

EHS Today®

SAFETY TECHNOLOGY

Workplace Safety in the Roaring Twenties

Thanks to innovative technologies already available, we can make the workplace safer today.

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From hard hats to wearable technology, workplace safety innovations have come a long way in the last 100+ years. And there's no reason to expect a slowdown anytime soon. If anything, safety will advance over the next decade, taking advantage of innovations in other areas to make new breakthroughs happen. Many safety advances are likely to be sparked by new applications of existing technologies or by novel combinations of advancing technologies.

As I scan the safety landscape, four trends stand out that will fundamentally change the way we manage risk and keep people safe.

LOCATOR BEAMS

Behavior-based safety theorizes that employees face thousands of choices every day. They choose between a safe and an unsafe approach. What if we can apply technology to guide that choice at the decision point?

Imagine that as worker, Emily, enters a facility, her cellphone buzzes. As she looks at the screen, a message pops up: "Welcome to our facility, Emily."

The phone recognizes her and confirms she is an employee and is up to date on safety training. Another message gives her a briefing about two recent safety incidents.

She's asked a few questions about the causes of those incidents. To confirm her understanding, she must pick an answer about the risks from a multiple-choice question. Once completed, she is reminded to be alert for overhead lifts and to mind the "green mile" for where she is allowed to walk. The program registers her responses into a learning management system (LMS).

This technology is possible today borrowing from the world of retail.

Using locator beams, we can generate safety messages and broadcast them to employees through their personal electronic devices. These messages can remind employees to make safe choices, or alert them to specific hazards.

Value Proposition: Influence employee choices and remind them of specific safety messages

Cost: \$ (very low)

Technology Origins: Retail marketing

Availability: Current

AI AND REMOTE VIDEO MONITORING

Imagine you are performing a line break on a pipeline. The work is zooming along in record time. The work crew is contacted from a remote location. A voice message states: "We didn't note that proper line isolation was conducted. Please verify that the following steps were taken"

The procedure was being monitored via video, automatically recording it and comparing it to a set of standards. Artificial intelligence (AI) identified that certain critical steps were likely missed. A person who received an alert intervened because things didn't look right.

This isn't science fiction. In fact, the medical community uses such technology to monitor surgical procedures. And the system can easily be adapted for safety critical jobs in other high-risk industries. It requires cameras, clear standards for critical steps, the application of AI, and review and intervention capabilities.

Value Proposition: Prevent errors in safety critical tasks

Cost: \$\$\$ (Moderate to High)

Technology Origins: Medical

Availability: Current

VIRTUAL REALITY TRAINING

Who trains people in snowstorms at night? Who allows people to make mistakes and experience the consequences— without hurting themselves?

Virtual reality (VR) allows the simulation of rare, expensive, impossible and dangerous experiences. The earliest VR simulations occurred in aviation, with the Link Trainer, which has evolved significantly since the 1930s. Every major airline has used simulators for decades to simulate the experience of flying specific aircraft. Other industries have used similar simulators, particularly in mining and refinery operations. Historically, though, cost was a barrier to entry. That's changed.

Utility companies have created interactive VR training to simulate working in underground electrical vaults. Learners get to experience what happens when a wire is accidentally contacted and they “feel” the shock of doing so. Construction operators can manipulate a crane and understand the impact of a shifting load. Aircraft “wing walkers” can experience the arrival process of an aircraft in the snow. All of these can be done effectively and safely.

Best of all, the costs have come down tremendously. While custom VR can cost \$80,000 per course, common/standard VR training—such as for crane operations—can be a fraction of that. Equipment costs (goggles) are dropping rapidly in price, too.

Value Proposition: Simulate the rare, dangerous, impossible, or expensive and certify competence

Cost: \$\$ (Moderate)

Technology Origins: Aviation

Availability: Current

INTRINSICALLY SAFE ROBOTICS

Science fiction writer Isaac Asimov called it “The First Law of Robotics.” He said, “A robot may not injure a human being or, through inaction, allow a human being to come to harm.” Unfortunately, we’re not yet at the point where we can fully protect people from unintentional injuries caused by contact with robots.

For example, in March 2017, a Michigan woman was bludgeoned to death by a robot after entering an area where she was not recognized by the systems.

Traditionally, robots have been kept isolated from workers, for example in a cage. Separated from humans, robots operate based upon their programming. Alternatively, automated guided vehicles (AGVs) work on a fixed circuit, with sensors to avoid collisions with people, plant and equipment.

Increasingly, however, humans and robots sit side by side to perform tasks. The next, inevitable step is autonomous robots. Enabled by advanced technology, data, and networking capabilities and AI integrated into their design, robots will work independently from humans.

A safety risk here is the unintentional interaction between humans and robots. Current research focuses on controlling the force exerted by robots—“soft” robots using advanced sensors and programs such that contact with them will not harm people. The BioRobotics Institute (Pisa, Italy) noted in February 2017 that soft robots will “help develop novel applications in industrial fields such as universal grippers.... Soft robots also promise to solve the questions related to safety, partially, if not completely. This prospect of embodied safety has also accelerated the development of manipulators based on soft robotic technologies.”

This will enable the introduction of fully autonomous robots interacting with human workers in a variety of industrial applications.

Value Proposition: Enable autonomous robots to operate alongside or independent of human workers

Cost: \$\$\$\$\$ (Expensive)

Technology Origins: Automotive

Availability: Emerging

A safe future isn't science fiction. By looking at existing industrial technologies, we can make the workplace safer today. We can already see the penetration of VR-based training. Locator beams are here now and can be rapidly adopted. Video and AI combinations are emerging. One day, we'll go to work next to a robot following Asimov's first law of robotics, but that's a bit further away!