LANTERN

WHITEPAPER

IMPROVING WORKER SAFETY & PRODUCTIVITY IN HARSH & HAZARDOUS AREAS

A closer look at the conditions of harsh and hazardous environments and what needs to be considered when designing safety solutions for these extreme areas.



Version 1.0 | April 2020

According to estimates in 2017 by the International Labour Organization (ILO), around 380,000 workers die from occupational accidents around the world every year.

[source: ILO][1]

Workers' safety is of utmost importance in any environment but is absolutely critical when they are working in harsh and hazardous areas. Workers in these environments face added dangers and unpredictable conditions, which can put their safety in jeopardy in emergency situations, further exacerbated if they are in remote locations which have low connectivity and are hard to reach.

Positioning solutions were created to help companies oversee movements of their workers and ensure their safety, but existing systems face multiple environmental and connectivity challenges which means they have limited functionality, are expensive and are difficult to deploy.

What is a harsh environment?

Harsh environments generally refer to places that have more extreme and challenging physical conditions.



Temperature

Extremely high or low temperatures – some components do not function out of a fixed temperature range. Rapidly changing temperatures can cause thermal fatigue and mechanical stress. Large temperature ranges and fluctuations can cause components to work inconsistently



Humidity

High humidity can cause the alteration of component's characteristics. Condensing humidity or condensation can cause short circuits.



Corrosion

Sea spray and salt fogs corrode connectors, circuit boards and short circuit components when salt bridges from dried saltwater form, while Hydrogen Sulfide corrodes printed circuit boards.



Exposure

Radiant heating from the sun causes equipment to overheat, while Ultraviolet light exposure can weaken materials over time



Animals and Insects

Electronics attracts nest and mound-building insects nests on equipment reduce cooling ability and may cause short circuits. Vermin may gnaw and destroy cable.



Dust

Accumulated dust in the environment reduces cooling ability and causes possible short circuits and fires



High Altitudes

Ambient atmosphere is less dense at altitude and reduces cooling ability, resulting in potential equipment overheating



Vibration or Shock

Vibrations in moving machinery cause equipment fatigue resulting in mechanical and electrical failures. Physical shock can happen from sudden impact and collisions



Electromagnetic Interference

EMI from nearby radio sources or welding equipment may cause unpredictable equipment operation or component failures



Noisy Electrical Power

Unfiltered and poorly regulated power from generators causes equipment stress and premature failure



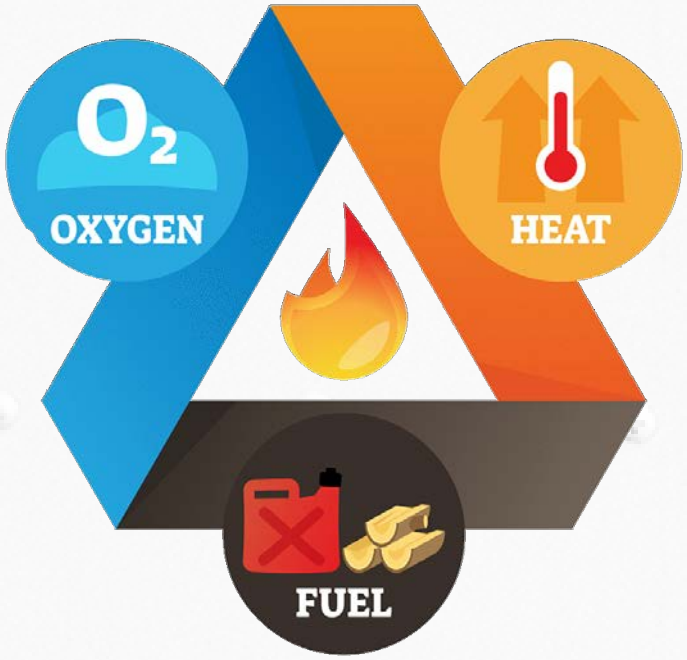
Precipitation

Rain, snow, ice, and sleet all have the potential to cause short circuits, while hail may also cause mechanical damage and shock.

What is a hazardous environment?

Hazardous environments are more dangerous than harsh environments as these areas are potentially explosive. Explosions are a result of three elements coming together:

Oxygen is required for an explosive atmosphere



Heat or something as small as a spark to ignite the explosion

Fuel or combustible materials in adequate concentrations

Photo credit: Vectormine/Shutterstock.com

Hazardous areas typically contain potentially ignitable concentrations of combustible substances like gases, vapors, dust or flyings, and when combined with ignition sources such as a hot surface on a running engine, an arcing wire, or even a discharge of static electricity create an explosion.

The European Union uses the Atmospheric Explosives Directive (ATEX) to regulate health and safety in hazardous areas and uses a zoning system to define how hazardous an area is through the frequency and duration of the occurrence of an explosive atmosphere.

[Source: EUR-Lex][2]

Zone 0
An area in which an explosive gas atmosphere is present continuously or for long periods

Zone 1
An area in which an explosive gas atmosphere is likely to occur in normal operation

Zone 2
An area in which an explosive gas atmosphere is not likely to occur in normal operation, and it if occurs, will only exist for a short time

Some common hazardous industries include petroleum refineries, oil and gas refineries and drilling, specialty chemical plants, cement, pharmaceutical, paper and plastic plants, as well as mines.

Designing safety and productivity solutions for harsh and hazardous areas

Given the challenging physical conditions, here are some key requirements needed for solutions in these areas to reduce safety risks and costly overheads.

Robust and reliable design

Solutions in these areas require purpose-built rugged equipment with robust materials and intelligent design features made to withstand the tough conditions and a reduced need to replace or fix frequently. For electrical equipment, products are specifically designed to greatly reduce the risk of igniting a flammable atmosphere in a hazardous area.

For example, the Lantern Positioning System has a tag that relies on the intrinsic safety protection method. This means that it is designed with a specific conductive polymer to prevent static discharge and has redundant safety components to ensure reliable and safe operation.

Easy to install and optimized for remote management

A streamlined, compact solution that is easy to install would reduce the need to deploy teams of specialists just for setup and maintenance. Solutions that are less reliant on specific connectivity that can be easily accessed remotely for updates and maintenance from anywhere in the world further increases the ease of management without the need to have a team physically on site.

Allowing for flexibility and growth

In this age where technology advances so quickly, complex customized solutions can become obsolete just as quickly, and it can be difficult and costly to completely overhaul or replace a system when that happens. Systems and solutions built on open and scalable platforms allow for easy customization that can grow and evolve with your company's needs.



Photo credit: Mohamad Baihaki/Shutterstock.com

Existing solutions are inadequate for harsh and hazardous areas

Considering the above, existing positioning solutions in the market today are inadequate, especially for the unique needs of harsh and hazardous areas.

Mostly manual procedures

Muster drills on most work sites remain a surprisingly manual exercise where heads are physically counted and matched against paper lists in a roll call, and any missing personnel have to be located. The precious time taken to manually solve issues and locate personnel could mean the difference between life and death in a true emergency situation.

In addition, while these drills are necessary, they are a very tedious and time-consuming part of any worker's day, taking up otherwise productive time when they are run.

Not built rugged

While technology does exist to help augment workplace health and safety today, most of the hardware in the market is not designed to withstand the extreme conditions that harsh and hazardous areas face.

Equipment for harsh and hazardous areas is required to be more resilient to hold up against the elements and requires specialized knowledge to design to ensure that stringent safety standards are met. Consequently, such solutions are more expensive to produce and resulting in less options available on the market. Often, the common solution for users is to place existing non-hazardous area rated products and encase them in flameproof enclosures. While this method does enable hazardous area operations, the end result is expensive and cumbersome. There are also a number of restrictions with this method that can lead to costly errors during the certification process.

Connectivity is another common issue faced by industries located in remote harsh and hazardous areas as many positioning solutions are dependent on specific connectivity requirements. GPS-based systems for example are problematic in areas that are underground or GPS-denied, while RFID based systems often cannot deal with high device density where a large number of devices are concentrated in a small area.

High costs

In addition, implementing positioning systems can require a significant investment of time and money. Existing solutions in the market tend to be specialized, complex systems that often take a long time to install and deploy. These systems are often purpose-built and require specialists with thorough training to implement, a difficult proposition for smaller companies without the resources.

Lantern Positioning is a safety solution built for harsh and hazardous areas

LanternEdge looked at the challenges faced by the industry in the creation of Lantern Positioning, a positioning solution designed to eliminate the inefficiencies and manual effort of current personnel management with near real time location of workers. This allows for the measuring and monitoring of worker's locations as well as controlling deployment and worker occupancy, helping ensure the safety and productivity of workers.

The LanternEdge solution leverages open and scalable technologies to reduce costs and overheads, improving safety and productivity even in the toughest industrial environments. Lantern Positioning consists of rugged hardware with ATEX and IECEx certification standards, coupled with cloud-native applications, distributed cloud and advanced analytics at the edge of operations.



References
1 International Labour Organization, 2019. *Safety and health and the heart of the future of work. builging on 100 years of experience.* Available at https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/publication/wcms_686645.pdf
2 *Directive 1999/92/EC Of the European Parliament and of the council of 16 December 1999 on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres (15th individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC).* Available at https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2000:023:0057:0064:en:PDF

For more information about Lantern Positioning, contact us at partnerwithus@lanternedge.com

LANTERNEDGE

Technologies to enable intelligence in harsh and hazardous environments

Copyright © 2020 LanternEdge Pte Ltd. All Rights Reserved.