THE NEED FOR A WELL-EQUIPPED SAFETY SHOWER AND EYE WASH STATION

A Honeywell White Paper
Abstract

Safety shower and eye wash stations act as a first aid station for emergency use when a person is exposed to harmful and corrosive materials or chemicals. Access to such equipment offers a chance to rinse away the harmful substances, greatly minimizing the injury or injuries that could result from the exposure.

Facilities or industries likely to require a safety shower and eye wash station include:

- Oil and petroleum refineries
- Hazardous chemical storage facilities
- Battery charging facilities
- High-dust environments like grain elevators
- University and high-school laboratories
- Hazardous waste disposal areas

People working in the above-mentioned facilities and industries have to deal with hazards and harmful substances each and every day of the work week. These workers are provided very comprehensive and thorough training on how to do their daily jobs by industry experts. But we must not overlook “human error”. Some of the causes that can lead to human error are: Maybe an individual did not follow certain operating protocols and procedures to implement a task or maybe an individual did not wear the proper protective gear. Simply put, no amount of training can eliminate human error. Otherwise, there would be no accidents in these types of hazardous environments, which is definitely not the case. As a matter of fact, it does not matter how many precautions have been taken or how much training has been provided – accidents can still happen.

Fortunately, Honeywell has a wireless solution that can be very easily implemented in a safety shower and eye wash station. Some of the key features of the solution are:

- Implements an alarm system so that people within the vicinity of the safety station, including the plant manager, are immediately notified when the safety station gets activated
- Implements an electronic monitoring system, which enables data logging
- Provides connectivity to intelligent devices such as Programmable Logic Controllers (PLCs), Human Machine Interfaces (HMIs), servers, etc.
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Introduction

Over the decades safety shower and eye wash stations have become a common fixture in industrial and chemical landscapes. However, few operators of chemical laboratories or industrial plants give adequate attention to these safety stations, and the vast majority of safety stations are not alarmed or monitored.

Ignoring safety stations in facilities dealing with hazardous chemicals or materials can be very risky for worker safety, legal liability and meeting regulatory requirements. The lack of an alarm creates an unsafe environment for workers who will need immediate help if exposed to hazardous chemicals – and, potentially, this could lead to legal liability for the plant operator and company. Without monitoring, it is difficult to ensure or show that the safety station is fully functional and appropriately used, has been tested periodically and is in compliance with federal safety regulations, such as those from the Occupational Safety and Health Administration (OSHA) and The American National Standards Institute (ANSI).

OSHA has adopted several regulations that refer to the use of emergency eye wash and safety shower equipment stations. The primary regulation is contained in 29 CFR 1910.151, which requires that, “where the eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.”1 However, OSHA regulations are often vague – for example, they do not offer specific guidelines about what constitutes “suitable facilities” for drenching the eyes or body nor do they provide guidelines for design, certification, installation, testing and maintenance of these safety stations. More specific guidance can be found, however, from ANSI, which has established standards covering emergency eye wash and shower equipment, and offers guidelines in the ANSI/ISEA Z358.1, “Emergency Eye Wash and Shower Equipment” compliance checklist.2,3,4

4. Please refer to the OSHA website (www.osha.gov) and ANSI website (www.ansi.org) for more information on the standards and regulations.
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The Current Lack of Alarm and Monitoring Systems

We have seen that for decades, OSHA regulations have required safety shower and eye wash stations. From industrial facilities to university and high-school laboratories, they are everywhere. But we also have noted the fact that many of these facilities give minimal attention to OSHA’s compliance regulations.

We will explore the reasons for this predicament, and the troubling implications it has for worker safety and company liability.

Alarm Systems Are Not Required.

OSHA regulations specify where and when emergency safety shower and eye wash stations must be available, but they are vague about what these facilities should offer or how they should be installed. For instance, while OSHA highly recommends that safety showers and eye wash stations be equipped with alarm systems, it is not required – with the result that 9 out of 10 stations at most plants do not have an alarm system. An alarm system typically consists of audible alarms or flashing lights that can alert plant management and other personnel when and where the safety station has been activated. The lack of an alarm creates unsafe conditions for workers, especially those who work in remote and isolated areas. Even with advanced engineering controls and safety precautions, accidental hazardous chemical exposures can still occur. For workers exposed to a leak or spill of hazardous chemicals who need emergency assistance, a quick response is often necessary to minimize or avoid potential injuries. Without alarms, unless someone else at the facility happened to actually see the accident, help may arrive too late, if at all. Injured workers who are unable to call for help because they are isolated or incapacitated by harmful chemical exposure are especially vulnerable to the lack of an alarm system.

Similarly, few safety shower and eye wash stations are electronically monitored. Based on research, it has been found that fewer than two in 10 original equipment manufacturers (OEMs) monitor their safety shower and eye wash stations.

Not monitoring safety stations means that many operators don’t know when, where or even if one of their safety stations has been activated. As a result, the operators will have a difficult time determining if the safety station has been used for a legitimate reason or not. For instance, a university will not know whether students or others are using a safety shower to wash hands or boots or for some other inappropriate purpose. These are the typical issues that can be addressed properly with the help of an electronic monitoring system.

Furthermore, the absence of monitoring systems in a safety station might make it difficult for an operator to determine when the last time a particular station was used. According to ANSI and OSHA regulations and standards, facility operators are required to activate a safety shower and eye wash station every month and perform a complete inspection once a year. Testing often consists of pulling the shower head and then writing down the date of the test on a piece of paper – there is no central database for this information. In turn, this means that companies do not know if and when showers have been inspected unless they have someone go to each shower to read the paper inspection tab. As a result, it is not unusual for safety shower and eye wash stations to fail to meet minimum compliance standards, including safety stations not functioning effectively.

An electronic monitoring system would automate the system, enable data logging, document test results, exact times of incidents and number of usages, store the data in a database or on a server and transmit the data to any desired location over a wireless network. In this way, Honeywell’s wireless products and technology provide convenience and further enhance the safety and reliability of safety stations.
The Need for a Well-Equipped Safety Shower and Eye Wash Station

The Honeywell Wireless Solution

In many cases, the plant managers overlook safety stations because they do not have a cost-effective way to monitor them. Many of these facilities are decades old, and as such, are likely to be difficult and expensive to retrofit with a hard-wired safety equipment detection system.

Honeywell has introduced Limitless™ Wireless Switches to help facility operators to cost-effectively monitor a variety of safety equipment, including safety shower and eye wash stations – and activate an alarm system when the station is used. This wireless system is easy to install and maintain, can reduce maintenance costs on safety equipment, help facilities stay in compliance with federal safety regulations and help prevent or minimize injuries.

What the Honeywell Wireless Solution Offers Over Hard-Wired Systems

Although electronic systems with alarm and monitoring capabilities for safety stations have been around for years, these are generally hard-wired systems. Let us take a look at a couple of real-life scenarios that clearly distinguish between a wired versus a wireless solution for a safety station.

Scenario A

Typically, wired systems are difficult and costly to install. Pulling wires and cables from an isolated safety station to a central dispatch area can be difficult and expensive, especially in an older facility, often requiring many hours of an electrician’s time. Sometimes, there are no power sources available in these isolated safety stations, requiring a new power source to be installed to connect the safety station.

Honeywell Limitless Wireless Switches do not require any wiring or electrical connectors, such as junction boxes and conduits. One set of over-the-counter batteries has the ability to power the switches all year. The wireless system operates on a 2.4 GHz globally license-free ISM band that consumes minimal power, thereby extending battery life. Furthermore, the 2.4 GHz band has low susceptibility to moisture.
The wireless system maintains a strong RF signal as long as the Limitless Wireless Switch is within 1,000 feet of the wireless receiver module, with an unobstructed line of sight between the two. If necessary, the signal strength can be improved by using higher gain antennas that come in decibels ranging from 2 to 8 dBi.

Monitoring Points

Monitoring points for a Honeywell safety shower and eye wash station without any wire/cable

Scenario B

In most wired systems, the water valves in the safety stations are electrically connected to alarms or buzzers in central dispatch areas to alert the appropriate authorities when the safety station has been activated. Essentially, as water flows through the pipe, it activates a switch which in turn sounds an alarm or a buzzer. If the water source is cut off – for instance, if the pipes are frozen – then the alarm will not go off.

On the contrary, Honeywell Limitless Wireless Switches are installed on the mechanical linkage of the shower pull–chain. Whenever the chain is pulled, the motion activates the lever of the actuator head assembly of the wireless switch (see the figure at right). The wireless circuitry of the switch will then convert the actuation point into a digital signal that is then transmitted to a wireless receiver module located in another area.

Monitoring shower valves with mechanical linkage

Monitoring eye wash valves with mechanical linkage
Similarly, it is also possible to monitor valves in pipes with mechanical linkage, detecting if there is an actual flow of water through a pipe or not. This information is valuable in order to meet mandatory periodic testing of these safety stations as required by OSHA and ANSI safety regulations and standards.

As a result, regardless of what happens with the water, the wireless system will send the alarm and give the exact location of the safety station that has been activated.

Two Types of Wireless Receiver Modules

Honeywell provides two types of wireless receiver modules: the WMPR series with Ethernet IP output and the WDRR series with hard-wired digital output. Depending on the existing control system in a plant, it is possible to use either the hard-wired digital signal or Ethernet IP signal to activate an alarm to alert the appropriate authorities.

Even though other wireless systems besides Honeywell Limitless Switches are also available, they tend to cost significantly more because they require professional installation and sometimes are integrated into a mesh wireless network with built-in redundancy – that is, if a signal is lost due to a poor RF link between the receiver and a sensor, the signal will jump to another sensor to get to the receiver module. In these types of mesh wireless networks, each of the sensors has the ability to talk to each other as well as to the receiver. So, poor RF signal quality due to temporary obstacles in the line of sight or excessive moisture in the facility may result in the signal hopping around from one sensor to the other to get to its receiver. These situations may cause unnecessary transmission delays and if the particular receiver is connected to a host controller device such as a PLC or HMI, unwanted communication timeout errors may occur.

Honeywell receiver modules (WMPR series and WDRR series) can also be connected to any host controller device or fieldbus coupler device that has Ethernet IP as the communication protocol. Each of the receiver modules can support up to 14 Limitless Wireless Switches.
WMPR Receiver

The WMPR receiver has Ethernet IP as its communication protocol, enabling it to transmit all relevant information, such as nodes I/O Status (both digital and analog), unit types of analog signals, battery level indication, radio frequency signal strength, radio transmit power type, field device type, radio transmitter type, sensor update rate and IP address, through the Ethernet IP output. It has a standard RJ45 Ethernet port, which needs to be connected to the RJ45 port of the fieldbus coupler through a Cat5e (twisted pair) or Cat 6 (standard) Ethernet cable to establish communication between the two devices.

In order to display the data in a host controller such as a PLC or HMI that has Modbus TCP/IP protocol, the fieldbus coupler must be connected to the host controller via a Cat5e or Cat 6 (standard) Ethernet cable.

Note: For more technical information, please refer to the product web page:

WMPR
https://sensing.honeywell.com/limitless-wmpr-multi-protocol-receiver

WDRR
https://sensing.honeywell.com/limitless-wdrr-din-rail-receivers

Typical system layout for the WMPR series

Connection scheme for WMPR receiver module
**WDRR Receiver**

The WDRR Series is a reliable din-rail or panel-mountable wireless receiver that can accept 14 digital signals (PNP or NPN type) from Limitless Wireless Switches. The WDRR receiver sends the digital signals that indicate the switch’s status (i.e., whether the switch is open or closed) to a host controller device that has physical I/O modules such as a PLC, DCS and SCADA. It indicates when an RF communication is lost or a battery’s voltage is low.

Once the WDRR receiver obtains the status of the digital inputs of the Limitless Switches, the information will be replicated in the WDRR’s output terminals. The output terminals of the WDRR receiver then must be wired to individual input terminals on the WAGO or Beckhoff fieldbus coupler.

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**Note:** For more technical information, please refer to the product web page:

**WMPR**
https://sensing.honeywell.com/limitless-wmpr-multi-protocol-receiver

**WDRR**
https://sensing.honeywell.com/limitless-wdrr-din-rail-receivers

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**Typical system layout for the WDRR series**

**Connection scheme for WDRR receiver module**

These features and technology make Honeywell wireless products very cost-effective as well as reliable, enabling engineers and other personnel to spend less time surveying a plant and more time addressing other critical tasks.
Benefits of Honeywell
Limitless Wireless Solutions

- Receivers
  - WMPR
  - WDRR

- Sensors
  - WPS

- Switches
  - WGLA
  - WBX
  - WLS
  - WOI

- Cost-effective because there are minimal retrofit, plumbing, wiring or electrician labor costs.

- The 2.4 GHz frequency band is less susceptible to rain, sleet, moisture, snow and dust.

- Uses a 16-bit PAN (network) ID, 16-bit address and 128-bit AES security key, which virtually eliminates the possibility of cross-talk or hacking.

- Antennas with gains ranging from 2 dBi to 8 dBi are available to improve the signal strength quality between the wireless units.

- Can operate as a stand-alone system or be easily integrated into an existing control system with Ethernet IP protocol.

- Switches are battery-powered, which provides more flexibility in choosing the best location for installing the safety station.

- More diagnostics and system data available from the receiver modules enhance incident reporting and industry compliance.

- Standard options lead to easy maintenance with generally available replacement options.

For more product specific information, please refer to the wireless section of the Honeywell website, sensing.honeywell.com.
Conclusion

By sending an alarm when a safety station is used, a wireless system such as Honeywell Limitless Wireless Switches protects workers by initiating an emergency response whenever a worker is exposed to hazardous substances. The Limitless Wireless Switches system also keeps detailed records of when the stations were used, tested and maintained.

The wireless system allows the operator to determine which shower was activated and de-activated at what times. For instance, if an employee or student is exposed to hazardous substances, federal regulators require they use the shower for not less than 15 minutes. By tracking how long the shower was used, the wireless system helps the operator ensure compliance and employee safety.

With wireless sensors, facility operators can verify that all safety showers are checked and time-stamped as to when the test took place. The central records of which stations are being used are able to tip off administrators that a particular safety station is often used, which may be a sign of inappropriate use or abuse. The alarms will also discourage inappropriate use, or vandalism, of safety stations.

By logging that the necessary servicing and shower flushing activities required under federal standards have been performed, the Limitless Wireless Switches system also helps to document the plant’s legal responsibility for health and safety.

The Honeywell wireless safety system provides an attractive, cost-effective solution to older sites where wired systems would be particularly difficult to install. It also makes sense for new buildings or as a complementary system in a building that already has a wired system.

Wireless safety systems like Honeywell’s not only reduce costs, but also help facilities remain in compliance with federal regulations and protect their workers in case of exposure to hazardous substances.