On GUARD

Selecting and maintaining industrial barrier systems.

BY ANDY OLSON

Industrial facilities, storage warehouses and distribution centres can be dangerous places.

Safety challenges exist around every corner, from forklifts zipping around workers and materials to hazardous machining processes that need to be guarded. Injuries to workers or pedestrians can occur, products can be damaged and equipment can take punishment.

By regulation – and as a matter of good practice – facilities will often use a combination of visual cues and physical barriers as a safety solution in these risk-laden areas. In some instances, these barriers may simply separate pedestrian traffic from other internal vehicle traffic. In other facilities, barriers may be employed to keep people away from automated processes and machinery or to protect employees against falls. As evidenced by OSHA's final rule on Walking-Working Surfaces, selecting the right barrier will play an integral role in fall protection in the coming years. Barriers may also be used to protect production equipment and/or the building itself from vehicle damage.

Regardless of the application, all barriers play an important role in helping facilities operate safely and efficiently. While the industry standard of 10,000 lbs. at 4 m.p.h. (4,535.9 kg at 6.4 km/h) is a good starting point for selecting a barrier, more facility managers are beginning to look at two different forklift operating criteria – the weight of the load and the speed of the forklift – at various areas of the facility. An appropriate safety barrier can be selected after evaluating this detailed application criterion.

Once the correct barrier is selected, it's a good idea to maintain it as part of a planned maintenance program. Before getting into maintenance specifics, let's first take a look at barriers and the newest method facility managers are using in selecting the right one for their specific application.

Types of barriers

While painted yellow lines on facility floors to designate pedestrian walkways are common in industrial facilities, they are increasingly being augmented with physical barriers. These barriers add a vertical visual component and create a physical barricade between pedestrians and potential hazards, enhancing safety. And it's a good idea, considering workplace injuries in the United States accounted for nearly $190 billion in losses in 2011 according to the recent data in a report from the National Safety Council. The most recent statistics from the Association of Workers' Compensation Boards of Canada (AWCBC) report that in 2015, 852 workplace fatalities were recorded in Canada, while 232,629 claims were accepted for lost time due to a work-related injury or disease.

Safety barriers are typically used to separate workers and pedestrians from potentially hazardous operations or dangerous situations. In some applications, they are used to visually and physically define work zones on the plant floor in areas where industrial vehicles aren't typically present – including restricting access to loading docks and corridors where forklifts might be operating.

In heavy equipment operation zones, safety barriers are used even more frequently due to the increased risk. OSHA estimates there are approximately 110,000 forklift accidents every year, so the risk is certainly great. The barriers used in these applications are designed to absorb the energy of a vehicle impact, protecting plant personnel from potentially life-threatening injuries.

Safety barriers can also be applied to protect sensitive equipment or structural elements in a facility, saving repair costs and downtime.

Deflection power

Barriers absorb an impact by distributing the impact energy into the materials that comprise the barrier. As the barrier absorbs energy, the materials that comprise it elongate and the barrier deflects. During the impact, the barrier deforms elastically to the point at which energy reaches equilibrium.

After most impacts, the barrier returns to its original position. After a severe impact, the barrier may sustain permanent deformation. In more major impacts, the barrier might break or become inadequate to protect against future impacts. Before installing a barrier, the user must consider the maximum elastic deflection to ensure adequate protection of personnel and equipment.

Considerations when choosing a barrier

There are several considerations facility managers should keep in mind when considering in-plant barriers applications:

- What are the maximum gross loads and speeds of the material handling equipment expected to impact the barriers?
- Is there sufficient space to allow the barrier to sustain maximum deflection when impacted?
- Is repair or replacement acceptable after a barrier impact creates permanent deformation?
- Are barriers permanently installed or do they need to be removed on a regular basis?

The impact rating of a barrier is often difficult to define. Although OSHA's regulation 1910.23 *(Guarding floor and wall openings and holes)* defines requirements for pedestrian handrails, it does not address barriers designed to stop heavier loads than the 200-lb. standard it uses.

Many manufacturers rate industrial barriers on an antiquated standard – their ability to stop an impact of 10,000 lb at 4 m.p.h. While this rating provides a meaningful reference for a specific load at a specific speed, it fails to define several key variables:

- How is the barrier's performance affected as the mass of the impacting vehicle increases?
- How is the barrier's performance affected as the impacting vehicle's speed increases?
- How severely was the barrier damaged by the impact? Is replacement necessary?
- How much did the barrier deflect during impact? Did it stop the load soon enough to prevent injury or damage?

Barrier rating methodology

Because of these variables, a test methodology has been developed to quantify specific applications and determine barrier ratings in terms of total kinetic energy absorption, instead of one defined mass and speed.

It is centered on the formula for kinetic energy ($E_K = ½mv^2$, where m=mass [weight] and


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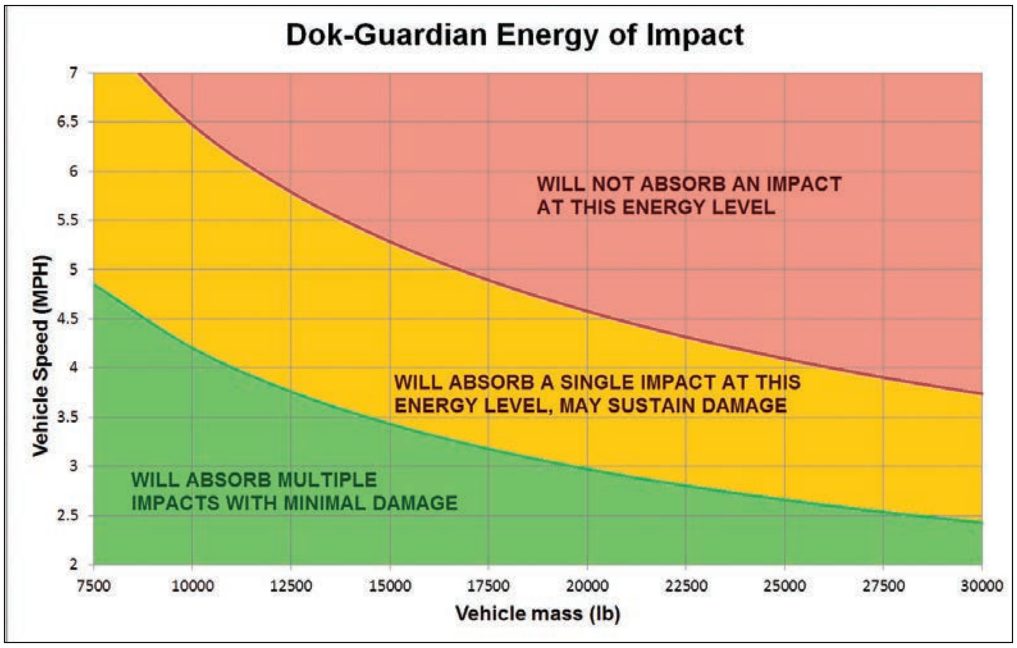

v=velocity), which takes into account both the weight and speed of the impacting object. Expressing the impact rating in terms of energy allows the user to understand the effects of various speeds and weights to determine a more appropriate barrier for their application than would be possible with a single speed and mass rating. Below is a kinetic energy chart used by some companies that manufacture loading dock barriers. The units shown are in Joules.

The chart separates the barrier's impact rating into three different areas. Note that differently rated barriers will have different kinetic energy charts.

The green area shows levels of testing where the barrier wasn't damaged and it is capable of being impacted again. For example, in the chart used above, a forklift weighing 17,500 lbs. (including the load its carrying) traveling at 3 m.p.h. is going to be able to hit a barrier with minimal damage to the barrier.

However, that same forklift traveling at 4 mph will fall into the chart's yellow area, which means the barrier will stop the load, but potentially sustain damage and might need repair or replacement.

The red area shows where the impact energy exceeds the barrier's maximum rating. In these cases, like if the 17,500-lb. forklift was traveling at 5 m.p.h., the impact from the vehicle cannot be fully absorbed and the barrier would not be able to stop the load – indicating that this barrier should not be used for this application.

If the heaviest forklift operating in the facility were 17,500 lbs. and the fastest speed it would be traveling where a barrier is being considered is 3 m.p.h., then the barrier would pass the BLAST. If a different area of the same facility regularly sees forklift traffic moving at 5 m.p.h., it would not pass the BLAST and a stronger barrier should be considered.

Barrier maintenance

After finding the right barrier, it's important to make that investment last. It's important to perform regular inspections to ensure it will continue to provide adequate safety for the application it was designed for.

For fixed or permanent barriers, best maintenance practices call for annual inspections of anchors and rail connections. If there is frequent impact, these inspections should take place more regularly. In the event of a significant impact, all parts of the barrier should be examined immediately.

When it comes to retractable or "moved" barriers, inspections should take place more frequently – every six months. The main indicators to look for include tearing in the curtain strap or bending in the metal (usually, steel) posts that house the fabric barrier. Be sure to check the sewing near the post, as well as the fasteners. If the sewing becomes frayed or there is significant damage to the mesh or strapping, the curtain should be replaced. Ensuring that the mounting anchors are firmly secured to the ground is also critical. Ongoing maintenance should include cleaning and lubrication for smooth rolling and unrolling of the curtain.

Planned maintenance

Planned maintenance programs (PMPs) offer a relatively inexpensive way to reduce an organization's dependence on internal maintenance staff. These programs typically cover a wide range of equipment and workspaces, from loading docks to internal hotspots. One benefit of a PMP is that it generally reduces costs associated with emergency repairs or workers' compensation claims.

Certified professionals who diagnose and repair safety equipment every day as part of a PMP can provide services that internal maintenance workers just don't have the expertise for. They can identify wear and tear on equipment before it suffers a catastrophic breakdown. After all, if a barrier fails, it re-introduces the safety hazard it was designed to minimize.

Benefits of PMPs

Following an initial survey to determine the state of the facility and what type of program is needed, PMP inspections can be scheduled monthly, quarterly, semi-annually, or yearly. A quarterly inspection is typical with most PMPs. Over time, the familiarity of the facility improves scheduling and increases the efficiency of maintenance inspections. Regular maintenance also maximizes the efficiency of the equipment. A well-lubricated retractable barrier is going to roll and unroll more efficiently and extend the life of the barrier curtain. Additionally, if an eßmergency does take place, a regularly scheduled, PMP-based technician can tend to the situation more quickly and affordably than one who is seeing the facility for the first time.

The bottom line

Safety barriers play an important role in virtually any industrial and commercial facility. Plant and safety managers are wise to look for the right barrier for their specific applications. While the old industry standard is a good starting point, using kinetic energy absorption is an even better model to follow.

Once the right barrier has been implemented, consider protecting the investment with a planned maintenance program. Not only can a PMP make quick fixes on compromised barriers and many other safety products, they can help identify possible problems well in advance. **MRO**

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