The Latest Technology Helping to Prevent Accidents in the Steel Industry

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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Comments are welcome. If you have questions about this topic or other safety issues, please contact safetyfirst@aist.org. Please include your full name, company name, mailing address and email in all correspondence.

Ensuring the safety of workers is a key issue for employers, particularly in the environment of the bustling steel industry where workers must navigate multiple hazards during the course of a day's work. Much work has been done in recent years to safeguard workers, yet despite health and safety regulations issued by government agencies, the incidence of injuries and fatalities at U.S. steel foundries remains high.

According to figures released by the U.S. Bureau of Labor Statistics, injury rates continue to be much higher than those for all other private manufacturing enterprises. In 2016, there were 25 fatalities within the primary metal manufacturing industry, of which steel is the largest component.[1]

A Global Problem

In terms of injuries, steel foundries are the third-most dangerous industry in the U.S. with 12.7 workers suffering from non-fatal injuries and illnesses per 100 workers each year.[2] Injuries often involve moving machinery and on-site traffic.

Globally, it is estimated that thousands of mining accidents occur each year and around 12,000 fatalities are recorded.

Common challenges for steel workers operating on a busy work site include:

- Collisions due to rear, front and side blind spots.
- Collisions due to poor visibility, such as dust, fog and working at night.
- Site workers being struck by vehicles and mobile machines.
- Hearing protection reducing site workers' ability to hear approaching vehicles clearly.
- Tonal back-up alarms being ignored by site workers.

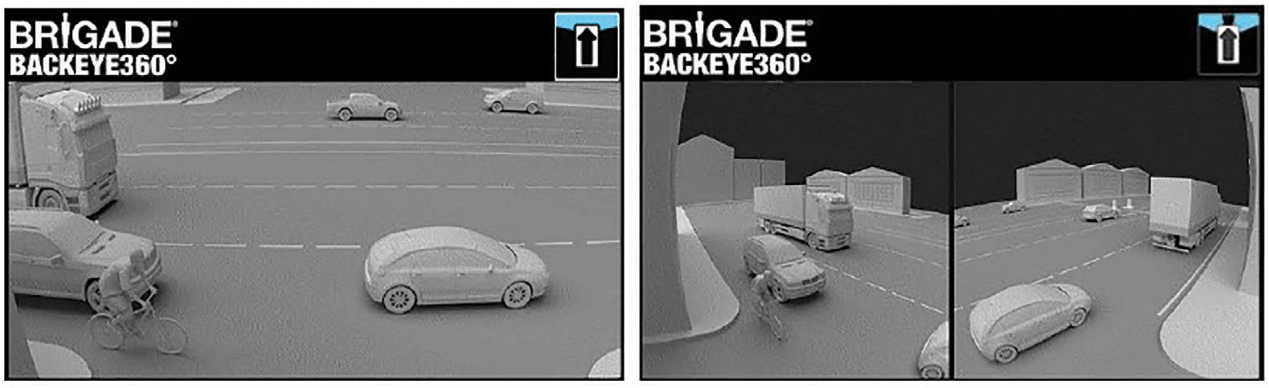
While working on-site clearly poses more risk of injury than other occupations, many of these incidents could be eliminated with the use of the latest technology. A range of technology systems is already being used across the world to help save lives and reduce injuries.

Eliminating Blind Spots

On busy iron and steel foundry sites, vehicle blind spots are a major factor in causing collisions. The complex shape and size of many vehicles and machinery limits the driver's visibility considerably, making accidents far more likely. While mirrors have traditionally been used for detecting blind spots, they do not eliminate them completely. Research has shown that in the time it takes to scan four mirrors, assess and then react to hazards, even at speeds of just 3 miles/hour, a vehicle could travel as far as 32 feet.

One organization that has improved its safety record using the latest technology is Steel Dynamics Inc., one of the largest domestic steel producers and metal recyclers in the U.S. The company used all-round vehicle visibility, which has been proven to reduce collisions and improve safety. Steel Dynamics invested in Brigade Electronics' BackEye® 360° camera system for its scrap pad wheel loader, 988 Cat. This was for use in areas where scrap deliveries are carried out. Drivers exit the cab to open the gate of the

Figure 1



Full Camera View (Front)

Cross Traffic (Front)

Simulated views from the Brigade BackEye® 360° camera system.

roll-off truck in order to dump scrap. The loader then pushes the scrap into the bay. During this process, it is crucial that the operator maintains a safe distance from the drivers.

Utilizing the technology, Steel Dynamics' drivers were given access to intelligent camera systems, which provide a complete 360° view of their vehicle or machine in a single image. The system combines images from several ultrawide-angled cameras, providing a "bird's-eye view" of the vehicle and surrounding area, eliminating blind spots.

Back-up Plans

In April 2015, 41-year-old steelworker Heather D. Warren was tragically killed when a semi-truck with steel coils backed into her as she was acting as a spotter for another truck on the loading bay. Her death highlights a major cause of injury and death on busy worksites, where multiple machinery and vehicles are being operated. It's thought that 90% of reversing accidents occur off-road, i.e., at construction and manufacturing sites.

Boosting safety when vehicles back up is one area where the right technology can help eliminate needless incidents. Back-up alarms are, of course, nothing new, having been widely introduced during the 1970s following the release of a Japanese-designed product. The traditional "beep beep" tonal alarms were soon to be found on worksites and public roads around the world. As time went on, however, it was noticed that workers and members of the public were becoming immune to the sound and had begun to ignore it. This represents a real problem on worksites when multiple alarms are sounding at any one time. It also became clear that it was difficult to detect the direction from which the alarm was sounding, leading to confusion and accidents.

Figure 2

Views from the BackEye camera system.

Figure 3

White sound back-up alarm.

The latest alarms solve these problems. Harnessing high-spec broadband sound frequency, the alarms emit a wide range of white sound frequencies, enabling workers to locate the direction of the sounds instantly. Rather than the old-style "beep beep," white sound back-up alarms create a "ssh-ssh" sound, which dissipates quickly. This means the alarm can only be heard in the danger zone, so there is more chance of alarm-weary workers paying attention. The broadband frequency also gives workers wearing hearing protection devices a better chance of hearing the alarm.

These alarms are compatible with most worksite vehicles, including wheel loaders, semi-trailers and dumpers.

Figure 4

Radar obstacle detection system.

Battling the Elements

Although camera monitor systems eradicate blind spots in most scenarios, radar obstacle detection provides another essential solution when visibility is poor. Dust clouds, fog, rain, snow and nighttime working create additional hazards to worksite drivers. Radar sensor systems detect both stationary and moving objects, providing the driver with in-cab visual and audible warning, thereby creating an instant alert to danger, whatever the conditions. Radar systems are available in programmable models, allowing organizations to fix a custom detection area, specifically suited to their needs.

Ultrasonic proximity sensors, meanwhile, minimize both vehicle damage and collisions with pedestrians or objects. This technology is useful for vehicles operating in confined spaces or maneuvering at low speeds. The detection systems alert the driver of obstacles close to the vehicle whether moving or stationary. Audible and visual in-cab warning informs of distance, while external speaking alarms can be added to alert pedestrians that a vehicle is turning.

A Safer Future

The iron and steel industry has made great strides in its attempts to address safety concerns in the workplace. However, even one accident is one too many. Clearly, research has a huge part to play in helping to safeguard lives, and new innovations are being developed at a rapid pace. It is now down to individual organizations to invest in the technology that will help to keep their workforces safe.

References

1. U.S. Bureau of Labor Statistics, "Industries at a Glance: Primary Metal Manufacturing: NAICS 331," https://www.bls.gov/iag/tgs/iag331.htm.
2. U.S. News and World Report, "The 11 Most Dangerous Industries in America," http://www.usnews.com/news/articles/2012/10/30/the-11-most-dangerous-industries-in-america.
3. U.S. Bureau of Labor Statistics, "Industry Injury and Illness Data — 2016," https://www.bls.gov/iif/oshsum.htm#16Summary_News_Release.

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Did You Know?

U.K. Steel Industry Unites Behind GBP35 Million Research Effort

More than 20 U.K. universities and steel industry representatives have organized a seven-year, GBP35 million research initiative that aims to make the country's steel industry carbon neutral and to introduce more data-driven processes to steelmaking.

Called SUSTAIN, the initiative is being led by Swansea University in partnership with universities of Sheffield and Warwick and a number of steelmakers, trade groups and research organizations.

In a statement announcing the initiative, SUSTAIN leaders said the initiative marks the first time the U.K. steel industry has collectively thrown its support behind a coordinated line of research. And with the U.K.'s Engineering and Physical Sciences Research Council contributing GBP10 million to the initiative, it represents the single largest investment in steel research by a U.K. research council.

"Research and innovation are the bedrock of a modern steel industry. This network represents almost the whole U.K. steel sector, with researchers and companies working together on an unprecedented scale," said Swansea University metallurgist and SUSTAIN deputy director Cameron Pleydell-Pearce.

"This news is a massive vote of confidence in the steel industry. It will support the industry's vision for a responsible, innovative and creative future. We are already on the road to clean, green and smart steelmaking, but this is another giant step forward," he said.