



# COLLABORATIVE AUTOMATION:

It's More Than Just the Cobot

WHITE PAPER



*Danish gear manufacturing company Osvald Jensen cuts machine-tending cycle time by 44% with collaborative automation, including dual gripper.*


## **NEW TO COLLABORATIVE AUTOMATION?**

### Consider the Whole Application, Not Just the Cobot

Collaborative robots, often called “cobots,” offer opportunities for companies of almost any size to cost-effectively automate processes that were previously out of reach. Cobots are available in a wide range of sizes, payloads, and capabilities, but they all share attributes that define the term “collaborative.” The aspect that most people think of first is safety—the ability for cobots to work alongside human workers without bulky, expensive guarding. Cobots include a number of built-in safety mechanisms, including rounded edges and softer materials as well as power- and force-limiting technologies that avoid injury and minimize

discomfort in case of contact, and sensors that automatically slow or stop the robot arm if a human enters its workspace.

But beyond safety, there are many other important factors that define the concept of collaborative robots. These include flexibility, easy programming, and much lower costs than traditional industrial robots, all of which leads to fast return on investment (ROI). These characteristics make cobots attractive, especially for small and mid-sized enterprises (SMEs) who were historically not suitable prospects for large, complex, and expensive industrial robots.



*Collaborative grippers are built with international safety standards in mind to minimize risk of injury.*

It's important to remember, however, that a collaborative application is more than just a cobot. John Santagate, Research Director for Commercial Service Robotics at IDC, says, "Innovation has occurred with regard to robotic arms over the past several years, delivering robots that are precise, powerful, and collaborative. However, the robot doesn't complete any tasks without end-of-arm tooling. The innovation that is occurring in the field of end effectors is the next frontier for collaborative robotic innovation. As collaborative robotic arms move towards commoditization, the innovation occurring around the end-of-arm tooling will enable organizations to deploy robotic technology in new ways."

## THE IMPORTANCE OF END-OF-ARM TOOLING (EOAT) ON 4 KEY COLLABORATIVE BENEFITS

Innovative end-of-arm tooling (EoAT) such as grippers, sensors, and tool changers has become a critical aspect of any collaborative application, making it accessible and profitable

for all sizes and types of manufacturers. Tooling has a significant impact on four key collaborative automation benefits. A thoughtful consideration of these provides a guide for choosing appropriate collaborative EoAT for common applications such as machine tending and packaging.

### 1. SAFE COLLABORATION WITH HUMAN WORKERS

Safe interaction between humans and robot is one of the primary advantages of collaborative automation, but it's important to note that no matter how cobots are designed and marketed, their use may not be free from danger in every application. For example, a cobot arm operating a welding torch or moving heavy objects can still present opportunities for injury to people nearby. This is why a risk assessment must always be performed before implementation, and why it must consider all of the elements of the application, including the end-of-arm tooling as well as the workpiece itself and the presence of other robots or equipment in the workspace.



End-of-arm tools for collaborative automation must be designed with certification in mind for the international standard ISO 10218, which defines safety requirements for robots and robotic devices. For example, grippers that are rated for 10 kg or lower payloads are considered “collaborative” in nature, and thoughtful design elements such as rounded edges, soft materials, and force-limiting and sensor technologies also contribute to worker safety. Another standard, ISO/CS 15066:2016, describes how a risk assessment for a collaborative application should be carried out, including specific ranges for acceptable force and pressure values on human workers. Collaborative grippers are built with this standard in mind, with appropriate maximum gripping force and available safety shields to minimize the risk of pinch-point injuries.

## 2. EASE OF USE AND PROGRAMMING

Cobots are known for their easy programming that allows even inexperienced users to “teach” a robotic process by simply moving the robot arm to the desired waypoints and using a touchscreen teach pendant to set the required actions. Collaborative EoAT extends this benefit with easy-to-use programming capabilities for the tool that are accessed directly from the robot’s teach pendant. This is one way that collaborative EoAT helps maximize production with faster uptime. Other ease-of-use attributes to look for include plug-and-produce EoAT implementation with limited cables and connections to manage. Electric vacuum grippers are an ideal choice for collaborative applications as they eliminate the need to manage air lines or clear space for pumps in smaller production cells. For environments that have implemented both collaborative and light industrial robots, tooling that can be used on both platforms interchangeably makes it easier for employees to learn the tools and move smoothly from one process to the other.

*Collaborative EoAT is easily programmed directly from the robot’s teach pendant with no previous experience.*





*A collaborative quick changer allows tool changes in seconds for maximum uptime and productivity.*

### 3. FLEXIBILITY FOR EASY REDEPLOYMENT

The ability to quickly and easily redeploy cobots provides numerous advantages for companies with changeable product lines, seasonal demands, or multiple processes that need to be automated using a single robot that is moved between tasks. Cobots can save multiple programs on the teach pendant and with collaborate EoAT, changing jobs can occur in minutes by simply plugging in the new tool and pulling up the right program on the teach pendant. The addition of a collaborative quick changer allows for fast and easy tool changes for maximum uptime and productivity. Collaborative design elements of the tool changer, such as low weight and height, minimize its impact on the application's payload limits and programming. Rounded edges support safe interaction with human workers, and reliable, easy-to-use locking mechanisms allow tool changes within seconds.

A line of collaborative tooling products that work seamlessly together can have a dramatic impact on long-term ease-of-use and flexibility, allowing tools to be easily moved between multiple robots and processes with no additional training. New capabilities can also be easily added, such as force/torque sensing on a finger gripper. This is ideal for sensitive applications such as placing parts in a blister pack, or for precision applications such as inserting a part into a chuck with a defined amount of force or polishing over a contoured surface. Force/torque sensing is also ideal for processes where the robot and humans work collaboratively side-by-side, such as a cobot that hands off a part to a human worker for a secondary operation. A collaborative gripper with built-in force/torque capabilities senses the human worker's grasp of the part and automatically releases it, just as another human worker would.

## 4. COST-EFFECTIVE FOR FAST ROI

Low upfront costs and fast ROI are attractive benefits of collaborative automation, especially for small and mid-sized manufacturers. Because the tool is such a critical aspect of the success of the application, collaborative tools must be simple enough to offer quick success even for operators with no previous robotics experience. These tools minimize the number of cables that could interfere with the robot's actions or cause downtime, and must be robust enough for ongoing productivity in an industrial environment running 24/7.

While collaborative automation often pays for itself within months, a line of collaborative tools can continue to build ROI over time. A manufacturer can start with a simple automa-

tion process and, once workers are comfortable and ROI has been proven, the company can extend the application with more capabilities for greater productivity enhancements. For instance, productivity can be increased over time by a change from a single gripper to a dual-finger gripper, which maximizes cycle time but is as simple to use and program as a single gripper and requires no re-engineering. Similarly, a full line of interoperable collaborative finger and vacuum grippers can be exchanged or combined as needs evolve, or sensors can be added for new applications or to enhance quality. Implementing a quick changer nearly eliminates downtime between process changes for additional cost savings.



*Collaborative automation often pays for itself within months, and tooling allows manufacturers to easily extend applications for even greater results.*





## EOAT DECISIONS FOR COMMON COLLABORATIVE APPLICATIONS

Collaborative automation is designed for easy implementation, even for those who aren't robotics experts. But to maximize success and ROI, it's worth considering what you want to accomplish and what technical capabilities and experience you have in house. Some applications are more complex than others, and may require outside integration help. For most companies, "walk before you run" is good advice. Look at all the processes you're considering automating and start with one of the easiest applications. Even if this isn't your highest-volume or most costly process, you're likely to see significant savings more quickly with a fast success. Choose a tool that can work across multiple production cells and processes and save programs for quick changes between tasks. Once your employees gain confidence and familiarity with the robot and tool, you can move on to more complex applications. Common applications to start with include machine tending and packaging, which can offer immediate results in terms of increased productivity, agility, and ROI. Each has its own considerations for EoAT decisions.

*Collaborative EoAT can work across multiple production cells and processes.*



*A dual gripper decreases machine-tending cycle times and boosts CNC machine utilization by handling two objects and actions simultaneously.*

## MACHINE TENDING APPLICATIONS

Machine tending requires repetitive motion and a high level of consistency, even after hours of work. By automating these processes, you can improve worker safety and ergonomics and make employees available for more valuable tasks. Automation can also increase output and allow production to continue after normal work hours. For example, you may be able to automate processes that can run overnight to have material ready for workers in the morning, which allows you to expand to multiple shifts without adding workers. A tool

with customizable fingertips allows the robot to handle components with diverse geometries and high surface finish.

With the right tool, you can also dramatically increase production with a single robot by moving from a single to a dual gripper. A dual gripper decreases cycle times and boosts CNC machine utilization as it is able to handle two objects and actions simultaneously, even highly variable materials.



*Versatile, collaborative EoAT in packaging applications can be easily redeployed if products or logistics contracts change.*

## PACKAGING APPLICATIONS

Packaging and palletizing applications can be easily implemented with one cobot and then replicated across similar lines to increase productivity and profitability. With versatile, collaborative EoAT, the robotic application can be easily redeployed if products or logistics contracts change.

With a line of plug-and-produce collaborative grippers, a single robot can also be used for multiple processes. For instance, a finger gripper can be used to pack a box with parts, then can be changed for a vacuum gripper to palletize. Dual grippers can precisely palletize two different shapes and sizes of boxes at the same time, and new electric vacuum grippers eliminate the need for an external air supply and hoses. Stacking and packaging tasks that require a human sense of touch can be automated quickly and easily with the addition of force/torque sensing on a finger gripper, which supports even delicate packaging applications such as placing parts in a blister pack.



## EoAT DRIVES INNOVATION AND RESULTS

As collaborative robot arms become commoditized, the innovation occurring around EoAT is enabling manufacturers to deploy robotic technology in new ways and gain new advantages. Collaborative EoAT such as grippers, sensors, and tool changers have become critical elements in the success of collaborative applications such as machine tending and packaging. The more manufacturers understand their EoAT options, the greater the return they will see in output, quality, and profitability.

