, even more so when you add peripheral technologies such as IoT or AI to the equation. Here is where the beauty of cobot technology lies; it can deliver automation benefits formerly available only to companies with large-scale production facilities. These benefits now can be shared by small-to-medium businesses in a broad range of industries.

The safety issue

Designed to work alongside their human counterparts, with proper risk assessment, cobots may not require confining cages or cumbersome safety guarding. Christoph Ryll, a cobot specialist who is collaborating with SMC to develop practical safety solutions, describes what would be the final purpose: working together, humans and cobots can achieve a higher efficiency than either could alone. However, safety is still an issue, and 95 percent of cobots are still confined by cages and not truly collaborative today. He notes that operator safety training may indeed take somewhat longer.

End effectors – A matter of symbiosis

End effectors, primarily in the form of grippers, enable the business end of the cobot to handle and manipulate parts with a wide variety of shapes, sizes and materials. The flexibility of adapting a cobot to many different applications is a major benefit, as long as it's easy to change the gripper. For instance, a cobot used to drive screws on an assembly line has to be easily refitted with a different end effector and used in a pick-and-place application.

Machine builders or integrators should communicate closely with end users in order to ensure the success of the union. The gripping technology should be able to adjust perfectly to the specific needs of the task. As important as it is to select the right cobot, it's equally vital to choose the correct end tool, capable of being customised to meet the specific requirements of the task, such as location of pick, maximum allowable force, weight profile of the part, its composition and shape.

Size and weight optimisation are especially relevant for collaborative robots. The weight of the end effector directly affects the overall cobot payload. As gripper manufacturers, our challenges are to provide maximum gripping force and flow while maintaining minimum dimensions and weight.

Simple: the best gripper always depends on the task

When choosing a gripper, start by defining the task, including the piece or pieces to handle (shape, weight, material). Are all them the same, or is there a mix? What is the required cycle time? Is precision needed? What about force? Does it need to be customised? Machine builders or integrators must choose the best gripping technology for the application. Manufacturers such as SMC have developed solutions designed to work with all robots and cobots on the market.

Pneumatic grippers are well suited for general pick-and-place applications. Air- operated solutions, by definition, provide a higher force, speed and operating frequency. If none of those parameters need to be controlled or precise, a pneumatic gripper is the best solution

Vacuum grippers generally are in the form of suction pads. Suction holding is normally recommended for moving and transferring delicate or flimsy workpieces. They are available to fit many unusual shapes and are constructed from a variety of premium materials such as silicone, NBR, urethane and fluorine, or those compliant with FDA standards.

Electric grippers - When it is necessary to control the position, force or speed, you need to choose electric grippers. They allow partial closing and opening, for example. This is extremely helpful in some processes, as it does not compromise the cycle time. Controlling the grip force and speed makes them ideal for handling delicate pieces such as Printed Circuit Boards (PCB), or when the process requires handling of different pieces.

Magnetic grippers – For those applications where suction pads and grippers will not perform optimally due to uneven or porous surfaces, magnetic gripping is the answer. With a holding force of up to 120 N, it is a versatile solution with a great variety of applications for handling ferrous metals.

SMC offers all different gripping technologies and develops plug-and-play grippers and gripper systems for all cobot and robot suppliers. We base them on the concepts of energy efficiency and performance, with special focus on size and weight optimisation. The consideration of weights, overall dimensions and ergonomics assists machine wrist movements and avoids limiting its performance.

However, where SMC can really make a difference is in our capacity to combine a 360° approach to automation necessities such as electric solutions that assist cobot mobility with the technical support to customise automation solutions that adapt perfectly to production processes and ensure optimum flexibility.

Finally, one game-changing technology for the cobot market is the application of wireless to drive pneumatic, digital and analogue signals. This will to reduce or eliminate cabling, especially for applications involving mobile devices, which experience such issues as breakage due to cable frictions that can produce major machine faults and lead to downtime or lost production.

The alliance between cobot and end effector actualises the flexibility that industry and end consumer demand nowadays. The new World Robotics 2020 Industrial Robots report, released on September 24, 2020, states that while industrial robots have experienced a decrease of 12% in sales volume, collaborative robots have shown a rise of 11%. Of course, the cobot market is its very early stages of adoption but eagerly looking forward to being a part of this blossoming and exciting industry.