Workplace Safety

How Industry 4.0 Makes Factories Safer as Well as Smarter

James Langford | Dec 22, 2022

By now, you've probably heard all about the ways that smart manufacturing can help you boost productivity, cut operating costs and generally do more with less.

What you may not know is that it can also make your business safer.

The sensor networks and connectivity that enable real-time tracking of machine performance and prediction of maintenance needs also allow environmental monitoring that can spot chemical and temperature hazards, track physiological data of workers in high-risk environments and streamline lockout and tagout systems.

Taking advantage of that capability has the potential to be a game-changer, safety experts agree, both for workers and their employers.

"With the ability to capture and analyze massive amounts of safety-system and operational data, safety professionals can move from merely describing what went wrong to predicting and preventing incidents in the first place," Peter Bussey, an analyst with LNS Research, says in a white paper posted on ***Rockwell Automation's website***.

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About half of factories today lack real-time visibility into environmental, health and safety data, but those that have begun addressing the gap by investing in safety technology upgrades have achieved significant results. Some 75 percent reported operational improvements, and 60 percent discovered financial benefits, LNS said.

Leveraging wearable devices and other tools to sync people and equipment gives businesses a new arsenal of safety-management tools, according to ***Rockwell Automation***, which specializes in digital manufacturing applications through ***The Connected Enterprise***, its portfolio of integrated control and information software. Those include:

- **Remote access:** Central monitoring of isolated operations such as oil pump stations means workers don't have to travel as often for inspections, curbing potential transportation accidents.
- **Operational visibility:** Real-time updates on manufacturing processes can help prevent accidents such as releasing hazardous chemicals.
- **Locating workers:** Wearable sensors provide a valuable link to colleagues and, if needed,

emergency personnel when employees are in difficult-to-access spots like underground mines. Video and voice technology can also enable communication in a crisis.
- **Relaying information:** Wireless and mobile technology can capture data on working conditions such as ergonomics, reducing the chances of injury to workers with certain health issues or in higher-risk environments.

Industry 4.0 tools also can simplify collection and storage of the reams of data for reports required by regulators such as the U.S. Occupational Safety and Health Administration, a boon to employers facing mandates to supply more information.

One ***rule change proposed this year by OSHA***, which hasn't yet been finalized, would require employers in higher-risk industries including metalworking to submit more detailed digital records on workplace injuries and illnesses, some of which would be posted online.

The regulator estimates its new rule on digital injury reports would cost the private sector $3.9 million a year, or about $81 per affected business.

The time and money required for such tasks has been a pain point for some businesses, but experts say making factories and machine shops safer ultimately buoys profit, a benefit that smart technology only enhances.

It "can boost productivity, identify and resolve common machine-stoppage problems—and even predict production issues before they happen," a Rolls-Royce health and safety manager said in a ***post on the engine-maker's website***.

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> Julian Moffatt
> VelocityEHS

Rolls-Royce has already begun using Industry 4.0 technologies such as 3D visualization software that helps employees monitor their surroundings, machine learning that monitors compliance with rules on personal protective equipment, or PPE, and robotic arms that take over dangerous tasks like furnace operations from human workers.

Not only can data collected by smart safety devices create a "trail of breadcrumbs" pointing to larger issues that affect production, it can identify discrepancies between policies and operating procedures, the company said.

Leveraging ***Industrial Internet of Things*** tools ultimately makes factories less hazardous as well as more efficient, agrees technology company Insight Enterprises.

"Moving forward, workplace safety will increasingly depend on a company's willingness to invest in cutting-edge technologies," the Arizona-based business says in a ***report on its website***.

Capabilities that U.S. industry is already using include the following, Insight says:

- **Computer vision:** Adding a digital camera to factory internet systems gives computers access to digital images they can scan for patterns such as shape and color, much like computers in autonomous vehicles, and spot potential risks such as a worker who should be wearing a hard hat or unattended equipment that's still running, the company says. Cameras can also be mounted on drones to allow remote inspection of operations like mines or construction sites.
- **Sensors and wearable devices:** ***Smartwatches can track worker heart rate*** and temperature, helping workers avoid potential injury or alerting their supervisors to an emergency. Radio-frequency ID (RFID) tags can make sure unauthorized personnel are kept out of restricted areas,

and sensors can monitor environmental data such as temperature, pressure, vibration or air quality.
- **Virtual reality:** Simulating real-life situations allows workers to train for hazardous jobs and conditions in a lower-risk environment, learning from their mistakes without suffering serious injury or damaging costly equipment.
- **Artificial intelligence and automation:** While robotic ***automation*** is widely used in manufacturing already, even the most sophisticated machines often require human involvement periodically. That need is likely to decrease, Insight predicts, as automated systems grow more adaptable.

"If the past 50 years have been transformational, the next 20 years will be truly revolutionary," Julian Moffatt of VelocityEHS, a provider of environment, health and safety software, says in a ***post on the National Safety Council's website***.

Already, the traditional duties of health and safety officials, such as investigating accidents, are being viewed as reactive and specialists are increasing their focus on proactive tactics, using technology to predict problems.

"If this sounds a little too futuristic, take a closer look at what leading EHS software vendors using AI-assisted video analysis are already doing today," Moffatt says. "We now have the ability to conduct an automatic ergonomics or safety assessment based on a smartphone video clip and conduct video behavior analytics. The future has already arrived."

Such advances don't mean safety officials can be replaced by software and robots, he cautions. Instead, they allow them to make better decisions, fine-tune spending and, most importantly, save lives and prevent environmental harm.

"The best way to adapt to the new normal is to get in front of the story: Investigate what is already available, identify infrastructure requirements to support high-quality data collection, and adopt management practices and systems that will help to support the coming revolution," he says.

