

Innovative Warning Lights for Mobile Equipment and Overhead Cranes

Have you ever walked through a facility when suddenly a maintenance cart approached from behind without you being aware of it? Have you ever stepped around a blind corner and been startled by a piece of mobile equipment moving toward you? Everyone is busy these days, often multi-tasking and being in a hurry, which can distract an employee from serious hazards such as mobile equipment traffic. Audible alarms are great, but often serve as a general warning of equipment in the area. If you also consider how loud a steel mill can be, along with the continuous use of mobile equipment or overhead crane sirens throughout a workday, you can understand how workers may become immune to these audible alarms.

To increase pedestrians' awareness of mobile equipment movement, warning spotlights are being manufactured that will broadcast a spot on the floor 15 to 20 feet from the equipment to forewarn pedestrians of their approach. In 2014, Steel Dynamics Inc. – Flat Roll Group Columbus (SDI Columbus) began installing blue spotlights on forklifts and other mobile equipment operating within the mill to increase pedestrian awareness. The lights do not take the place of audible alarms, but they provide an additional visual warning that is very direct with respect to the proximity of the hazard. Additionally, forklifts typically do not have an audible alarm when moving forward, and with the high noise level in steel mills, SDI Columbus decided to install blue lights on the front and rear of forklifts to forewarn employees of their movement in either direction. The front light is continuously on when the forklift is running, and

the rear light is wired to activate when the equipment is placed in reverse. Recognizing the increased safety awareness and potential market, manufacturers are now creating various lights that can project a line on the floor to warn pedestrians of the danger area surrounding mobile equipment (i.e., forklifts, rotating equipment).

The positive employee feedback regarding the awareness of mobile equipment via the blue lights recently installed made us wonder if such a concept could be implemented on overhead cranes.

Although a well-known rule of looking up and locating cranes while walking through a steel mill exists, an employee focused on a task or deep in thought may not be aware of the overhead crane siren. The audible alarm serves more as a general caution to employees in the area, but requires employees to identify the hazard and assess if its proximity is in their immediate

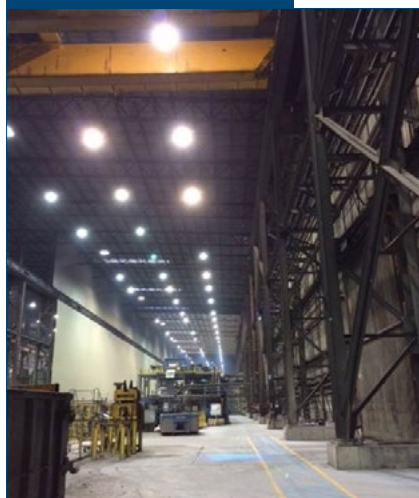
Hazards are ever-present in the steel plant environment, and a heightened awareness and emphasis on safety is a necessary priority for our industry. This monthly column, coordinated by members of the AIST Safety & Health Technology Committee, focuses on procedures and practices to promote a safe working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



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Figure 1



Blue 4 LED overhead crane spotlight at 80 feet trialed at Steel Dynamics Inc. – Flat Roll Group Columbus.

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.

danger zone or not. The movement of a light from an overhead crane will provide an actual and definitive warning to affected employees — those in the immediate area. Also, unlike audible warning sirens, which are dependent on the crane operator to activate, the spotlights are automatically on when the equipment is energized, thus reducing human error.

Unlike the blue lights on forklifts where the beam is projected 15 feet, producing a consistent and visible blue spot on the ground, SDI Columbus recognized the variable heights of our overhead cranes may be more challenging to find the correct LED light to produce a large, bright spot on the ground. SDI Columbus began to research options for overhead crane warning lights and learned that this concept is still fairly new, but manufacturers are engineering and developing LED lights to be used on overhead cranes to warn pedestrians of crane movement.

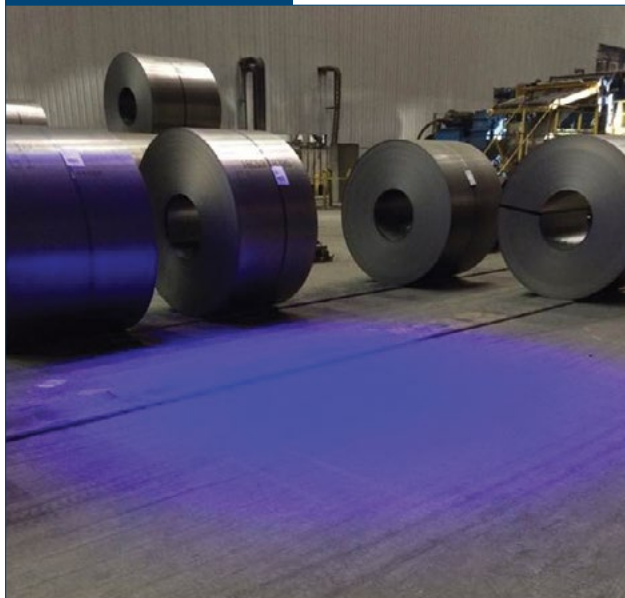
The first LED lights trialed on overhead cranes were those used on our mobile equipment — the 4 LED blue spotlight. The blue spotlight was installed on the bridge of an overhead crane at 65 feet and it created a 6-foot x 6-foot blue spot on the floor. After installing the blue light on the crane we realized it would be best for the lights on overhead cranes to

Figure 2



A red 24 LED light at 100 feet received positive comments from employees on the visibility of the light.

Figure 3



A blue 24 LED light trialed at 100 feet.

be different than the color of the lights used on the mobile equipment, so that workers could distinguish between the two. The only other color available in a focused beam spotlight was red. We purchased a red 4 LED spotlight from the same manufacturer as the mobile equipment light we already found success with and installed it on the same overhead crane at 65 feet. The crane's area of operation was well-lit, with halogen lights and natural sunlight coming from overhead doors. However, this particular red light produced a soft red color spot, which was more difficult to see on the floor and tended to fade when exposed to full natural sunlight.

To overcome the height of our taller cranes (100 feet plus) and produce a stronger spotlight on the ground, we purchased red and blue 24 LED lights designed to be used on overhead cranes as warning lights. These lights performed well from 100 feet, producing a bright 7-foot x 7-foot spot on the ground, but again, there was some fading of both the blue and red colors in areas illuminated by natural sunlight. After discussing the effect of natural sunlight on the intensity of both the blue and red lights with a distributor of high-powered LED lights, it was suggested to trial the color green. A 9 LED green light was built by the manufacturer to trial at 100 feet. The light produced a large pattern on the ground floor, but the intensity of the light was not as bright as the red or blue light in areas illuminated by natural or artificial lighting. After trialing a green light on a crane, we received quick feedback from our employees that they felt visibility was greater with the red light versus the green light. Considering the performance of the different colored lights and our employees' feedback, SDI Columbus has decided that the red light will best

Figure 4



The warning light can be angled out from the overhead crane to forewarn pedestrians of crane movements.

meet the needs of our facility. We encourage each facility interested in this technology to experiment with different types of colored lights in their facility to determine which light best meets their needs.

The overhead crane lights have been a positive complement to SDI Columbus' crane's audible warning siren. Should employees become distracted or complacent to the audible warnings of overhead cranes, a moving light on the floor will grab their attention and prevent them from unknowingly walking under a suspended load. The lights will be angled out from the bridge of a crane to warn workers of an approaching crane, with adjustable distances selected based on the area. Another option we may consider is installing lights on the trolley projecting straight down from the four corners of the trolley, thus creating a danger zone around a suspended load. Installing the lights on the trolley can also be beneficial to crane operators while they are picking up or setting a load down, as they do not have to take their eyes off the crane block or load to know the trolley is centered over the load.

SDI Columbus believes its effort to provide more awareness of overhead crane movement will result in fewer opportunities for employees to be in the wrong place at the wrong time, minimizing the potential of a preventable accident.

Acknowledgments

The author wishes to recognize the entire SDI Columbus crane maintenance team for their efforts in researching and implementing the overhead lighting trials featured in this article. ♦

Did You Know?

Swedish Energy Agency Supports Carbon-Dioxide-Free Ironmaking Project

The Swedish Energy Agency has decided to contribute SEK 6.7 million to support the pre-feasibility study in SSAB, LKAB and Vattenfall's joint initiative for carbon-dioxide-free ironmaking.

"We are delighted that the Swedish Energy Agency has chosen to support the pre-feasibility study in the initiative for carbon-dioxide-free ironmaking. The success of the project is not only important for the steel industry, but is also an important contribution to the drive to make Sweden fossil free by 2045," said SSAB's CEO and president, Martin Lindqvist.

The initiative is split into three phases beginning with a pre-feasibility study, which will analyze all the conditions and will continue until the end of 2017. This will be followed by a more concrete research and development program in a pilot study, which will last until 2024 before finally progressing to demonstration plant trials, which will continue until 2035.

In early April, SSAB, LKAB and Vattenfall announced their joint initiative to solve the carbon dioxide problem in the Swedish steel industry. By using hydrogen in the direct iron ore reduction process instead of blast furnaces using coal and coke as is the case today, the goal is to create a steelmaking process that releases water instead of carbon dioxide.

"This project could be the starting point of radical change in the Swedish steel industry. In the long run, it can mean Sweden becoming the first country in the world to use hydrogen in ironmaking on an industrial scale," said Klara Helstad, head of the Sustainable Energy Unit at the Swedish Energy Agency.

SSAB's existing production system is already one of the world's most efficient in terms of carbon dioxide emissions. Nevertheless, existing steelmaking technology means SSAB is Sweden's largest single source of carbon dioxide emissions. The success of the project will also mean a major contribution to a fossil-free Sweden.

With its specialized, innovative steel industry, access to fossil-free electricity and the highest quality iron ore in Europe, Sweden is uniquely placed for the initiative.

Nevertheless, completion of the project requires continued significant national contributions from the state, research institutes and universities over a period of 20–25 years.