

EXECUTIVE SUMMARY

Building a Machine Safety Mindset

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KEY TAKEAWAYS

- When employees don't have a machine safety mindset, it can lead to serious OSHA violations.
- Company safety standards form the foundation of a machine safety mindset.
- Once organizations create company safety standards, they must train employees on safety fundamentals.
- Risk assessment is the best way to start any safety project.
- Every risk assessment includes schematics reviews.
- Validation is performed on-site at the end of a project.
- Third-party partners can help companies overcome challenges associated with developing a machine safety mindset.

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Building a Machine Safety Mindset

OVERVIEW

When designing or upgrading industrial machines, many employees involved in machine safety design rely on their own personal understanding of what is “safe.” The result is inconsistent machine safety methodologies amongst EHS, engineering design, and maintenance professionals. In worst case scenarios, it can also lead to worker injuries.

Leading manufacturers embrace a machine safety mindset. Cultivating a machine safety culture means developing company-specific safety standards, training employees on safety concepts, performing risk assessments, reviewing schematics, and validating machinery once it is installed on the factory floor. As companies build their in-house safety expertise, third-party partners are often a great resource.

CONTEXT

Peter Rigakos described a five-step framework for building a machine safety mindset and achieving a more uniform methodology for machine guarding and safety.

KEY TAKEAWAYS

When employees don’t have a machine safety mindset, it can lead to serious OSHA violations.

In 2019, machine guarding was the second most frequently cited serious OSHA violation in general industry. These violations are rarely deliberate. In many organizations, employees simply don’t have the knowledge necessary to prevent such hazards. Every person has their own viewpoint about what is safe.

A 2003 safety study conducted in the United Kingdom reinforces these findings. The researchers discovered that the safety requirements specification part of projects resulted in 44% of system failures, while design and implementation accounted for 15% of system failures.

Figure 1: Serious OSHA Machine Guarding Violations – 2019

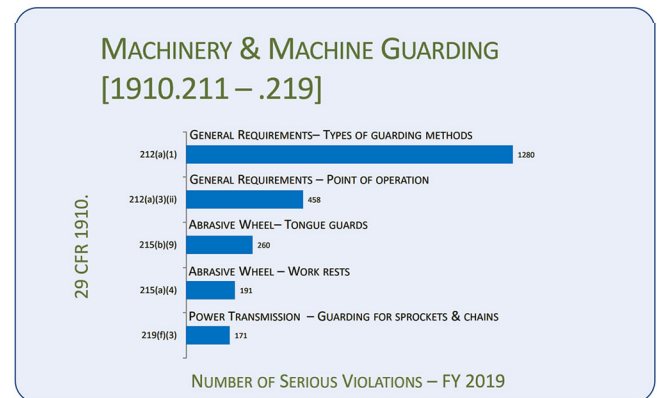
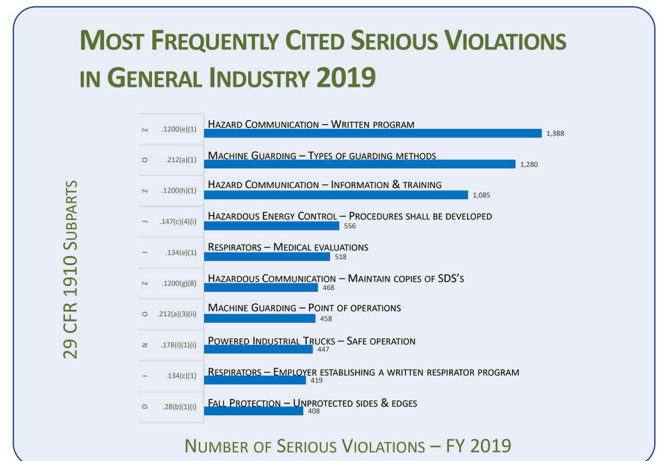
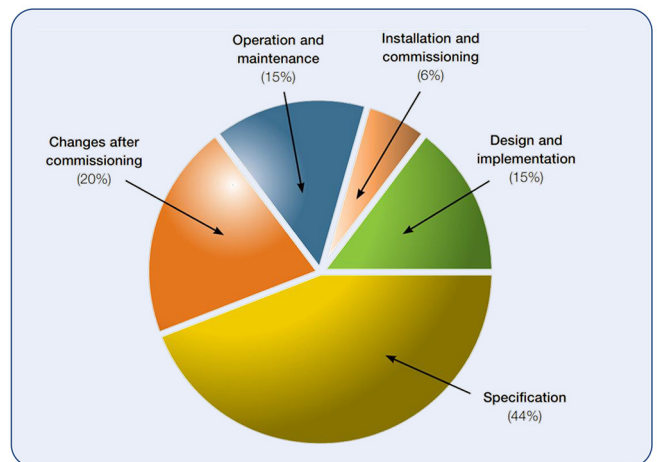


Figure 2: Machine Safety Study Results



Building a Machine Safety Mindset

Company safety standards form the foundation of a machine safety mindset.

As your team thinks about machine safety, employees may feel overwhelmed by the large numbers of safety standards that exist. The good news is most organizations discover that only three to five safety standards typically apply to their facilities and industry.

Once your company has identified the safety standards that are relevant to the business, the next step is to simplify and customize them for the organization's use. For example, a robotic standard may state that if a person opens a machine guarded door and enters a robot cell, the door inside the cell must have an emergency release. To simplify this standard, a company may decide to require an emergency release on all facility doors.

With this information, your team is ready to create company safety standards. This is more than simply cutting and pasting information from industry standards. You must elaborate on concepts that are vague and perhaps add images, such as wiring diagrams that show how safety devices connect to the safety controller.

Different categories of machines, such as robots or injection molding cells, may have their own company safety standards. Teams can use these standards to standardize employee training. For instance, your organization may want all safety PLCs programmed in a certain way.

Adding the following components to company safety standards can simplify the integration process:

- Wiring diagrams
- Example safety PLC programs
- Information about new safety technologies
- Manufacturer contact information

Company standards are living, breathing documents. As a result, they must be continually reviewed and updated as your industry and technology evolve. When safety standards become outdated, employees begin to rely on their own ideas of safety.

When you create a company safety standard, the goal is to make it more visual and to explain it in depth for engineers and maintenance people in your facility. For example, can you add images, drawings, or links to videos showing what an installation should look like?

Peter Rigakos, Schmersal

Once organizations create company safety standards, they must train employees on safety fundamentals.

These courses must explain why the organization needs machine safety. A robust training curriculum will include:

- Examples of past accidents and why they occurred
- The need for machine guarding and company standards
- Relevant government rules and regulations
- Statistics that illustrate the impact of implementing a company-wide safety standard mindset

Leading companies conduct safety training on a quarterly basis since employee turnover is inevitable. They also offer different levels of safety training, ranging from introductory to intermediate and advanced.

Building a Machine Safety Mindset

Risk assessment is the best way to start any safety project.

Risk assessments help companies understand the hazards associated with their equipment. These assessments determine how severe the safety risks are for different machines, as well as how frequently those risks are likely to arise. The more severe the risk, the more guarding that is required.

An employee with a day or two of training is not qualified to complete risk assessments on existing or new machines. A best practice is to develop a risk assessment apprenticeship program. With this type of program, each risk assessment is conducted jointly by a safety professional from the company or a third-party company, along with a risk assessment apprentice.

If you're building a new machine, risk assessment is best done during the conceptual phase, so you can engineer out any hazards. It is a good idea to use a standard risk assessment template throughout the organization.

A risk assessment apprenticeship program teaches employees to have a 'safety eye.' A simple rule I still use today is over, under, around, and through. Can an employee get over, under, around, or through a guard?

Peter Rigakos, Schmersal

Every risk assessment includes schematics reviews.

Schematics reviews are a critically important part of reviewing equipment. A schematics review focuses on three key areas: controls, hydraulics, and pneumatics. Not every safety employee is skilled in all of these areas. As a result, multiple people may participate in a schematics review.

In some cases, companies turn to experts from third-party companies to assist with certain aspects of a schematics review. As a general rule, it is always good to have a second set of eyes or a third-party review schematics.

One important type of schematics review is a safety PLC review. Even though safety PLCs have many features to prevent unsafe programming, there is still a chance they may have been programmed incorrectly. Another best practice is including documentation within a schematics review. SISTEMA, for example, is a free software package that teams can use to evaluate safety devices in a system.

Validation is performed on-site at the end of a project.

In the world of safety, organizations use validation to test and confirm the safety circuits after a system has been built and installed. There are no specific rules to follow when conducting validation. For each machine, the team selects the safety devices and creates a checklist. For each safety device, team members confirm that it is operating as they expect.

Building a Machine Safety Mindset

Third-party partners can help companies overcome challenges associated with developing a machine safety mindset.

As organizations begin their journey to a machine safety mindset, they may encounter a variety of challenges, such as:

- **Lack of internal expertise.** For example, a company may not have anyone on staff who knows how to perform a risk assessment.
- **Insufficient resources.** There may be just one person company-wide who can conduct a risk assessment. Alternatively, there may not be any resources to evaluate the safety of existing equipment or to determine what safety measures suppliers are taking when they ship a new machine.
- **Limited bandwidth to continually maintain safety standards.** Monitoring changes to industry safety standards over time can't be overlooked. Updates then need to be reflected in company standards.

Fortunately, industry experts can help with all of these issues. Third-party companies can help train your staff, review schematics, or assist with validation.

BIOGRAPHIES

Peter Rigakos

Professional Engineer, Schmersal

Peter is a licensed Professional Engineer; he holds a Bachelor of Science in Electrical Engineering from Saginaw Valley State University and an MBA from Purdue University West Lafayette.

Peter started his career as an Electrical Engineer designing and reviewing automated safety systems primarily for automotive manufacturing facilities. Since that time, Peter has gained extensive knowledge in machine safety for various industries, allowing him to obtain his TUV Functional Engineering certification.

Before joining Schmersal in 2012, Peter worked for a diverse range of organizations, including consulting, integration, and engineering design, all within the industrial automation industry. Each of these roles prepared him to understand the industrial machine safety industry.

Peter also supports technical colleges by offering a strategic plan for instructors to implement topics related to machine safety automation into their curriculum. The safety curriculum includes hands-on workshops and lectures on issues related to machine safety automation.