

## How to Protect Productivity and Safety Amid a Changing Workforce

Hazards are ever-present in the steel plant environment, and a heightened awareness and emphasis on safety is a necessary priority for our industry. This monthly column, coordinated by members of the AIST Safety & Health Technology Committee, focuses on procedures and practices to promote a safe working environment for everyone.



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The labor pool that has traditionally fueled skilled trades including the iron and steel industry is shrinking. Older workers are moving toward retirement and taking decades of experience and knowledge with them, while a limited talent pool of younger, less experienced workers take their place.

This trend is happening all around the world. In the United States, the average age of a highly skilled manufacturing worker is 56. In Europe, the European Commission found that one-third of employers said their recruitment difficulties are due to a lack of technical skills and candidates. In China, McKinsey & Co. estimates the country's demand for highly skilled workers will exceed the number of available workers by 24 million in 2020.

This evolving workforce challenge will have major ramifications on manufacturing productivity. However, it also could have significant consequences on worker safety.

Older workers are at higher risk for certain injuries as their aging bodies begin to affect their work. For example, their ability to recognize and react to hazards can take longer, and their ability to lift or carry heavy objects can become diminished, making them more prone to injuries. Older workers may also take longer to recover from injuries than younger workers.

Younger and less experienced workers, however, are more frequently injured and tend to have more serious injuries. This can be attributed to inexperience, cognitive and developmental characteristics, hesitance to ask questions, misjudging risks, and failure to recognize workplace dangers.

### Technology Skills Gap

At the same time, the technology landscape is rapidly changing. Manufacturing has evolved far beyond the days of the assembly line. In fact, industrial operations will more radically change in the next 5 years than they have in the last 20, and the Internet of Things (IoT) is a catalyst of this shift.

The IoT, and specifically the convergence of information technology (IT) and operations technology (OT) systems, is transforming manufacturing through deeper visibility, greater connectivity and nearly unlimited potential for improvement. With rapid advancements in technology come new demands on the workforce. New skills are needed to enable IT/OT convergence and to take advantage of new technology. And these skills are not easily found in today's workforce.

### Building a Response

Workforce availability is a long-term, multi-faceted challenge. There is no single or short-term fix. However, there are five key steps manufacturers can take to better prepare their operations and empower their workers to adjust to the challenges ahead.

**1. Improve Machinery Design** — Machinery design must be improved for a changing, more diverse workforce. This requires significantly rethinking how machinery is designed and built.

Older workers require physically less strenuous interaction with machinery, including reduced lifting, bending, twisting and repetitive actions. Younger, inexperienced workers require more passive safety systems to help mitigate risks in the event of an inappropriate action, such

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as placing a hand or another body part in a hazardous position.

In addition, a more diverse workforce requires that machinery be designed for a wider range of workers, including workers that are male and female, tall and short, right-handed and left-handed, and/or those with disabilities.

Hazard assessments should take into account not only traditional hazards, but also ergonomic and usability issues for today's broad range of workers. Engineers who are performing assessments and building functional specifications need to assess all potential operator and maintenance technician movements as part of the process.

Contemporary safety systems, integrated with machinery control systems, can be very effective in mitigating risks while providing for effective and productive machinery operation. These systems are not as prone to nuisance shutdowns as older hard-wired systems, which helps improve productivity and safety. They also are more ergonomic, reducing the probability that workers will override the systems and put themselves at risk.

In addition, machinery design strategies such as safe-speed monitoring and zone control can provide alternative protective measures to lockout/tagout procedures. This helps to reduce physical demands put on workers and may keep a machine running longer for improved productivity.

Machine builders should consider both ergonomics and passive safety systems when designing machinery, and manufacturers should demand machinery designs that accommodate the needs of a more diverse workforce and the physical limitations of aging workers. The evolution of machinery design will require time, but such requirements should be built into all new machinery specifications.

**2. Build a Connected Enterprise** — A connected enterprise consists of industrial operations that are smart, secure, and connected, from sensors and machinery in one location up to the enterprise, and across the entire supply chain. Seamless information sharing spans people, processes and technologies across global and remote operations, which enables better collaboration, faster problem-solving, and improved innovation and productivity.

When it comes to adjusting to workforce challenges, having a connected enterprise can aid in a number of ways. For example, a connected enterprise can help identify risks and gain new insights into where safety-related shutdowns and incidents are taking place — and where further assessment and mitigation might improve worker safety. Collection and analysis of information can expose the particular locations, applications and operations where risks are higher.

This insight goes beyond simple identification of where injuries are currently taking place in a single facility to include identification of common applications

across an enterprise where injuries, near misses and safety shutdowns are taking place, affecting both worker safety and productivity.

Once the problems are identified, solutions can be implemented to reduce safety incidents or improve productivity. Lockout/tagout locations might be identified and analyzed to see if there are opportunities for alternative measures that can improve productivity.

A connected enterprise also can help reduce job complexity. Worker-specific instructions and other contextualized production information can help reduce complexity for younger, less experienced workers. This information can be collected from machinery and delivered to workers in real time, in a context relevant to each employee. In addition, collecting information from experienced employees and integrating it into workflow instructions can help preserve critical tribal knowledge.

Mobile devices can also help extend information sharing to younger workers in a format they are familiar with. Mobile devices also can deliver information to older workers with “anytime, anywhere” convenience to help reduce physical demands.

Finally, remote-access technology can reduce travel demands and improve work-life balance for older workers who may otherwise be considering retirement. Employees can offer their expertise to sites around the world from a central location or command center, or even from home.

**3. Use Training** — As experienced workers retire and younger workers take their place, and as new technologies emerge in industrial facilities, the management of knowledge becomes critical.

Knowledge management in an evolving workforce requires a multi-faceted approach. The tribal knowledge of older, more experienced workers must be preserved and passed on to younger, less experienced workers. Younger workers also need to acquire the technical skills and knowledge necessary to maintain equipment and troubleshoot problems to help increase uptime.

Effective training programs incorporate key elements for retaining and building knowledge management, including:

- A formal program to document standard processes and procedures to help maintain consistency through transitions. The program should also help employees identify exceptions to those processes and procedures, as well as know when issues should be escalated.
- A regular analysis of job skill and knowledge levels to confirm workers have the knowledge and abilities to perform at the desired level. The analysis should target specific job categories and focus on tasks that affect worker performance. Skills assessments can be targeted to specific job responsibilities.

- A sustainable and flexible competency improvement program to continually improve productivity and profitability throughout the enterprise, as skills will undoubtedly range from a foundational, to an intermediate, to a mastery level depending on each employee's experience.
- IT/OT training for workers who will be responsible for designing, managing and maintaining a connected enterprise. IT and OT roles that have long remained separate are now blending, requiring additional skills and training for both individuals and teams. To this end, workers on the plant floor must increasingly become specialists in areas such as networking technology, data analytics and industrial security.

**4. Use External Services** — Some specialized skills are only occasionally required. For these skills, it might make sense to use consulting and technical services available from industry specialists. In other instances, such as when a manufacturer has limited resources or can't find the talent locally, external services can help augment an existing workforce.

For example, machinery safety assessments require deep understanding of applicable safety standards, machinery hazards and mitigation techniques. These skills aren't easily developed and may not be needed on a day-to-day basis. Third-party safety assessments can help verify standards compliance, reduce risks and improve productivity.

This is also an area where outside expertise can offer a valuable fresh perspective. Internally conducted safety assessments may overlook potential hazards on machinery that employees are familiar with and on which no one has previously been injured. But an external specialist taking a fresh look at the equipment might identify the hazards.

Network services may also not be available in-house or needed on a daily basis. This can include network assessment, design, implementation and validation. At the same time, using outside specialists for continuous network monitoring and maintenance can help manufacturers better manage their networks and help improve uptime.

Remote support and remote monitoring services can provide continuous machinery monitoring, data collection and 24/7 live support to help immediately identify and quickly resolve technical issues. This can be especially valuable for critical processes, round-the-clock operations and operations that are based in remote locations.

In addition, data integration and contextualization is an emerging service that is becoming increasingly important for manufacturers that seek to capture the value of a connected enterprise and deliver real-time, contextualized information to workers. Collecting the wealth of data supplied by a connected environment and

turning it into actionable information can help identify opportunities to increase productivity.

**5. Engage the Community** — Employers can no longer rely on schools as a key source of workers, as many career-bound students possess different skills and experiences than previous generations. They are more likely to be comfortable working with computers and modern technology, and less likely to have mechanical experience gained from working on machinery or automobiles.

Younger people also are less inclined than previous generations to envision themselves working in manufacturing and industrial operations. They perceive industrial jobs as boring and unsafe, rather than high-tech, safe and sustainable.

Manufacturers must take it upon themselves to alter these perceptions. They need to demonstrate the new face of manufacturing, and communicate the wide array of interesting and financially rewarding jobs that are available. Manufacturers need to create a passion for these skills early in the education process by showing that manufacturing can be a rewarding career, as well as fascinating and fun.

More than generating interest, manufacturers must also ensure that these young workers are equipped with the interdisciplinary skills needed for modern industrial environments. These skills include the ability to communicate and operate in a collaborative and connected work environment.

Manufacturers also need to change their perception of potential employees by bringing in more under-represented groups. This isn't simply about race or gender equity. In a global and competitive environment, manufacturers need every bright mind focused on new solutions. A diverse workforce keeps perspectives fresh and transforms ideas into innovation. Creating a diverse workforce must become a business priority for every company.

## Getting Ahead of the Challenge

The world's workforce is rapidly evolving — in age, needs and expectations. The issue is profound, global and inescapable.

As the global workforce evolves, manufacturers need to provide an infrastructure that improves workers' lives. This infrastructure must include a safe working environment, comfortable working conditions, flexibility, training and knowledge that can sustain not only their own futures, but the organization's as well.

Manufacturers that start adopting programs now to address these changes will find themselves with a long-term competitive advantage and better situated to take on the challenges of an evolving business environment. ◆