

Steeled for Safety: Visual Aid Technologies to Increase Safety With Material Handling



Author

Christopher Machut
Netarus LLC, Norfolk, Va., USA
chris@netarus.com

This paper will provide details of how safety incidents were significantly reduced in material handling operations and productivity was increased by 20% when deploying visual aid technologies. The paper provides an overview of the issues encountered prior to the visual aid technology being deployed and the results of the implementation. It provides specific implementation techniques, including recommended strategies for deploying visual aid technologies.

The steel producer that is the subject of this study strives to produce cold-rolled coil steel that can meet customer demands for high surface quality and strength while also maintaining safe working conditions for warehouse workers. Cold-rolled steel is typically coated or painted, with applications including electronic cabinetry, lighting fixtures, metal office furniture, water heaters, container manufacturers, tubing, appliances, and a variety of construction-related products. The gauges range from 0.011 to 0.134 inch thick, in widths ranging from 27 to 60 inches. Weighing between 20,000 and 30,000 lbs., the steel coils can be extremely challenging and dangerous to transport and handle. Therefore, proper safety precautions are vital to preventing hazardous incidents.

Warehouse operators employed by the steel producer use overhead gantry cranes to redistribute coils throughout the warehouse and remove the coils for shipment. Crane operation must be performed safely and effectively to prevent worker injury and property damage. Warehousing coil steel without the proper equipment can be hazardous and even deadly. Without visual guidance, the hook from an overhead gantry crane cannot properly enter the center bore of the roll. This creates instability in coil stacks and reduces the ability of

the operator to safely maneuver the coils. Contact with the bore also damages the steel and requires the roll to be redone. Without a full visual on the crane, other workers may step in harm's way without the operator's knowledge. While best practices and safety measures can reduce risk of workplace injury, safety cameras are recommended to improve visibility for crane operators and prevent unnecessary damage to person or property.

New technology and work procedures have been applied successfully to reduce the risks and problems associated with warehouse crane operation. Safety cameras are a form of hazard prevention that provide an additional safety check to crane operating procedures and product transport processes. The cameras can also improve operator efficiency by creating a visual aid for transporting processes. This article will discuss existing warehouse crane safety procedures, risks associated with crane operation, reported workplace incidents, and the use of safety cameras to make crane operation safer and more productive.

Discussion

What Cannot Be Seen Cannot Be Stopped: A Steel Producer's Incident — Steel producers have succeeded in improving warehouse safety

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Figure 1



Cold-rolled coils in a warehouse.

standards by implementing safe procedures and safety training for workers. Lost-time injury (LTI) is defined as any incident causing injury to a worker that inhibits the worker from returning to the next scheduled shift or work period. The lost-time injury frequency rate (LTIFR) represents the number of LTIs per million hours worked. According to the World Steel Association, the steel industry saw a decline of 82% between 2006 and 2016 in LTIFR. This was largely the result of implementing safety and health programs, including safety workshops, reflection on past incidents and shop floor safety audits. Companies who are members of the World Steel Association also observe a “Steel Safety Day” on the International Labour Organisation’s World Day for Safety and Health at work, during which a special safety audit is performed on the five most common causes of serious safety incidents. These practices, among other safety measures and best practices, have aided in reducing the LTIFR per one million hours worked from 4.55 in 2006 to 0.84 in 2017.

However, the data from the World Steel Association shows that these improvements are not yet enough to achieve the zero goal, in which workplaces would be 100% injury-free. The addition of a safety camera can aid the crane operator in performing their job safely because it provides a visual on nearby workers and potential accidents. Having a safety camera installed also makes the operator more accountable and responsible for hazardous operation of the crane. Without a complete visual on the crane, operators do not have the necessary equipment to fully control all potential risks to worker safety, placing greater liability on the company. Safety camera installation is an additional step that companies can take to put hazard control back in the hands of the operators and bring

workplace injury incidence closer to the zero goal described by the World Steel Association. Additional measures would allow workers to remain healthy, safe and productive, with minimal incident of injury or fatality.

A Broader Perspective on Workplace Injuries and the Need for Greater Visibility — Working with steel coils has proven in the past to be extremely hazardous and has led to a number of fatal workplace incidents. According to the U.S. Bureau of Labor Statistics, steelworkers have the sixth most dangerous occupation nationwide. Injuries and fatalities in the steel industry occur at a relatively high rate due to hazardous conditions. The U.S. Bureau of Labor Statistics also reports a fatality incidence rate of 29.8 fatal work injuries per 100,000 full-time equivalent steel industry workers. Crane operation accidents are frequently the cause of injury in steel warehouses because operators lack full visual awareness of the crane and danger areas due to the blind spots of the equipment. The process of moving steel overhead throughout the warehouse poses risks not only to the operator, but also to all the other workers near and underneath the overhead crane. Steel coils are also extremely heavy, large and cumbersome to transport. At great heights, destabilized or dropped coils pose a fatal threat to both the crane operators and the workers in the warehouse below.

Some crane-related accidents have resulted in property damage and LTI incidents without causing fatal or serious injury. An incident report from the U.S. Occupational Safety and Health Administration (OSHA) describes a crane-related incident that occurred at a steel temper mill. The temper mill erects place towers on top of coils through a process called nailing. The crane had a movable cab, but the operator could not see the hook on the crane. As a result, the operator accidentally drove the hook into the first tower, damaging two other towers and harming the entire worksite. Another report from OSHA describes an incident in which a crane operator sustained fractures to his clavicle and scapula on his left side in addition to fractures to his second, third, sixth and seventh ribs. The crane operator was attempting to seat a stopper rod assembly on a crane tundish. The chain hooks snagged on the stopper rod assembly when the operator was repositioning the crane. The operator later realized the problem and may have reacted quickly enough to prevent the crane’s momentum from causing damage, but the battery for the crane’s remote ran out and was not working at that point in time. Had the operator obtained a visual check from a safety camera before repositioning the crane, he could have caught the error before the snag occurred.

Other crane-related accidents have resulted in serious injury and worker fatality. OSHA has documented

a number of fatalities due to crane incidents at steel factories. An OSHA accident report documents the fatal injury of a “hole man” whose role consisted of utilizing slitters to cut down the steel, then rewinding the steel into coils. The worker was observing the steel as it was rewound onto a spindle, after the steel had been put through the slitting process. He was killed after being pulled into the steel coil. Another report from the New Jersey Department of Health and Safety states that a 41-year-old warehouseman at a steel cutting plant was crushed to death between two rolls of coiled steel. The steel was delivered to the plant in large coils that ranged in weight from 5,000 to 40,000 lbs. The coils were then stacked in long rows on the plant floor. A 20-ton-capacity overhead crane was used to move the steel inside the plant. On this day, the victim was using the crane to lift a coil from a stack of coils that had been stacked three coils high. As the operator lifted the coil, the movement apparently dislodged one or more neighboring coils, causing one 10,000-lb. coil to slip forward off the row, pinning the victim against a row of coils behind him. Lacking equipment such as a safety camera removes the additional visual check that crane operators have on these dangerous objects. Operating errors become more likely without this additional safety measure in place, as do serious and, in the worst cases, fatal injury.

The Solution: Safety in Sight — Installing a safety camera on a crane improves warehouse safety conditions for the crane operator and other warehouse workers and reduces incidence of injury. One of the most dangerous aspects of crane operation is the existence of “blind spots,” large areas that are blocked from view of the operator by crane machinery. If the operator cannot see hazardous areas nearby the crane, other workers are either put directly in danger by the crane itself, or indirectly by coil stacks that have been destabilized by operating errors. The additional visual aid provided by a safety camera allows the crane operator to quickly check for hazards throughout each step of the lifting process. Although standardized safety procedures have reduced overall injury rates, the footage from the camera acts as a constant reminder to check for hazards before moving the equipment. By creating an additional visual check for the crane operator, safety cameras further prevent many operating errors that would otherwise go unseen.

The addition of a crane camera also improves worker productivity and prevents unnecessary damage to warehouse property or product. Crane operators employed by the customer have noted the ability to grab and deliver coils much more quickly. The safety cameras also make transporting processes more straightforward for operators. Using the camera, an operator can immediately see when the back foot is in or out of the coil and act accordingly. Operators can

also easily see and read the coil IDs using the cameras, improving efficiency of warehouse distribution and accelerating product transport processes. Finally, the footage provided by the cameras creates a visual reference that improves communication among workers. Thus, in addition to improved safety conditions for workers, steel companies have a significant financial incentive to install cameras.

Increasing Safety Ratings by 90% — Case studies emphasize the ability of safety cameras to improve ease of operating, provide full visuals at all times for the crane operator aid, improve efficiency, improve jobsite communication, and add safety checks throughout transport processes. One case study was performed using the HoistCam safety camera for performing a blind lift in the hull of a ship. The study cites an increase in safety ratings above 90% following installation of the cameras. Respondents credit the crane camera system for maximizing the efficiency of the unloading process by reducing the duration of the process from 9 hours to 4 hours. In other words, installing the safety camera resulted in a 55%+ increase in overall productivity and efficiency of the process. Another case study performed using the HoistCam equipment showed that installation of cameras improved the process for mounting and moving shipping containers. By using the cameras to precisely pin the container to the gantry crane, operators were able to quickly complete the process with fewer mistakes. Additionally, workers reported improved jobsite communication, as the video footage provides visual aids in addition to radio contact. As evidenced by these case studies, safety cameras result in better outcomes for both the company and their employees.

Best Practices Conclusion: Zero Incidents — The steel company studied in this report noted a marked change in workplace incidents following safety camera installation. “We have had zero incidents since installing and using our crane cameras,” says an electrical planner for the company. The client’s experience with this technology provides strong evidence that safety cameras are key in reaching the goal of zero accidents due to crane operating errors.

Any trolley of length greater than 30 feet long will require use of a high-end camera lens (9–20 mm in diameter), which can be easily upgraded to suit various functions. The zoom on this size of camera allows the operator to have a close-up visual of several areas at once. The visual on the equipment provided by the camera allows the operator to ensure coil stack stability. The added visibility also allows operators to confirm that workers are not in harm’s way before lifting or moving inventory. Installing a camera with a programmable control unit allows the operator to

switch quickly between multiple focal points at a job-site or on the crane.

The customer highly recommends crane cameras for using overhead cranes to lift and transport inventory. Crane safety cameras can provide not just an additional safety check for crane operators, but can improve efficiency and prevent any unnecessary damage to property. Safety cameras create a direct solution for the “blind spot” hazard that makes crane work in the steel industry so dangerous. Therefore, it is recommended that any warehouse using cranes to move hazardous products install these cameras to reduce inefficient use of the crane and limit unnecessary danger to employees.

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