LOVOTICS

Ostergaard, LOVOTIC 2014, 2:1
http://dx.doi.org/10.4172/ 2090-9888.1000111

Short Communication Open Access

Your New Robot Colleague – Coming Out of its Cage

Esben Ostergaard*

Universal Robots, Denmark

***Corresponding author:** Esben Ostergaard, Chief Technology Officer, Universal Robots, Denmark, Tel: +45 89 93 89 89; E-mail :esbenman@gmail.com

Received date: January 30, 2014; **Accepted date:** October 24, 2014; **Published date:** October 31, 2014

Introduction

Next-Gen, New-Gen, co-worker-call it what you may, a robotics revolution is rolling into manufacturing, warehousing, materials handling, and supply chains worldwide.

When asked how they envision a robot, most people either think of huge, unwieldy robots working in fenced off areas in large factories. Or, they think of futuristic cyberbots mimicking human behavior.

But somewhere in between these two scenarios lies a new emerging reality: A new class of robots, dubbed "collaborative robots" due to their ability to work directly alongside employees with no safety caging. These kinds of co-bots are poised to bridge the gap between fully-manual assembly and fully-automated manufacturing lines. Nowhere is that more obvious than in the SMB sector, that up until now viewed robot automation as too costly and complex to even consider.

Unlike their big brothers working behind glass at automobile plants and other big assembly lines, collaborative robots are lightweight, flexible and can easily be moved and reprogrammed to solve new tasks, meeting the short-run production challenge faced by companies adjusting to ever more advanced processing in smaller batch sizes. The automotive sector still comprise roughly 65 percent of all robot sales in the U.S., while RIA (Robotic Industries Association) quote observers believing that only 10% of companies that could benefit from robots have installed any so far.

Lowering the Entry Barrier

The reason that number is so low is primarily due to three challenges now addressed by the new collaborative robots: Cost, user-friendliness, and applicability. Let's start with the financial issue:

Even where workers are affordable, the next generation of complex products will require assembly adaptability, precision, and reliability that is simply beyond the skills of human workers. According to the old rule of thumb, the cost of a robot would be equivalent to one worker's two-year salary. But collaborative robots are closer to one fourth of that price. Combine that with the faster turnaround time that robots bring to the workplace, and robotic technology demonstrates that the offshore exodus doesn't make good business sense any longer.

Instead, the new robots become a high-tech currency that's changing the wage wars into a competition over increasing product quality and quick turnaround.

A Plug and Play robot

With traditional robots, the capital costs for the robots themselves account for only 25 to 30 percent of the total system costs. The remaining costs are associated with robot programming, setup, and dedicated, shielded work cells. The "out of box experience" with a collaborative robot is typically less than an hour. That's the time it takes to unpack the robot, mount it, and program the first simple task.

Which leads us to user-friendliness: Instead of requiring skilled programmers, this new class of robots come with a tablet sized touchscreen user interface, where the user guides the robot arm by indicating movements on the screen. Or, by simply grabbing the robot arm, showing it the desired path of movement. The interface is compliant with most industrial sensors and programmable logic controls (PLC). Programming for new tasks is easy-as experienced by Danish manufacturer of hearing aids, Oticon, a company impressed by the intuitive user guidance and the precision of the new co-bots. Oticon needed a flexible robot that would be economically viable for short runs. Rapid advances in medical engineering have resulted in constantly changing production processes and a broader range of hearing aid models that require a robot handling smaller batch sizes.

Precision Handling

The new robot addresses the issues around applicability and portability not met by the traditional robots that Oticon had employed in the past. The parts for modern hearing aids are getting smaller and are often only a milimeter in size. The hearing aid manufacturer was looking for a solution that could suction small parts out of a mold. This was impossible manually. And not suitable for their "old" two- or three-axis robots that were only able to perform lateral and vertical movements. If, for instance, a small part is stuck in a mold, the robot had to be able to tip it out.

It took just one day to install the robot for its new task in Oticon's molding shop. Mounted firmly to the injection molding machine, the new robot can position itself over the mold and suction the plastic elements using a specially designed vacuum system while more complex molded components are handled with pneumatic gripping tools. Because of its six axes, the new robot is very manoeuvrable and can rotate or tilt the parts in order to lift them quickly out of the mold. The robot works in four- to seven-second cycles depending on the size of the production run and the component. Due to the optimized production process, the payback period was only 60 days.

Working within Space Restraints

At Cascina Italia in Italy, a collaborative robot works on a packing line handling 15,000 eggs per hour. The robot is equipped with a pneumatic gripper and fills boxes with egg trays containing 10 eggs each. The job demands very precise handling and the careful placement of nine layers of 10 eggs each in box.

Cascina didn't expect to be able to use a robot for the job, but after seeing a demo of the robot at their own factory, it was easy for the egg company to visualize the benefits. Ninety days later, the new robot was running on the line. Weighing only 11 lbs., the robot colleague can easily be moved between packing lines, which is crucial for Cascina

that handles four different egg sizes and needed a robot that could work within significant space restraints right next to their employees.

Safety First

Safety has been a hot-button issue and the major thrust of research and development in robotics labs for some time. With human collaboration in mind, the new generation of industrial robots consists of rounded joints, back drivable motors, force sensors, and lighter weight materials.

If the robots at Cascina come into contact with an employee, the built-in force control limits the forces at contact and does not cause bodily harm, adhering to the current safety requirements on force and torque limitations. In most applications, this safety feature enables the robot to operate with no safety guards after risk assessments have been conducted.

Avoiding Back-breaking Movements

This is the case at Scandinavian Tobacco Company, where a collaborative robot now works directly alongside employees handling the lids for tobacco tins in a setup where tobacco is packed.

The new robot spares the employees from having to make back breaking repeated movements and freed one or two employees who previously performed the tasks by hand. They now carry out other tasks at the factory. There was no room to screen off the robot in the setup at the factory, so employing a collaborative robot simplified the setup and costs considerably.

Scandinavian Tobacco developed their own gripping tool and had one of their own technicians do the initial programming. This kept the knowhow in the building and ensured high productivity while avoiding downtime in production and eliminated paying for expensive external consultants if the automation solution fails. The optimized production convinced the owner to keep production in a high wage Scandinavian country. The ROI for the tobacco company's new robot was 330 days.

From 45 to 70 Bottles Per Minute

Larger manufacturers also benefit from the new robots. At Johnson & Johnson's plant in Athens, Greece, a collaborative robot has significantly optimized the packaging process of shampoos and skincare products. The robot arm works round the clock, picking up three bottles simultaneously from the production line every 2.5 seconds, orienting them, and placing them in the packing machine. Manual handling processes 45 bottles per minute, robotic-assisted production handles 70 units.

The bottles are vacuum lifted and transferred cleanly without any danger of scratching or sliding. The dexterity of the robot plays a crucial role as the label is not printed on the same side on all products and the bottles are various shapes and sizes, which means the robot has to grasp from both the right and the left.

Any member of Johnson & Johnson staff can reprogram the robot for new tasks, saving the company the cost of hiring external programmers.

A New Way of Approaching Robotics

Above are some examples of the new generation of robots solving real life challenges not previously addressed by robots. When it comes to human collaboration and flexible manufacturing, features of the classic industrial robot must evolve on nearly every level: from fixed installation to relocatability; from periodic repeatable tasks to frequent task changes; from intermittent to constant connectivity; from no interaction with humans to frequent collaboration with workers; from space separation to space sharing; from profitability within years to near-immediate ROI. The near future will see even more advances in this nascent field of robotics, changing the way we work and interact with technology.