ORIGINALLY PUBLISHED BY **"TODAY'S MOTOR VEHICLES MAGAZINE"**

SAFE HUMAN-ROBOT COLLABORATION

Features - Motion, Design and Automation

Before working with cobots, follow the proper assessment phases necessary to reduce risks.

Often, manufacturers wait until a safety issue has occurred to bring in safety experts. However, assessing risk in the planning and design phase provides the opportunity to change course at lesser cost.

Users who are looking for guidance on risk should seek out a system integrator who is well versed in the standards and best practices for safety risk assessments and can draw upon that knowledge in their approach to system design. Consider operator safety in the design phase and look at ways to complete the same task with less exposure to the operator. Applied Manufacturing Technologies (AMT) experts have found that usually one or more design changes can be adopted to reduce hazard exposure for the operator.

"AMT has experience conducting risk assessments for all phases within the manufacturing cycle," says Michael Jacobs, president and CEO of AMT. ***"Changes made in the design phase often have the largest impact and the least cost."***

RISK ASSESSMENTS WITH ROBOTS

Until a few years ago, the only way to make robots safe around humans in manufacturing was to lock the robot behind guarding. Changes to safety standards opened the door to the development and future use of collaborative robots (cobots) and provided other safety features for more traditional robots.

Designing a safe space for humans and robots to work requires knowing specifications outlined in the Robotics Industries Association (RIA) "R15.06-2012 American National Standard for Industrial Robots and Robot Systems - Safety Requirements," adopted by the international standards ISO 10218-1 and ISO 10218-2 for industrial robots and robot systems. The standard defines four categories of safety features for collaborative robots:

- Speed and separation monitoring
- Power and force limiting functions
- Hand-guided teaching operational mode
- Safety-rated monitored stop

For these four categories, the standard defines a risk assessment formula and how to quantify the associated variables to ensure an adequate level of safety in working conditions.

ASSESSMENT PROCESS

A risk assessment looks at the system from a task-based approach, which means examining each task that will be performed to uncover the system's use and potential misuse. Before using the RIA standard-defined risk calculations, it's best to assemble a team of stakeholders from the user's organization with multiple operational points of view. Include safety representatives, engineers, maintenance personnel, and others working with the application, and involve as many different operator classifications as possible. Having the right opinions and experience in the room during this initial conversation is critical to identifying all potential risks associated with a new or existing system.

Through discussions with this team, the risk assessor uncovers the system's use within its intended design. The assessor characterizes the identified potential system risks by three criteria:

- Severity – Will this cause a bump/bruise or a potentially catastrophic event?
- Exposure – How often will the operator be exposed to the hazard?
- Avoidance – Is there potential for the operator to avoid the hazard?

An experienced assessor will also gather data and understand the potential for any foreseeable misuse of the system and will be able to uncover discrepancies between manufacturing data and the system's intended use that could lead to operator injury.

CONSULT MANUALS

Throughout this conversation and after, the risk assessor will refer to and consult the relevant safety standards. Three levels of standards must be considered:

1. The most generalized standards apply broadly to risk assessments. The Robotic Industries Association has "RIA TR R15.306-2016, Task-based Risk Assessment Methodology," and provides ISO 12100:2010 Safety of Machinery.
2. Robot-specific standards include the RIA "Technical Report TR R15-606-2016 for Robots and Robotic Devices" which provides safety guidance for collaborative robotics sharing a workspace with humans.
3. System component standards consider each specific technology used in the system. Called C-type standards, from organizations such as ANSI and ISO or from the country or region where the system is installed, these are specific to the technology used, such as grinding, or to the equipment, such as guarding or end-of-arm tooling.

A complete safety risk assessment will use these myriad codes from all three levels to determine proper safety standards for the system's sub-components.

RECOMMENDATIONS, IMPLEMENTATION, VERIFICATION

After the safety assessment has been completed, the user will receive a report containing any standard-defined safety level recommendations which must be implemented to mitigate the identified risks, and a plan to validate the changes. Once the safety recommendations are implemented, the validation plan must be executed to verify total compliance with the standards.

It is highly desirable to begin this process in the design phase for a new system. Some recommendations might include changing machinery, parts of machinery, or programming. These changes have the potential to be very expensive if the system is already commissioned. However, if risk assessment is completed in the design phase, the changes can be implemented as part of the completed system and there is little or no sunk cost.

LOOKING AHEAD

New technologies have eased the burden of verification, and the latest industry trends are the continued intro-duction of new products to help verify that the safety codes are being met. One important new product is a force tape, a physical device that can be put between two objects to read how much pressure is being applied to that area. Typically used to ensure a robot stops when encountering a human, they verify that the force exerted in the pinch-point area will not cause harm.

Applied Manufacturing Technology (AMT
248-409-2000 | sales@appliedmfg.com
https://www.appliedmfg.com