Maintenance and Technical Training in the Digital Age

Learn how online training with cloud-based simulations can help close essential technical skills gaps in today's industrial facilities

- Maintenance technician training
- Electrical technician training
- HVAC technician training
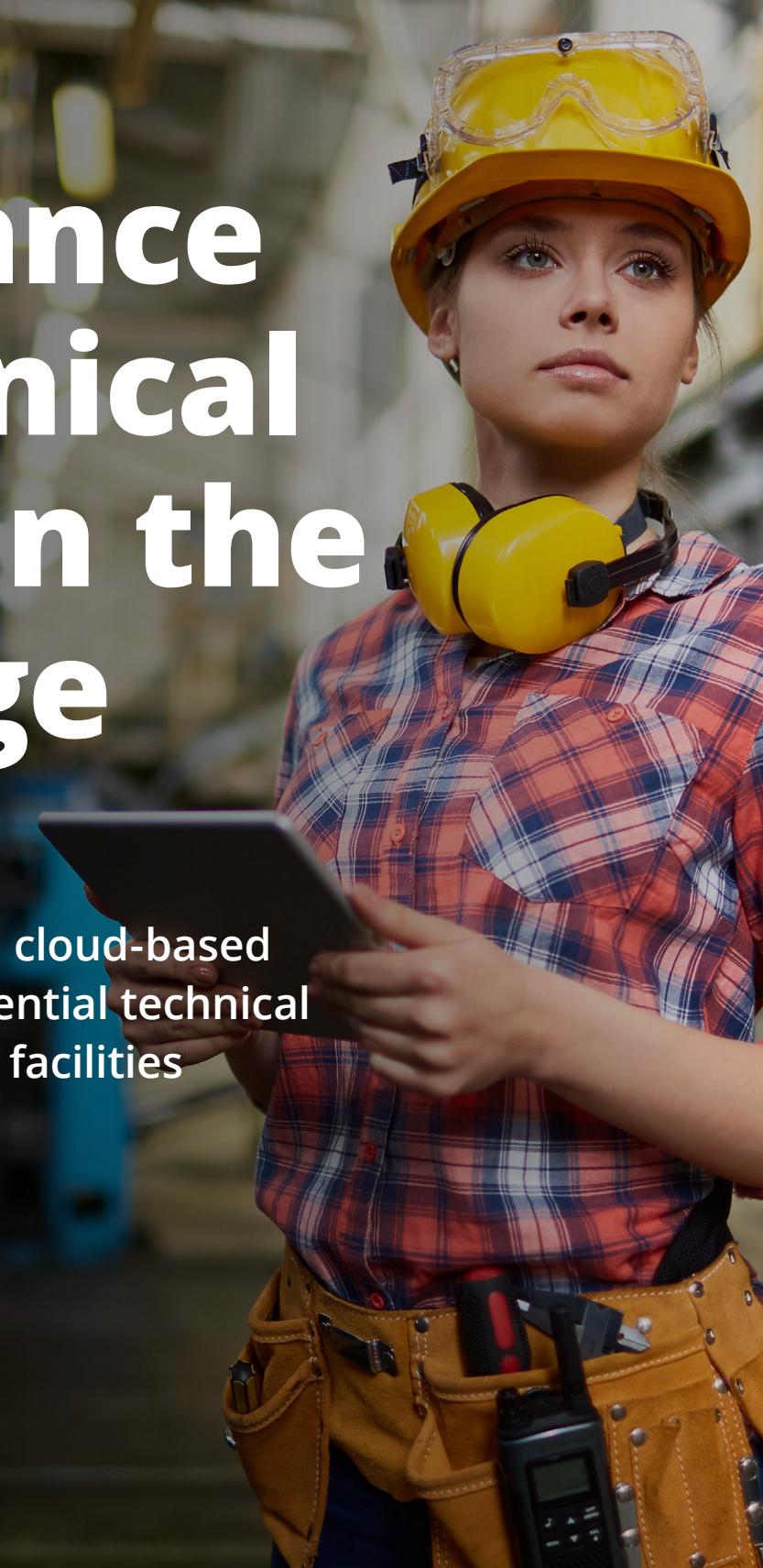
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MANY PATHS, ONE GOAL: REACHING EVERY LEARNER WHERE THEY ARE

People have different learning styles and respond differently to training approaches. This is especially true in today's industrial settings, where workers typically come from a wide variety of cultural, social, economic, and educational backgrounds. To maximize the effectiveness of your training programs, it's important to match the *training* styles you employ to the *learning* styles of your employees.

In the past, traditional, instructor-led training provided the basis for technical skills training. While this provided students with a fundamental base of knowledge, it didn't provide a mechanism for technicians to practice and demonstrate their newly gained skills in a safe, non-disruptive environment. That's why more and more organizations these days are moving toward a combination of flexible online

and simulation-based training as a supplement to training led live by expert instructors.

On-demand online training modules enable technicians to gain the needed skills at their own pace and when it works best for the company.

Immersive cloud-based troubleshooting scenarios and exercises, in turn, enhance the overall learning and skills development process, increase retention levels, and make the training more relevant for the new generation of technicians. Simulations also provide a way for your technicians to demonstrate their improved troubleshooting skills in a safe and non-intrusive environment.

Flexible, cloud-based digital training tools also provide a practical option for individuals looking to supplement or progress beyond

instructor-led training and track their progress.

NOT YOUR FATHER'S LEARNING ENVIRONMENT

Today's cloud-based training simulators are a far cry from the rudimentary PC-based training resources available to earlier generations of technicians. Just as advances in gaming technology are helping to transform the medical, automotive, entertainment, and other industries, modern cloud-based training simulators take advantage of software and graphics technologies from the video gaming world to create a more immersive, interactive, and overall more engaging technical training environment.

Robust training simulations provide the look and feel of the actual, real-world electrical and mechanical equipment, operating environments, and fault situations that your technicians are likely to encounter on the job.

Unlike the hardware-centric training simulators of the past, modern cloud-based simulations can be deployed flexibly and cost-effectively anywhere, anytime, on virtually any smart device with a high-speed internet connection. More to the point, the immersive 3D training simulations are generally more appealing to today's digital natives than traditional learning materials. This makes it easier to quickly bring younger workers up to speed, improve and verify their troubleshooting skills, and help retain these now-valuable employees through ongoing professional development and accreditation.

The most effective simulations will also incorporate the same familiar schematics and other tools they are likely to encounter on the job. Combined with lab exercises and skills tests, these enable your maintenance, electrical, and other technicians to first develop and then practice the necessary skills

in a safe, simulated plant environment so they are ready to address the challenges they are likely to face on the job efficiently and effectively.

WHY SO MANY COMPANIES ARE MOVING TO CLOUD-BASED SIMULATION TRAINING

Simulations support a proven, practice-by-doing learning approach. This makes it easier for new technicians to gain essential skills, more experienced people to further advance their existing skills, and for all technicians — new or experienced — to retain those skills.

What's more, the latest cloud-based simulations from leading technical training organizations are far more cost-efficient than traditional simulators that require dedicated hardware and software that's often expensive to purchase and support.

Progressive learning

Simulator training supports progressive learning. Once learners have completed the basics, they automatically progress through the training program. Through realistic and immersive simulations, they encounter increasingly more difficult equipment faults to identify and repair. During these troubleshooting exercises, some systems even provide feedback on the cost of the replacement part(s) the trainee selects, encouraging them to make the best decisions. In this manner, your technicians' skill levels
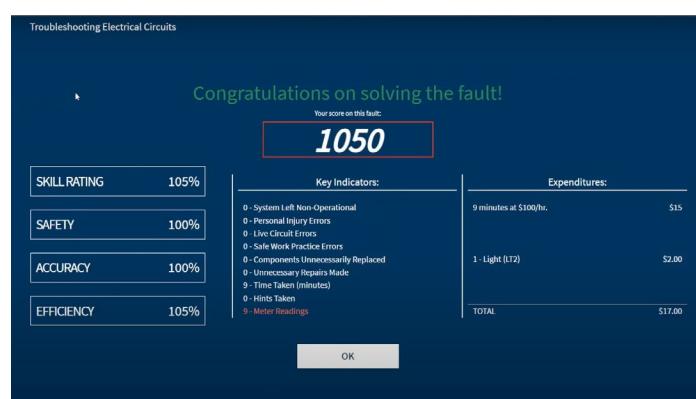
can advance rapidly and be assessed for both their own personal satisfaction and to enable managers to document a technician's increasing competency.

Quantifiable training outcomes

Training simulators can track, analyze, and report valuable training data. Gamified scoring systems can help learners measure their progress in real time.

Management dashboards

Leading training simulator suppliers offer online dashboards that provide both training managers and trainees with instant feedback on individual learning progress and automatically produce reports on demand for managers. Advanced management dashboards can also enable managers to quickly assign appropriate courses as well as provide learners with flexible start-and-stop access to those online courses and scenarios.

A safe and effective environment for developing critical troubleshooting skills

Unlike on-the-job training, immersive simulations enable students to learn and absorb high-risk skills such as electrical troubleshooting in an entirely safe, non-disruptive, hands-on environment that doesn't interfere with actual production operations. The best simulations will support a systematic approach to teaching troubleshooting. So, when the student encounters faults on the job

that were not covered during training, instead of wasting time and effort through trial and error, they can use the same methodical approach they learned in training to quickly and efficiently identify and remediate the root cause.
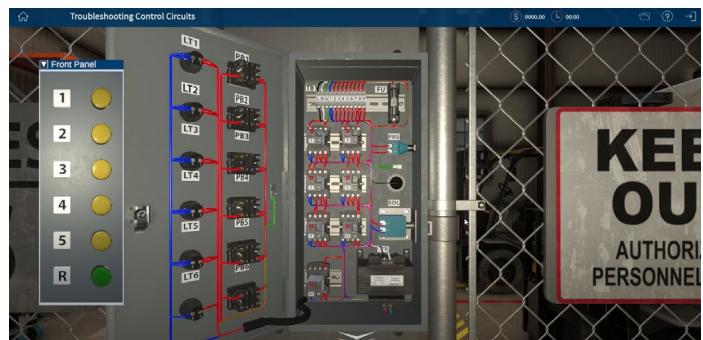
THE RIGHT TECHNICAL TRAINING CAN HELP AVOID COSTLY AND DISRUPTIVE ACCIDENTS

As you know, even in relatively well-run and managed plants, factories, and other industrial facilities, bad things can and do happen. All too often, these are linked in some manner to human error. And that's where technical training enters the picture. The right training can help your plant avoid most maintenance-, electrical-, or operational-related incidents and will almost certainly help your technicians avoid repeating the same mistakes. It will also support professional development (including formal accreditation) and overall job satisfaction.

When you consider the potential costs of those avoidable incidents — in fines, repairs, downtime, missed delivery deadlines, and negative publicity — it's clear that a well-planned and executed online training program is one of the best investments any industrial organization could make in its business.

Consider the following common scenarios and how training could have helped avoid them.

SCENARIO #1
A serious electrical accident puts the entire plant on edge.

When troubleshooting what he believes to be a minor electrical fault in a motor control circuit, a technician hits the appropriate breaker to deenergize the circuit but gets careless and fails to also physically lock out the circuit or notify his supervisor. Not having received prior notification of this work, a production operator inadvertently resets that breaker and reenergizes the circuit. The technician receives a severe shock that requires medical attention and a prolonged period of recuperation. This unfortunate and clearly avoidable accident results in an OSHA investigation and fine, as well as the temporary loss of that technician.

Less tangibly, but just as disruptive, it creates general anxiety throughout the plant with the realization that this kind of serious — yet easily preventable — accident could have happened there. Morale and productivity suffer as a result.

How training could have helped avoid this situation ...

Despite the legal requirement to provide workers with the training they need to understand and follow the applicable hazardous energy release procedures, companies continue to rack up related violations. From October 2020 to September 2021, OSHA issued 1,440 citations for lockout/tagout violations, amounting to $9,369,143 in total penalties. More recently, in 2024, the agency recorded more than 2,500 lockout/tagout violations.

In the scenario presented here, the technician had previously received basic electrical training but is clearly in need of a refresher course, particularly on associated safety procedures. He could benefit from simulation-based training. Well-designed simulations enable hands-on learning and practice-by-doing. Studies also show that practice-by-doing can significantly improve retention rates.

It's also likely that refresher training for the plant's production operators, maintenance supervisors, and production engineers would also be appropriate. Ideally, a thorough review and updating of the associated procedures and documentation should be performed in conjunction with this training.

These efforts will help ensure that, moving forward, all groups are aligned and working in sync to bring the plant back to a top-tier level. That is something that everyone — from line workers and technicians to plant management — can feel good about.

SCENARIO #2
Increased unscheduled downtime and spare parts consumption draw unwanted attention from the plant manager.

Recent supply chain disruptions create unrealistic demands on a factory's production line. This, in turn, leads to deferred maintenance and increased equipment failures, resulting in costly unscheduled downtime. Due to a shortage of technicians with the appropriate troubleshooting skills, remediation often involves a lot of trial-and-error parts replacement. This wastes precious time and can draw down the factory's spare parts maintenance inventories.

The plant manager starts receiving phone calls from irate customers who are unhappy about missed delivery deadlines. She also starts hearing from the plant's purchasing department, which is finding it increasingly difficult and more costly to replace the globally sourced spare parts needed to restock the maintenance inventories.

It's only a matter of time before corporate management becomes aware of this situation and heads begin to roll.

How training could have helped avoid this situation ...

Without specific training on how to troubleshoot and remediate equipment issues and opportunities to practice those skills, it's unrealistic to expect newer technicians to quickly and efficiently identify and remediate the root cause of equipment issues. Faced with pressure to get the line up and running again, it's not uncommon for less-experienced technicians to simply resort to replacing "stuff" until the equipment is functioning once again without considering the associated costs. Obviously, this is not an efficient approach.

Appropriate training could have helped avoid this situation in several ways. These start with refresher training for maintenance managers on best practices for developing effective maintenance procedures.

Training for the maintenance technicians could include online tutorials on how to quickly identify, isolate, and remediate faults. These should be followed up with generous opportunities to practice these newfound skills on immersive simulators before having to deal with actual faults in the production environment.

SCENARIO #3
Following a corporate merger and reorganization, a global manufacturing company now finds itself with different and often-conflicting operational and maintenance procedures, documentation, and best practices.

A well-respected global manufacturing company with best-in-class manufacturing and maintenance practices and procedures acquires several smaller, yet high-performing companies. Each of those companies has its own operational and maintenance practices and procedures based, to a large degree, on institutional knowledge. This creates internal confusion and conflicts, hurting morale and making it challenging to achieve the desired manufacturing and supply chain synergies across the company's global manufacturing base.

Even worse, the confusion begins to compromise profitability, as well as operational and environmental health and safety performance.

Something has to give, and soon.

How training could have helped avoid this situation ...

Following a merger or acquisition, a well-conceived and well-executed training program can help a large company's manufacturing plants minimize miscommunication, improve collaboration, and avoid conflicts between the individual plants and between the manufacturing operations and corporate. This includes training on core corporate standards, processes, procedures, workflows, and technologies. This is particularly true for those processes, workflows, and technology systems that typically span multiple plants, such as document management, maintenance management, and manufacturing execution systems.

Appropriate training can help ensure that everyone uses common terminology to avoid unnecessary confusion and consistent processes and procedures in both day-to-day operations and to address abnormal situations. It's also vital that the training be designed in a manner that isn't offensive to local cultural norms and values.

THE FUNDAMENTALS OF A MODERN TECHNICAL TRAINING PROGRAM

1	*Evaluate critical mechanical, electrical, HVAC, and control assets and determine approriate training requirements for each based on operational and maintenance philosophies*
2	*Perform plant skills assessment to identify gaps between "as Is" and desired states*
3	*Determe specific knowledge and skill areas where training is required to close the gaps*
4	*Determine most appropriate approaches, materials, and training tools to employ*
5	*Track and periodically review results and implement improvements as needed*

Process for establishing an accurate, credible, clear, and practical technical training program

While digital technology opens new opportunities for learning technical skills, one thing hasn't changed: According to OSHA, an effective training program must be accurate, credible, clear, and practical. While the available technologies have evolved significantly, the fundamental process for establishing an accurate, credible, clear, and practical training program has remained relatively consistent. This process involves:

- Evaluating the critical mechanical, electrical, HVAC, and control assets in your plant and determining the appropriate training requirements for each based on your corporate operational and maintenance philosophies
- Identifying the knowledge and skill sets that your various maintenance and other technical staff require to properly perform the related tasks

- Performing objective skills assessments of your various current technical skills to identify the gaps between the "as-is" and desired states
- Determining the specific skill areas where your employees need training to help them close those gaps
- Determining the specific approaches, materials, and training tools that are likely to be the best fit for your technicians
- Tracking and periodically reviewing results and implementing ongoing improvements as needed

When practical, it's usually a good idea to develop your training plan with input from key stakeholders up and down the line. This helps ensure critical buy-in and fosters a learning culture throughout your organization.
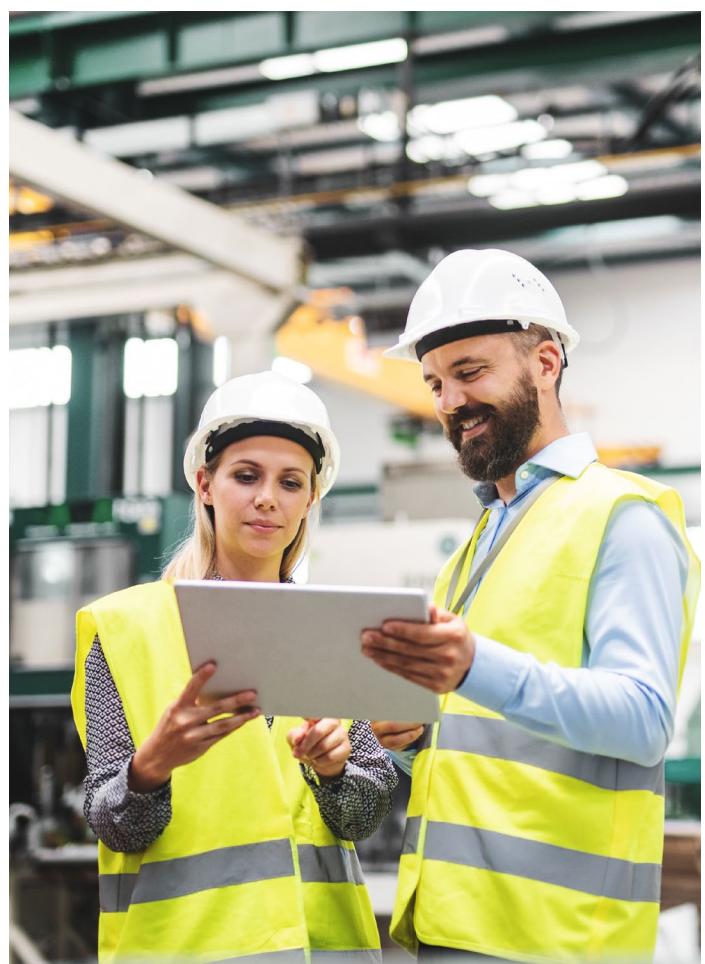
WHY YOU SHOULD CONSIDER HIGH-QUALITY TECHNICAL TRAINING AS AN INVESTMENT IN YOUR BUSINESS, NOT A COST

High-quality, online technical skills training supported with advanced web-based simulation-based training is a sound investment in your business and your people, not a line-item expense. Effective training:

- ✓ Helps improve asset reliability to minimize disruptive and costly unplanned downtime
- ✓ Enables you to meet OSHA, EPA, and other relevant regulatory requirements to avoid costly fines and, in regulated industries, obtain a basic license to operate
- ✓ Improves operational, safety, and environmental performance to enhance profitability, protect workers, and maintain amicable relations with your neighbors

- ✓ Enhances the productivity of your maintenance, electrical, HVAC, and other technical staff
- ✓ Offers a flexible learning environment so your key technical staff members can learn between tickets and start and stop at any time.
- ✓ Helps you reduce time-to-value when installing and commissioning new plant equipment and/or automation to meet competitive or regulatory challenges
- ✓ Enables your plant to meet new tariff-related onshoring/reshoring challenges and avoid future supply chain interruptions due to evolving geopolitical conditions and any natural or other disasters