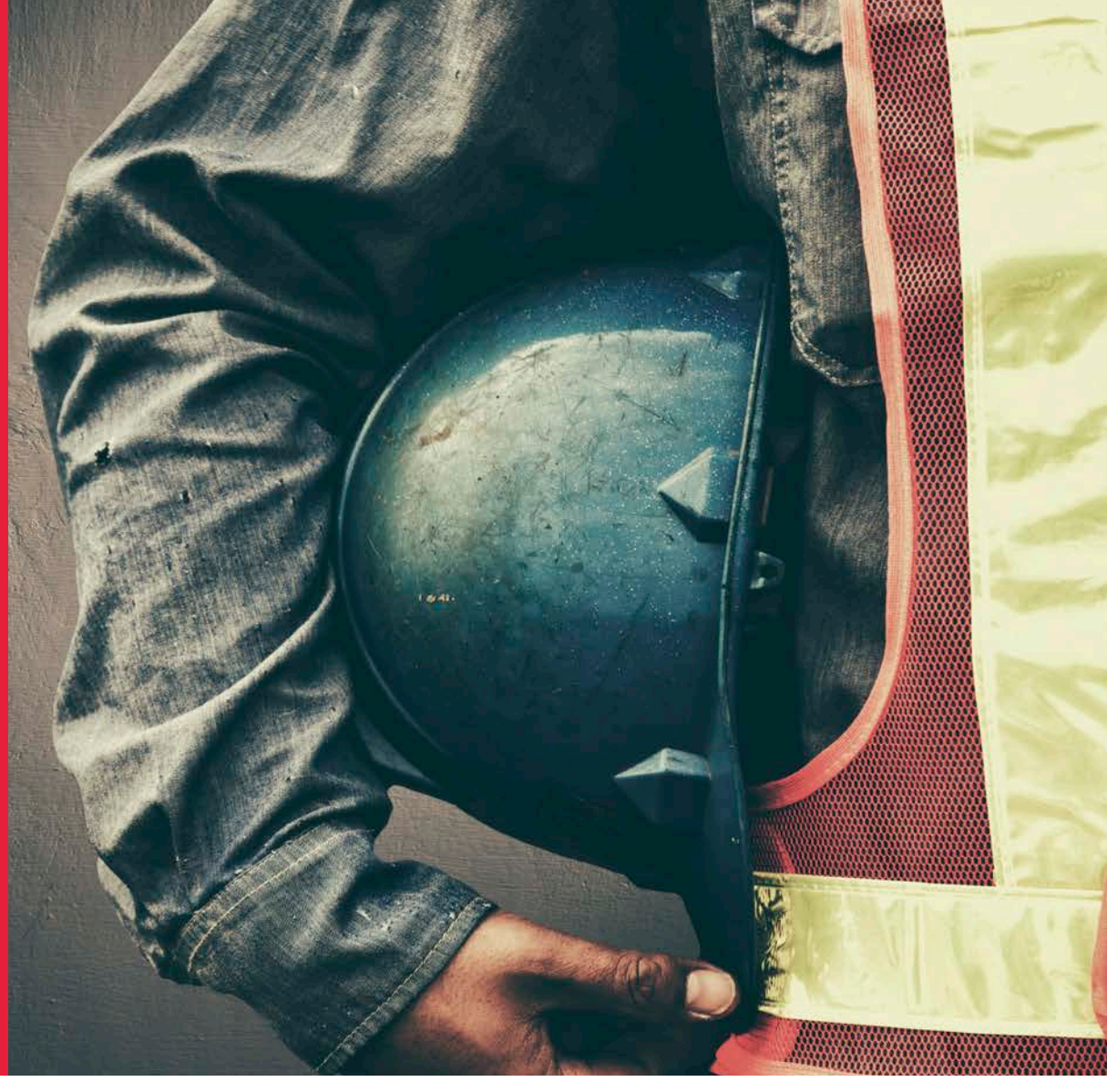
SAFETY:
FIRE & EXPLOSION PROTECTION



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APPLICATION SPECIALISTS

EDUCATION IS ESSENTIAL

Control Instruments positions itself as the application specialist in industrial safety, process, and environmental gas monitoring.

Since 1969, we have been engineering and manufacturing solutions to both simple and complex gas monitoring problems. Our primary mission is to protect life and property from accidents caused by hazardous gases.

Studies have shown that practically all accidents can be traced back to human failures in three particular areas:

- Inadequate Training
- Improper Maintenance
- Improper Application of Equipment

Our goal is to first EDUCATE our customers in understanding gas hazards, then assist them in selecting the appropriate equipment for each application.

BASIC PRINCIPLE OF SAFETY

ACCIDENT TRIANGLE

A basic principle of safety can be illustrated by the accident triangle. This principle states that for each accidental death that occurs, there are X instances of human injury, Y instances of property damage, and Z instances of near misses (hazardous situation exists but accident doesn't occur). The best way to avoid death, injury and property loss is to stay out of the near miss zone.

Staying out of the near miss zone requires analyzing hazards, creating guidelines for safe operation and then educating people about the areas; placing warnings and indicators whenever possible. Unless we follow safety guidelines to prevent & avoid accidents, a great deal more money and time is spent correcting them after they've occurred.

When combined with proper operator training, hazardous gas detection is a cost effective way to manage risk and help ensure industrial safety.

› BASIC PRINCIPLE OF SAFETY

BASIC PRINCIPLE OF SAFETY

HUMAN ERROR

Hazard indicators can significantly reduce accidents, but some people disobey them, committing a human error in judgment. Their actions can result in death, injury, and property damage.

Human error has been found to be a major factor in almost all industrial accidents. In some of these accidents, operators were not aware of the hazard, in others, they misunderstood the danger of operating in the near miss zone. Safety experts advise increasing education and training of personnel as the best way to avoid such accidents.

Some accidents are caused by human error of a more subtle nature than clear disregard of a rule. Such applications require continuous monitoring to provide the highest level of safety.

- BASIC PRINCIPLE OF SAFETY
- LFL101

FLAMMABLE HAZARDS

ELIMINATING HAZARDS

Three elements must be present for a flammable hazard to exist: fuel, oxygen, and a source of ignition. If any one of these elements is lacking, it is not possible to have a fire, which is why safety experts study ways to eliminate one of them.

The best way to control flammable gas or vapor hazards is to keep the level of fuel below the flammable level. Continuous monitoring of gas and vapor levels provides the early warning needed to correct dangerous situations.

This method works in the two basic types of applications: monitoring for leaks in areas where gases are not normally present; and monitoring for rising concentrations in processes where some flammable gas or vapor is always present.

Trying to remove oxygen sources (inerting) or attempting to eliminate all sources of ignition is NOT a safe or reliable way to reduce flammable hazards.

- FLAMMABLE HAZARDS
- CLASSIFYING HAZARDOUS AREAS

GAS VAPOR IN AIR MIXTURES

LFL MONITORING RANGE

For each flammable substance there is a level of concentration in air, usually expressed as a percent by volume, known as its Lower Flammable Limit (LFL) or Lower Explosive Limit (LEL).

Below the LFL, the mixture of fuel and air is too lean to support combustion. As the amount of fuel continues to increase, the mixture will eventually become too rich to burn - there will be too much fuel and not enough Oxygen. This concentration is known as the Upper Flammable Limit (UFL) or the Upper Explosive Limit (UEL).

Between the LFL and the UFL lies the flammable range where, given a source of ignition, the mixture will readily ignite. While it may be theoretically possible to operate safely at concentrations up to 100% of the LFL, authorities world-wide have established safety regulations which require operation well below this point.

- GAS AND VAPOR IN AIR MIXTURES
- ATMOSPHERIC GROUPS

SAMPLING METHODS

AREA MONITORING

Indoor and outdoor gas hazards that exist in open areas are usually monitored using diffusion-type sensors.

This sensor type has no active sample-drawing system; it relies on the ambient air movement and pressure to deliver the sample to the sensing element. When being installed, the weight of the sample in relation to ambient air is important, and will determine sensor placement.

Diffusion sensors are a reliable and cost-effective way to monitor open area gas hazards.

- AREA MONITORING: DIFFUSION SAMPLING
- GAS SENSORS

SAMPLING METHODS

PROCESS MONITORING

Enclosed spaces require an active sample drawing system. Active sampling systems are superior to diffusion-sampling systems because they confirm that a sample is flowing across the sensing element, but since a sample is being transported, they are also more complicated.

Care should be taken to avoid condensation & keep sample lines short, to limit maintenance issues and response-time delays.

APPLICATION CONCERNS

CHOOSING THE RIGHT ANALYZER

When looking for a gas monitoring system you must address some key concerns:

- Proper Selection of Sensor Technology
- Accuracy of Readings
- Speed of Response
- Maintenance

Although several different types of sensors are employed as LFL monitors, each has an appropriate application to which it is best suited. Fires and explosions in equipment that was thought to be protected can occur without warning when a sensor is not capable of doing the job it's been assigned. Choosing the right kind of instrument can be a detailed task, even when familiar with the process.

The instrument of choice may vary from one application to the next, but the correct one should perform accurately under the demands of the industrial environment, avoiding unnecessary downtime and frequent maintenance.