



## COBOTS – Providing a Safe Return on Your Investment

by JD Teter

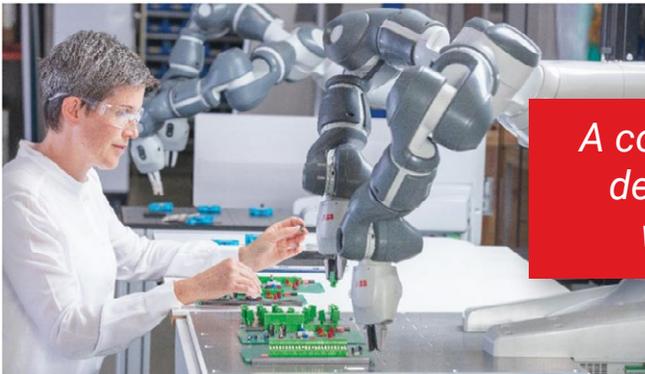
*Business Development Manager for Drives & Motion, Power/mation*



### What is a Collaborative Robot / COBOT?

Merriam-Webster defines **Collaborate** as: “To work jointly with others”

For those interested in the etymology, it is derived from the Latin; **Collaborare** “to labor together.”



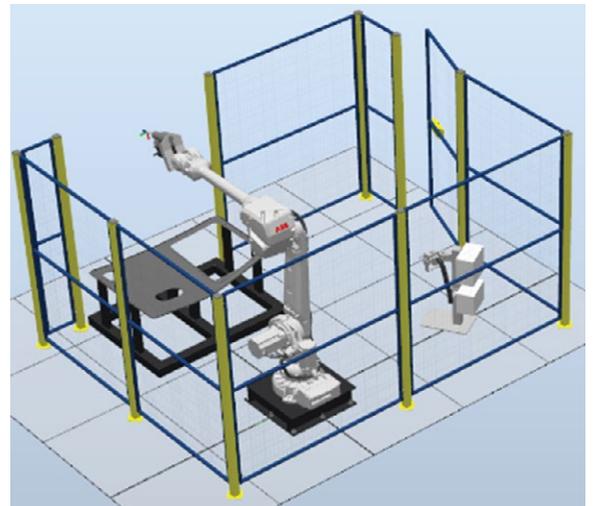
**A collaborative robot, or COBOT, is a robot designed to jointly operate in a shared workspace with a human operator.**

### What exactly is it, that makes it a COBOT?

Before diving into COBOT physiology, consider factors of a typical industrial robotic application:

- Highly repetitive motion
- Risk to personnel from parts, tooling, or operation itself
- High-volume and/or repeatable, precise operations
- 24-hour “lights out” operations
- and many others...

To be effective in these applications, industrial robots may be large and designed for high-speed, high-force operation, with the ability to move heavy loads quickly. Operator interaction is typically limited to feeding or removing parts and monitoring operations. External devices such as fencing, scanners, light curtains etc., required for personnel safety, also permit the robot to perform in a fast, efficient, and autonomous manner. Personnel entering the area of an operational industrial robot, do so by use of established safety protocols such as a two-person rule, safety monitoring devices, and robot “manual” mode (a maintained safety switch permitting motion at reduced speed).



While these protocols are effective when properly used, there is still the potential for injury from robot pinch points, pressing forces, and end-of-arm tooling—just to name a few.

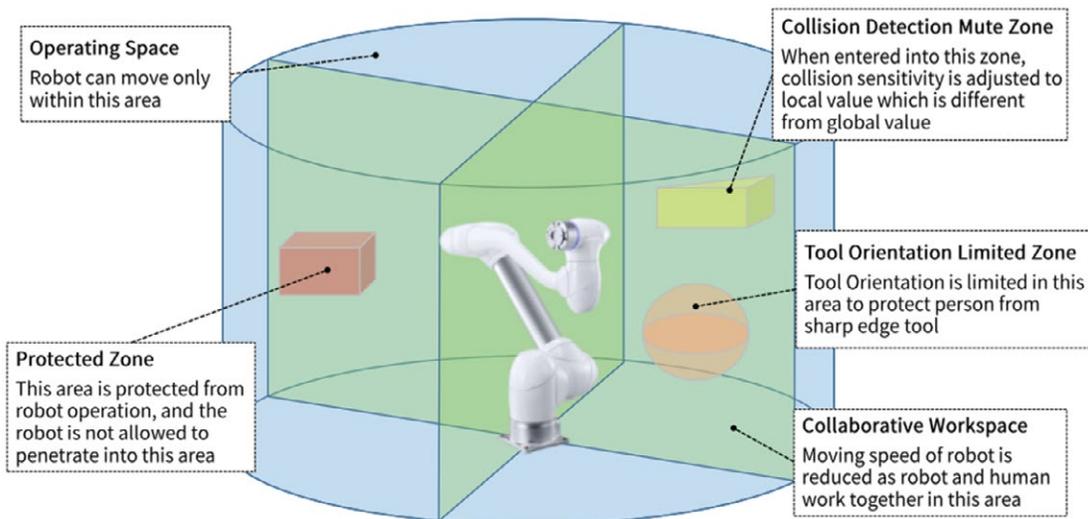
COBOTS, by design, are inherently safe (mechanically and functionally) by significantly reducing (you never completely eliminate) hazards to personnel without the need for external safety devices. **There are cases when you employ external safety devices with a COBOT, but that is a topic for later.**

Mechanically, COBOTS employ strong, light weight arms, smooth, rounded geometry, and the elimination of pinch points. Some designs include padded arms, integrated smart grippers, and easily back-drivable joints.



Functionally, COBOTS utilize advanced safety programs and torque sensors in the joints to continuously monitor motion and immediately stop the robot in the event a collision is detected. Together, these safety features meet Performance Level d (PL d) as well as Category-3 Protective and Emergency Stops and Safety Integrity Level 2 (SIL2).

In addition to their safe design features, COBOT controllers and software permit the user to design and deploy a variety of operating modes, speeds, and zones in and around the COBOT working envelope. This provides a lot of flexibility in that a COBOT may be programmed to operate at lower speeds and forces in one zone (where an operator is present) but able to utilize full force and speed in another zone.



**Safety tip:** While a COBOT is designed to be safe, it is still a robot. Like any other piece of industrial equipment, it has the capability to move fast and carry a payload that could present a hazard to personnel. Therefore, it is the user's responsibility to be familiar with all aspects of the COBOT, its embedded safety functions, and the ability to properly utilize those functions.

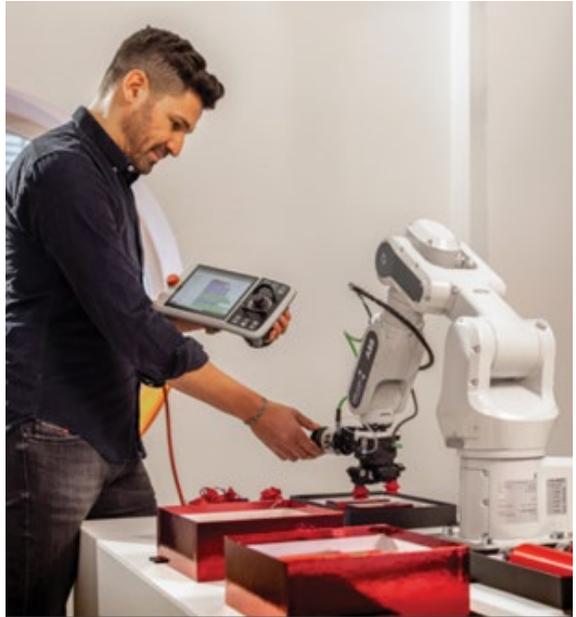
## What are some applications for a COBOT?

- Today's COBOTS are found in virtually any application:
- Assembly
- Inspection
- Machine Tending
- Medical / Pharmaceutical
- Palletizing
- Pick & Place
- Stacking / De-stacking
- Welding
- So many others...

You may be thinking “Some of these are definitely NOT collaborative applications!” and you are right, they are not. However, remember that the inherent safety features of the COBOT depend on the user and the application. A COBOT is first and foremost a robot, capable of doing a variety of tasks and operating at very high speeds, some as high as 5m/s!

You may be also wondering “Why use a COBOT if I do not require collaborative operation?” The answer is **ease of use**.

From basic hand-guided operation to simple touch pendant programming, COBOTS are designed for easy operation. Typically utilizing function block or Wizard style programming COBOTS make it easy for first time users to design and deploy a robotic solution.



In addition to the programming / operating software, today's COBOTS easily integrate vision into your application as well as use third party end-arm tooling such as smart grippers, vacuum generators and automated screw driving devices.

Pictured right: the Smart Vision Module (SVM) from Doosan Robotics.



## What are some applications for a COBOT?

As mentioned before, a COBOT is first and foremost a robot. Therefore the guiding principle for selecting a COBOT is very similar to selecting any robot. The first considerations, as with any motion system, are Payload, Reach, Speed (PRS).

- What am I moving – Payload
- Where is it going – Reach
- How fast do I need to go – Speed

Once you have defined PRS for a robot, you can see if there is a COBOT that meets those requirements. Chances are, if the payload is 25kg (55lbs) or less, the reach is less than 2 meters and speed is 2m/s or less, you may just have found a workable COBOT application. Of course, as with anything else there are exceptions to the above PRS numbers, so be sure to review the application with a knowledgeable robotic application individual. Once PRS is defined, you can move on to other features:

- Required inherent safety functions
- Interface to a PLC or other controller
- Communication protocols (Client / Server function or CIP Safety, ProfiSafe)
- Additional, external safety devices
- External devices and tooling such as cameras and grippers
- Advanced motion capabilities

All of these requirements need to be considered in order to size and select the right COBOT for your application.

All too often a robotic application is categorized as “needing to be collaborative” when in fact the application does not meet the criteria for true collaborative operations. This could be due to the payload, the operation being performed, the required motion profiles and the proximity of personnel to the operation. Bottom line, before attempting to select and deploy a COBOT, be sure that the application lends itself to being collaborative.



Special thanks to ABB Robotics and Doosan Robotics for the images used in this article.



800.843.9859  
www.powermation.com

