Dropsafe®

Drops Prevention Technology

EMPOWERING DROPS PREVENTION

A DROPSAFE HANDBOOK

CHAPTER THREE

DROPS PREVENTION BARRIER SYSTEMS IN POWER GENERATION

The previous chapter of Empowering Drops Prevention: A Dropsafe Handbook laid out the fundamental building blocks of a successful Drops prevention strategy in power generation.

This instalment will take a closer look at one of the core engineered Drops prevention solutions available to plant managers as they look to mitigate Drops at their facilities – safety barrier systems. To date, there has not been a detailed guide on the best practice applications of this technology in power generation.

DROPS Reliable Securing, which was originally developed for O&G but has now formed the basis for best practice across other industries, states:

"Safety barricades and mesh systems may be applied to reduce potential for items to fall through guard rails. These should be of suitable materials, incorporate appropriate securing features and be installed and maintained in accordance with manufacturer's recommendations."

To expand on this guidance, this chapter of the handbook will help plant and facility managers in power generation to identify the best barricade systems and show how they can be used most effectively as part of a broader Drops prevention programme.

WHAT IS A DROPS PREVENTION BARRICADE SYSTEM?

Drops prevention barrier systems attach along the inside of guardrailings on stairways, elevated walkways and raised working platforms, covering the gaps to prevent objects from falling through. These objects can include tools, handheld equipment, and loose fixtures or machinery components.

A robust barrier system will also prevent items that have dropped from potentially ricocheting further, by absorbing the force of a falling object. This is particularly important because items that drop can often ultimately strike a worker from unexpected directions.

CASE STUDY: DROPS INCIDENT

HAMMER KICKED FROM WORK BASKET

INCIDENT

A 2.3kg (5 lb) hammer falls 3 metres (10 ft) from an elevated work basket, where it strikes an employee on the hard hat. The hammer creates a pinch point between the hard hat and safety glasses thus resulting in a laceration below his left eyebrow.

CIRCUMSTANCES

An employee operates a work basket while using a shop hammer. He drops the hammer to the bottom of the work platform and whilst moving about the area to arrange the chain hoist, accidentally kicks the hammer through the railings.

IMPACT

Employees were reminded of the importance of tethering/securing any tools when working overhead, even when working in a work basket. Additionally, the work plan for operating in elevated work platforms must be reviewed to include the importance of keeping the lift basket orderly.

ANALYSIS

This incident could have also been prevented if a barrier system was installed on the work basket. In the case of the hammer being dropped to the floor, if kicked, it therefore wouldn't fall from the platform.

WHERE SHOULD BARRIERS BE INSTALLED?

There are four main Drops risk areas at power generation facilities where installing a barrier system is most effective: walkways, stairways, turbine guards and chimney stacks.

Walkways

Elevated walkways are high-risk Drops areas, due to large gaps between the guardrailings, and a high likelihood of personnel walking below. Walkways also serve as arteries for maintenance teams, who often carry untethered tools and equipment throughout the facility, creating Drops risks.

In power generation facilities, barrier systems are a crucial part of Drops prevention, as the walkways across power facilities are often extensive and will be placed over multiple levels.

Stairways

As a point of transition within a facility, a stairway presents a significant Drops risk. Additionally, when personnel are using stairways, they may carry tools or equipment in one hand while using one hand on the handrail, further increasing Drops risks.

Barrier systems should therefore be installed along the guardrailings at the sides of the stairs to prevent objects being dropped through. Where the gaps between steps are large, plant managers should also consider installing barriers on the underside of stairs.

Turbine and furnace guards

In thermal power plants, the turbines and furnaces are often surrounded with guardrailings. If an object falls through these and damages vital components, it can have significant financial implications for the facility. Additionally, if a tool is dropped next to the turbine, it may be unsafe to retrieve, causing disruption to tight work schedules. A barrier system will help to mitigate these risks. Also high traffic areas during maintenance and turnaround periods.

Storage tanks and chimney stacks

Although the layout differs depending on the facility type, power generation plants often store fuel in large storage tanks. Along with chimneys, the height of these structures makes even small objects potentially life-threatening if dropped or dislodged. Plant managers can mitigate this risk by installing a barrier system. For an illustration of how Drops risks increase with height, please see the first chapter of this handbook here.

The correct installation of a barrier system is vital, but what characteristics need to be considered when choosing a barrier?

KEY ATTRIBUTES OF A BEST PRACTICE DROPS PREVENTION BARRIER SYSTEM

Commonly adopted solutions in power generation include **flexible mesh netting**, **plywood**, **bolted metal fencing** and **modular polymer barriers**. Each of these products can be used effectively in specific circumstances, but not all of them are appropriate for long-term use, depending on the conditions in which they are being deployed.

The following section will provide a breakdown of key benefits of leading barrier solutions available to power generation plant managers.

FLEXIBLE MESH NETTING

Flexible mesh netting is constructed out of connected strands of fibre or other flexible or ductile materials, often PVC, and attached to rails on walkways at height.

Benefits

- Fast installation requiring limited tools
- Minimal number of attaching components
- Can be attached to any structure regardless of shape
- Readily available with limited procurement time
- Low upfront cost

Flexible mesh netting is widely used due to its low cost, ease of installation and versatility. Although not ideally suited for use as a long-term solution when compared to more durable or hard-wearing alternatives, flexible mesh netting remains a popular choice at power generation facilities.

Sustainability

Flexible mesh PVC netting is an ideal solution for short-term, temporary installations in facilities. Its flexibility and speedy installation is somewhat overshadowed by its poor durability. Not able to withstand harsh weather conditions or high levels of impact makes PVC a weaker option for a drops prevention barrier when compared to alternatives. The short-term usage plays a big part in its low level of sustainability; it requires regular replacement due to damage, resulting in huge amounts of industrial waste. PVC netting can also not be recycled, due to the mixture of toxic chemicals used in its manufacturing. Of the four most popular barrier options, flexible mesh netting has the lowest level of sustainability.

Sustainability rating

Plywood is easy to procure, low cost and can be modified to cover most structures. The low upfront cost of the solution must be balanced with its higher installation costs and long-term replacement costs.

PLYWOOD

Plywood panels, attached to guardrailing, is more commonly deployed within the onshore oil & gas sector as drops prevention. While somewhat challenging to install, it is a commonly used solution due to it's impact strength.

Benefits

- Readily available with limited procurement time
- Can be cut to exact sizes to fit non-standard guardrailings
- Low upfront cost (although not as low as flexible mesh netting)

Sustainability

Plywood is commonly used for longer-term, temporary installs. It also takes significantly longer to install, requiring the use of power tools such as drills to affix the plywood sheets to the guardrailing. While more hardwearing than flexible PVC, when removed plywood creates a significant amount of industrial waste. It does, however, remain installed for longer and is more durable, requiring little to no replacement during it's install period. While regular plywood can usually be recycled, plywood used on worksites is often treated with paint or chemicals to make it fire-retardant, non-slip, waterproof, or generally longer lasting. This makes recycling rarely a realistic option, therefore it is less sustainable than flexible mesh netting and results in high levels of industrial waste.

Sustainability rating

BOLTED METAL FENCING

Bolted metal barricades are typically made of alloys or steel mesh, and can be attached to handrails using specific mounting brackets or welded in place. Some systems are corrosion-resistent, using either galvanised steel or paint, however, they can still require ongoing maintenance. While strong compared to PVC netting, their large aperture can allow smaller objects and debris to fall through.

Benefits

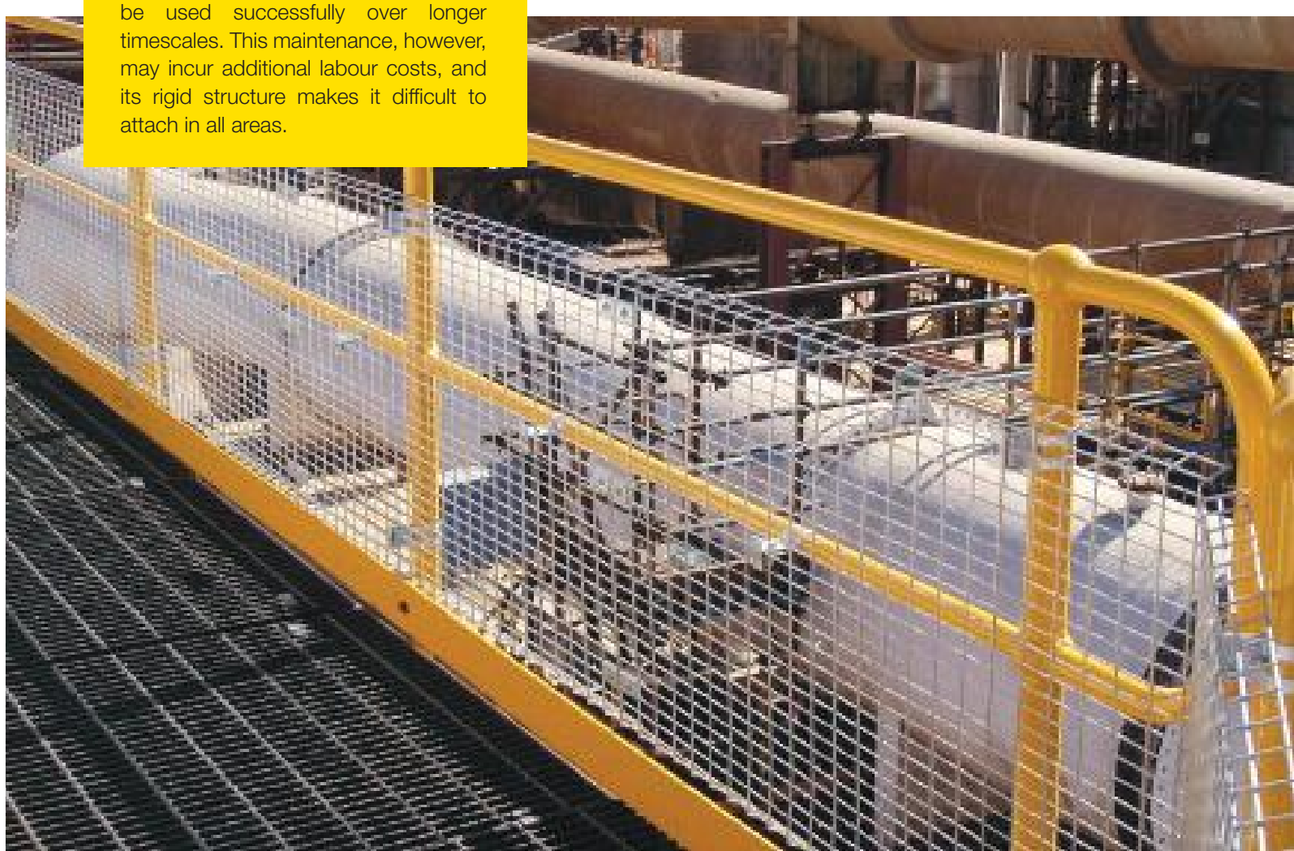
- Long lifespan if maintained effectively
- High impact, heat, and fire resistance rating
- Wide operational temperature range

Bolted metal fencing is one of the most robust solutions, with high impact and heat resistance. When maintained regularly, bolted metal fencing can be used successfully over longer timescales. This maintenance, however, may incur additional labour costs, and its rigid structure makes it difficult to attach in all areas.

Sustainability

Bolted metal fencing requires a significant effort and specific skills to install. Some systems use mounting brackets, however, hot works is often required; therefore, the whole process takes longer than any other barrier option. It is, however, intended for a more permanent installation, lasting for a number of years. Metal fencing is hardwearing and very durable. It also requires maintenance to prevent rust or other corrosion, but on the whole is sturdy, withstanding impacts, extreme weather conditions and the test of time. Furthermore, when bolted metal barriers are uninstalled at the end of their life, they are recyclable. This lack of industrial waste makes this a very sustainable option.

Sustainability rating



MODULAR POLYMER BARRIERS

Modular polymer (plastic) fencing systems can be installed on various configurations of handrailing. Polymer barriers are available in a range of specifications, with different levels of resistance to environmental parameters.

Benefits

- Minimal tools required for installation, with no 'hot works'
- Minimal Drops risks during installation due to limited components
- Easy removal and reinstallation
- High resistance to impacts, heat, wind, and chemicals

Polymer barrier systems are easy to install, maintain and redeploy. With high resistance to impacts and adverse environmental conditions, the solution is a common choice for power generation facility managers. The upfront cost of certain polymer barrier solutions can, however, be high and depending on region, delivery times may be longer than non-specialist solutions.

Sustainability

Modular polymer barriers are also intended as a long-term solution, but due to the ease and speed of installation (which requires neither tools nor hot works) can often be uninstalled and redeployed. The quality of polymer systems does need to be considered; weaker options are often not tested, while stronger, more robust options are designed for long periods of use (often 10+ years). Those that are designed to be permanent are strong enough to withstand harsh conditions and impacts, requiring little (if any) maintenance or replacement. Modular polymer barrier solutions are usually fully recyclable, eliminating industrial waste, offering another sustainable barrier solution.

Sustainability rating

CASE STUDY: POWER GENERATION

What does a successful barrier roll-out look like in power generation? The following case study outlines how one facility owner was able to mitigate Drops risks across their facility with a barrier system.

Challenge

At one of Asia's largest coal-fired power stations, which generates over 4,000 MW, there are eight separate generating units, each of which has its own furnace and boiler. These units are on a rolling maintenance programme, which sees no more than two shut down at any one time to maintain consistent production.

Conducting essential routine maintenance at this plant is resource intensive and involves the deployment of specialist technicians, many of whom work at height in the vicinity of critical infrastructure. During maintenance periods, mitigating the dual risk to personnel and equipment posed by Dropped Objects (Drops) from walkways and stairwells was a core concern for the plant's operators.

Solution

A polymer barrier system was installed to mitigate Drops risks during essential maintenance operations - with technicians working at height to conduct vital inspections and repairs on furnaces and boilers.

Initially, enough barrier was installed to safeguard two out of a total of eight furnaces on site. Following the success of this initial installation, the system has now been rolled out across the whole facility.

Drivers

Universal attachment system

Easily attached and removed using a universal mechanism, the barrier was installed quickly, reducing installation time and costs. When conducting such a large-scale rollout, ease of installation was a crucial factor for the facilities maintenance teams, requiring minimal training and saving time.

Installation cost

This versatility ensured that installation costs were minimized, as the plant's engineering and maintenance provider installed the barrier in a timely and cost-effective manner.

Manufacturing quality

The certified manufacturing quality of the barrier system gave the facility owners confidence they had invested in a long-term, effective safety solution. The barrier was engineered from high-grade polymer, which is robust, but lightweight.

Outcome

The barrier system was easily installed, reducing the overall time and resource required and ensuring safety of personnel.

The facility's owner is well-placed to comprehensively mitigate the risk of dropped objects during maintenance, and in doing so, will set a benchmark amongst power generation businesses with its robust approach to tackling one of the major safety risks to the industry.

Installing a robust Barrier system is one of the primary lines of defence against Drops in a power generation facility. But another key pillar of a best practice approach to Drops prevention in the sector is tool tethering.

The fourth chapter of 'Empowering Drops Prevention: A Dropsafe Handbook', drawing on the expertise of Stopdrop Tooling, will therefore guide power generation facility managers on how tool tethering solutions can reduce Drops incidents and save lives.