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EXECUTIVE SUMMARY

How to Create an Effective Machine Safety Training

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KEY TAKEAWAYS

- Statistics on effective training methods reveal a need for better training approaches.
- Training for key building blocks can use one or more of three different methodologies.
- Five recommendations can improve the application of each methodology.
- OSHA requires both training on certain regulations and specific methods for the training.

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How to Create an Effective Machine Safety Training

OVERVIEW

Industry surveys show there is a need for more—and more effective—safety training. Using proven methodologies and learning management systems, companies can create effective ways to integrate impactful training into a machine safety mindset.

This presentation is the final building block of a four-part series on Machine Safety Mindset. The first three are: "Building A Machine Safety Mindset," "Risk Assessment Methods for Machine Safety and Cobots," and "Why Machine Safety is Not Complete Without Validation."

CONTEXT

The presenters discussed the importance of safety training, methodologies to use, and how to best implement those methodologies. They also explained OSHA-mandated trainings and methods, as well as additional tips for developing effective safety trainings.

KEY TAKEAWAYS

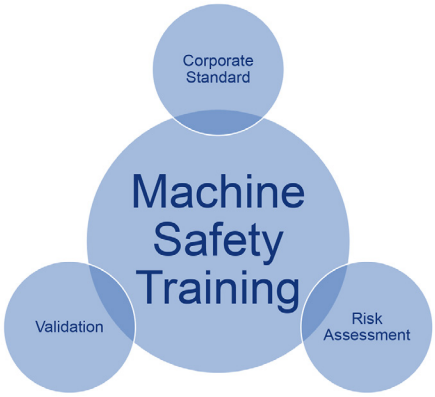
Statistics on effective training methods reveal a need for better training approaches.

In "The State of Workplace Safety Training," an Intertek Alchemy survey of 1,100 respondents representing 4,400 worksite facilities, the top three training challenges were:

1. Scheduling time for training (59%)
2. Verifying effective training (31%)
3. Retraining, remediation, or refresher training (24%)

Other key findings revealed that 66% of companies believe, despite their best efforts, that they still have employees who don't follow workplace safety protocols on the floor. However, companies providing at least 20 hours of annual safety training are 68% more likely to have employees following safety protocols on the floor.

Figure 1: The building blocks of effective training



Companies using site-specific photos or videos in training courses are two times more likely to have employees "very engaged" in safety training; using interactive audience response training technology makes it 58% more likely to verify if a specific employee understood their training. In addition, those using a learning management system (LMS) provide 30% more training refreshers and reinforcement. However, up to 38% of companies use paper and/or spreadsheets alone to document and manage their training program.

To close the gap and provide more—and more effective—training, companies must first develop and practice the building blocks of risk assessment, validation, and applying the corporate standard.

Training for key building blocks can use one or more of three different methodologies.

Training for key building blocks might use different methods, including in-class, group work, and/or apprentice approaches. However, when developing effective training for each of the building blocks of machine safety training, one characteristic that applies to all methods is specificity. Keeping training specific ensures that it applies to the right people. Specific, focused training also keeps the training shorter and to the point.

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Figure 2: Training methodologies

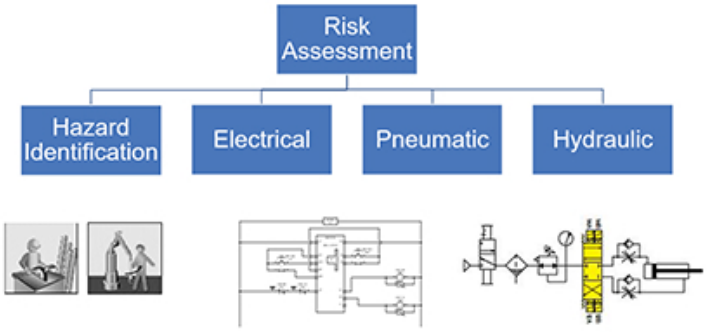
The corporate machine safety standard is all company-applicable standards collated in a single location/document guide to help employees in the design or review of machine safety. Having a training for this document will not only help people, but also create an awareness that the document exists.

Training on the corporate standard can be most impactful through an **in-classroom** training that covers the standard at a 10,000-foot view. Demonstrating multiple examples of how the document is used, then having **group work** to brainstorm how to use the document in real-world situation, and debate with other groups on best practices, helps cement knowledge through practical application. This approach, followed by a brief quiz, provides effective training. The apprentice methodology is not applicable to corporate standard training.

There are multiple areas of expertise needed to cover in a full risk assessment. Identifying hazards is an important step in learning risk assessment, which is challenging to accomplish in a classroom setting alone. **In-classroom** training for risk assessment, therefore, is best served by using the **group work** method to allow every attendee to discuss, explain, and debate why something might be a hazard or not, as risk assessment is a subjective topic. Each sub-topic can be taught in a classroom, but must be accompanied by an individual-specific, structured, on-the-job **apprentice program**; after a set number of hours, the candidate is ready to perform the task on their own.

Only one training methodology—**apprentice**—is applicable when developing an effective training for validation. While, like risk assessment, validation covers many subsections, in-class or group-work is ineffective because most validation Phase 1 subsections are trained during risk assessment. Validation training on Phase 1 knowledge centers on confirmation that the person being trained has completed enough projects to be comfortable with the task, while Phase 2 functional testing should always be done with the machine on the plant floor.

Figure 3: Risk assessment and its sub-topics



Five recommendations can improve the application of each methodology.

There are five recommendations that can make each of the methodologies more effective. Schmersal has observed the following recommended methods as the best approaches for building a strong team in each section of the mindset building blocks:

1. **Use company photos and video.** Using outdated or non-specific content will lead to employees not trusting the information, and information will not be used or promoted in the organization. While stories from accidents at a facility can be dated, current images that show the corrective actions put in place demonstrate improvements made to safety. Using site-specific photos to ask, "What's wrong in this

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picture?" should yield safety-centric answers, such as that long hair and jewelry are unsafe, not that the shop floor layout is not correct or that the company does not have the machine featured in the image. Companies using site-specific photos or videos and training courses are two times more likely to have employees very engaged in training.

2. **Implement a structured apprenticeship program.** As risk assessment and validation have subtopics done by different job titles, such as electrical and mechanical employees, on-the-job training is the best approach. However, it is critical that the training is structured and planned, such as in an apprentice program where a certain number of hours must be completed to certify an individual to complete a portion of the project. This is different from non-structured on-the-job training and should include a way to record hours completed. Using a LMS software provides that capability.
3. **Make in-class training collaborative.** Collaboration is an effective way to create an interactive discussion about topics such as a safety incident that occurred or a current hazard. Discussion will provide a good idea of how most of the class feels about safety, and everyone will get to understand a different point of view. Following a whole-class discussion with group work can facilitate discussion, as some attendees are more comfortable sharing questions or opinions in smaller groups. Interaction between the instructor and trainees before and after discussion reinforces key material.
4. **Measure results.** The only way to confirm understanding is to measure the outcome. Quizzes assess how well the staff knows the content, and helps instructors gauge how well they are delivering the topic and creating an environment where everyone is engaged. Companies using interactive audience response training technology are 58% more likely to verify if a specific employee understood the training.

> If nobody gets what you're saying, you will be sending people back to work with the same knowledge they came to class with. This is why it is important to measure the results by testing everyone. The results can provide many indications, such as if you need to break the class material up into two classes, or simple things like . . . adding more group work or interaction.
>
> *Peter Rigakos, Schmersal*

5. **Track training (LMS).** Follow the previous recommendation (measure results) with tracking training by using software to analyze content and measure results; this is a highly effective way to offer training. Or, when using a third-party company to administer the training, the third-party company can prepare a quiz that can be tracked with software, including results and analytics on the effectiveness of the training. Tracking mechanisms can be something as simple as a Microsoft or Google Form to make quizzes and surveys. Companies using LMS end up providing 30% more training, refreshers, and reinforcement to their employees.

In the "The State of Workplace Safety Training" survey, when asked how confident employees felt about being trained by another employee, only 52% of respondents indicated "Somewhat agree." Improving safety training confidence is critical to influencing confidence in employee-to-employee training. As a starting point, a third-party company can be called in to assist in the training or apprentice program until the right team is in place internally to do the training, and using surveys to obtain real feedback for the third-party company will help when transitioning to using an internal team.

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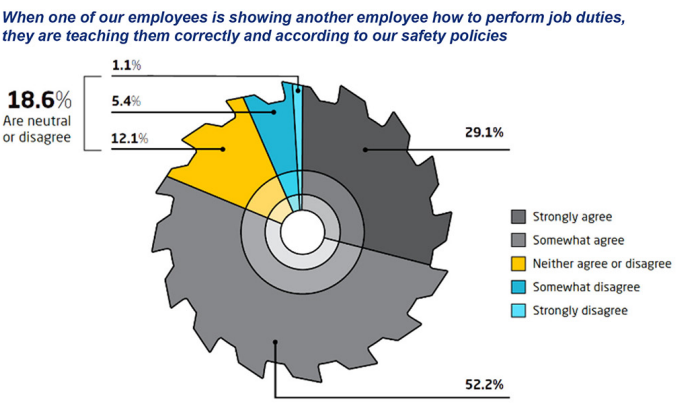
Staying up to date and constantly improving also contribute to employee confidence in safety. Employee turnover requires regular, up-to-date training, and even for established employees, if the training is not used every day, some rules can be forgotten. Refresher training is important. The type and methodology of refresher training depends on the topic and whether an apprentice program is in progress.

Figure 4: Employee-to-employee training



OSHA requires both training on certain regulations and specific methods for the training.

For OSHA trainings required by law, including 29 CFR 1910.95 Occupational Noise Exposure, 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response, 29 CFR 1910.132 PPE (General Requirements), and 29 CFR 1910.146 Permit Confined Spaces, there are also training methods OSHA requires companies to use.

Many companies already use these specific methods of training without realizing it. **Bloom's Taxonomy** is a method used to define the different levels of human cognition. The levels include:

- **Cognitive** (knowledge-based). Training attendees should be able to recall or recognize specific facts or procedural patterns and concepts. An example of the cognitive level is asking trainees to rephrase or explain in their own words a policy such as the OSHA general duty clause.
- **Affective** (emotions-based). This requires active participation from the audience to assess trainees' ability to solve a problem. Real-world stories are used to teach by relating to the audience's emotions.
- **Psychomotor** (physical-based). This is demonstrating capability through physical movement, coordination, and the use of motor skills in areas that range from simple manual tasks, such as replacing a light bulb, to more complex tasks, such as operating a complex piece of machinery.

In an example OSHA-required training for powered industrial trucks using Bloom's Taxonomy, a classroom setting (cognitive and affective) and a practical setting (psychomotor) provides impactful, highly effective training for a single employee role. In the case of lockout tagout, however, there might be separate trainings for the affected employees who are not doing the physical lockout tagout but still need to be aware of what it is, as well as for the authorized employees doing the lockout tagout. Classroom setting training (cognitive and affective) can be sufficient for affected employees, while authorized employees should also receive practical setting (psychomotor) training.

Figure 5: Effective OSHA-required lockout tagout training employs all levels of Bloom's Taxonomy

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To determine the best application of Bloom's Taxonomy to training and choose the most effective methodology, understand whether the material being taught is for general information or providing specific instructions, and whether instructions need to be followed in a precise sequence and manner. Determining this information will help guide which methodology to use.

Additional tips to consider when developing training.

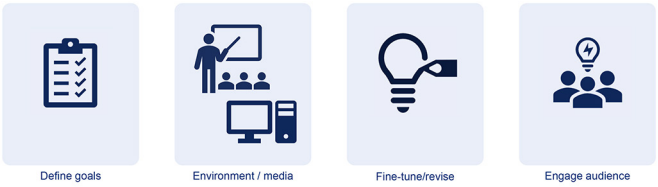
- Don't overcomplicate the message… Rather than a long, wordy explanation, determine the key steps and remove acronyms and jargon to deliver the message at a clear, concise level.
- …but don't oversimplify the message, either. A lack of sufficient detail leaves room for interpretation, potentially placing employees in a hazardous situation.

To create an optimal safety training, it is helpful to first define the desired outcome of the training and share that goal beforehand to ensure that those being trained know what the training is about, begin to build the right mindset, and establish a foundation for engagement in the training itself.

Conducting the training using the proper platform, environment, and media, as well as access as needed to the relevant machinery, will result in a more impactful training. For training program developers, it is important to fine-tune and revise the message before the training takes place. Addressing all of these areas, then adding in engagement and interaction such as in-training polling, questions, or discussion points, will support retention and improve safety confidence.

> You want to make sure that you have that engagement [by] defining the goals and [sharing] the goals for that training with the target audience, so they come in prepared with questions or discussion points . . . to have open communication, especially about safety.
>
> *Devin Murray, Schmersal*

Figure 6: Additional steps for developing effective training



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BIOGRAPHIES

Devin Murray

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Devin is the tec.nicum services manager for Schmersal's engineering services group in North America. He has written many whitepapers related to safety standards and general machine guarding, conducted risk assessments and validations, and developed and reviewed the implementation of corporate safety standards. As a founding member of our tec.nicum team, Devin helped develop our curriculum of machine safety training courses and recently lead our successful efforts to be an IACET Approved Provider. He holds a Bachelor of Science in Electrical Engineering and an MBA from Alfred University and is a TÜV certified Functional Safety Engineer for Machinery.

Peter Rigakos

Director of Operations, Schmersal

Peter is the current director of operations for Schmersal in the US and has 10+ years' experience working for a diverse range of organizations, including consulting, integration, and engineering design, all within the industrial automation industry. Peter also supports technical colleges by offering a strategic plan for instructors to implement topics related to machine safety automation into their curriculum. 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 is also a TÜV certified Functional Safety Engineer for Machinery.