

**AUTOMATIC FIREFIGHTING  
SYSTEMS IN  
THE STEEL INDUSTRY**





*Each hazard and approach implies a different type of extinguishing*

## Hazard type

### **WHAT IS AN INTEGRATED PLANT AND A SPECIALIZED STEEL MILL?**

Metalworking involves treating iron ore to produce steel alloys.

The steel industry transforms the natural mineral into pig iron and later steel, after a preliminary process of separating impurities by magnetization or density filtering.

The subsequent casting and rolling process involves transforming the raw molten steel into the final product, as profiles or sheets.

The facilities where all the processes necessary for steel production take place are called "whole mills", whereas plants that take the raw material from steel recycling are known as "specialized mills".

A steel works is an extremely expensive facility, both in terms of the value of its installations and the financial damage involved in shutting down production due to an accident.

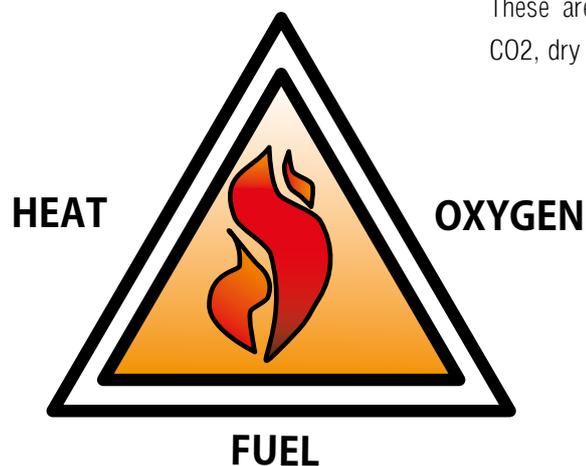
The installations in a steel works present a high chance of fire due to electrical and mechanical hazards, liquid fuels, lubricants and the existence of process at high temperature processes that make ignition very easy. Proper fire protection is very important in these mills in order to avoid possible risks and be able to extinguish any fire outbreak before major damage occurs that could affect staff and production.

The main areas to be protected with automatic extinguishing in a steel works are:

- Production machines
- Blast furnaces and casting
- Rolling mills
- Electric generators
- Technical rooms
- Flammable liquid storage tanks
- Electrical panel rooms
- Electrical transformers
- Control Rooms

Choose the most appropriate extinguishing system for each hazard based on the type of fire.

These are: inert gases, chemical gases, CO<sub>2</sub>, dry chemical, foam and water mist.



# Prevention and protection.

Fire protection to prevent accidents focuses on prevention and extinguishing.

Prevention occurs through proper design of facilities, the materials used, maintenance, and enforcement of existing health and safety legislation.

Special attention should be paid to refurbishment and maintenance actions carried out in the rooms and production lines which could present risks, such as welding, vehicle traffic and machines.

***The extinguishing works by a detection system that automatically activates the installed fire protection equipment before the fire spreads.***

The fire protection should be considered in two stages:

- The protection of workers, to prevent injury in case of fire or explosion.
- Physical protection of the facilities

The hazard to be considered, according to the regulations, will be the risk of fire in combustible solids, flammable liquid fuels and flammable gases.

The automatic fire extinguishing system must protect fire hazards using properly placed nozzles to cover all areas, which may be by total flooding in some rooms and local application in individual components such as machinery and transformers.

## ***EXTINGUISHING AGENT PROPERTIES***

*The quicker the response time to a fire, the less the equipment will be damaged and the risk of uncontrolled fires and explosions will be reduced.*

*For this, it is necessary to have a detection system that automatically triggers the release of the extinguishing system to produce the discharge of the agent practically immediately after the fire begins. The fire is usually detected electrically via a fire panel equipped with flame, smoke or temperature sensors. When deemed necessary, this system can feature a mechanical and mechanical-pneumatic detection system that can operate autonomously without power. They must also have manual release in case of emergency.*

## ***THE IMPORTANCE OF BACKUP SYSTEMS.***

*For the perfect optimization of the activities undertaken in these spaces, it is important to have a backup cylinder bank for the extinguishing system. This backup ensures ongoing production in case of discharge, without even having to stop plant operations until the necessary maintenance to refill the extinguishing agent is completed.*



# Choosing the right system for the type of hazard

## FURNACES, CASTING AND ROLLING MILLS

Steel works use powerful electric furnaces to melt the raw materials and manufacture steel. There are also large machines such as casting machines and rolling mills. One of the things these components have in common is that they all work at high temperatures with molten steel and chemicals. These machines are powered by electricity and require hydraulic lines to stay lubricated and prevent overheating of mechanical components.

The risks generated in the furnaces and machinery are: possible fires due to shortcircuits and overheating of electrical equipment, explosion due to mixing chemicals, hydraulic line or bearing overheating, lubricating oil spills, and spills of molten steel in the treatment and transport lines.

## TRANSFORMERS

Transformer rooms house electromagnetic devices which can increase or decrease the mill's electric voltage and current.

Given the importance of the transformers and their cost, the need arises for the installation of fixed fire protection systems to safeguard them.

Among the transformers in enclosures, oil-filled ones are a particularly high fire hazard, since the lubricating liquid has a relatively low flash point and therefore a risk of fire with a considerable release of smoke. At SIEX we are highly experienced in the protection of transformers, both oil-filled and dry.

## BOTH HAZARDS ARE PROTECTED BY CO<sub>2</sub> and Water Mist.

The choice of extinguishing agent will depend on the size of the room where the risk is located and choose if it is protected with total flooding or local application.



Water mist is a high pressure system that delivers specified amounts of to the base of the fire in the form of micro droplets.

The droplet size, coupled with a high rate of penetration into the flames, are important features that allow the system to provide an effective yield of fire suppression and/or extinguishing with much lower water volumes than those normally used with other fire protection systems.

This technology replaces traditional sprinkler systems, using less water and thus requiring less space for storage. Water mist is especially suitable for protecting electrical-electronic equipment since it avoids one of the greatest risks for this equipment, smoke. Water mist systems can also be employed

to protect objects, such as machinery, by local application.

We have all the design and approval protocols for both total flooding and local application systems.

The installation can be done through a W-FOG UAP pumpset connected to a water storage tank when large areas are protected.

We can also install systems with W-FOG UAC cylinders for small spaces and local applications. In this case, the water is stored in banks of high pressure cylinders with propulsion provided by N<sub>2</sub> cylinders.

It is the nozzles—designed with the latest technology—which explain the widespread acclaim of our system and on which its

effectiveness depends. We can supply both open and closed nozzles. Each type of nozzle has been designed and approved independently for each hazard, and there is a wide range of nozzles for ordinary hazards, machinery rooms, local applications or cable tunnels, etc.





## CABLE GALLERIES

Steel works furnaces are electric, so they require a complex electrical cable installation to power all plant equipment. This cabling runs through galleries used to bundle power supply cables.

The risk of fire in galleries may be due to overheating and shortcircuits. If the fire is generated and is not correctly detected and extinguished automatically, it will propagate quickly, causing serious damage to the electrical system of the plant, because these are hidden and physically inaccessible places.

**The recommended extinguishing method for this hazard is water mist** through specially designed open nozzles, approved for this use, with control valves to divide the gallery in sections and minimize the toll on equipment.

## FUEL STORAGE TANKS

There may be different rooms in mills housing tanks with fuel for power generators and lubricants for hydraulic machinery lines. These materials pose an additional risk, since it is a class B fire that needs to be studied differently than electrical hazards.

The main problem with these rooms is possible rupture and spill of combustible or flammable liquid that may cause a fire in the room.

**Dry chemicals and foam-based solutions are the most suitable extinguishing agents for the protection of a hazard where there are flammable or combustible liquids.**



The SIEX-CO<sub>2</sub>™ system consists of high pressure cylinders, modular or cylinder bank, depending on the amount of gas needed and the installation design is carried out on a case-by-case basis.

The high CO<sub>2</sub> pressure allows using long pipe runs in large installations and to separate cylinders from the protected hazard in case of risk of explosions.

The SIEX-CO<sub>2</sub>™ systems are suitable both for total flooding with calibrated radial nozzles and for local cup nozzle applications.



The SIEX™ FOAM PREMIX system is designed to act against the most adverse flammable liquid circumstances that require rapid actuation to control them. The system is designed to create a homogeneous layer of low-expansion foam on the surface of class B materials. The foam is created by adding air to a foam concentrate and water solution stored in our tanks, at the specific concentration for extinguishing. It is therefore an autonomous system that does not require an external water supply.

The foam layer works prevents the creation of flammable vapours, eliminates oxygen and cools the fuel and hot surfaces. For this to occur, nozzles should be suitably distributed and all system components which contribute to the discharge should be efficiently and instantaneously activated.

Our units are supplied with tanks that contain the agent in the concentration stipulated for use. They are built with a stainless steel layer and an inlet for the N<sub>2</sub> propellant at the top, in addition to check valves. Equipped with burst disc for a pressure of 15 bar, pressure reducer, control gauge and relief valve. We have a wide range of tanks, ranging from 120 to 2,000 litres.



SIEX™ IND dry chemical systems use a safe extinguishing agent which is the most common choice for flammable liquid, gas and chemical fires. It is a white solid mixture of several components, finely divided and with a high dispersal capacity in the space. Fixed dry chemical fire protection systems are used to extinguish fires in special hazards requiring large quantities of this extinguishing agent, such as class B and C fires and open spaces (local application). They can be used for both total flooding and local application.

The dry chemical does not deplete the ozone layer and has zero global warming potential. This material is readily available anywhere in the world and is inexpensive to refill should the system be discharged.

This system makes it possible to protect hazards which are impossible to protect via local application.

The SIEX™ IND valves are manufactured with their relevant CE marking according to the applicable EU directive. These valves are tested according to the gas protocol by an top-ranking organization such as VdS, demonstrating the total reliability of these components.

SIEX™ IND has specific nozzles for total flooding, local application, and flat discharge for protection with a powder curtain.

#### PROPERTIES:

- Harmless to the ozone layer.
- Easily accessible.
- Low cost.
- May be used for total flooding or local application.
- May be applied in enclosures with openings.
- Wide experience in its use.
- High extinguishing capability
- Suitable for hazards with flammable liquids in suspension
- Versatile system design



#### SIEX™ IND: Dry Chemical Tanks

The system consists of two main parts: the dry chemical tank with its accessories and the cylinder filled with nitrogen (propellant) with its accessories.

The vertical dry chemical tank is constructed with steel sheet according to the pressure equipment directive, with an inlet for N<sub>2</sub> and a check valve at the bottom. It is equipped with a pneumatic actuation output valve of the right diameter or burst disc for a pressure of outlet valve of suitable diameter bar, pneumatic discharge head (actuation pressure 10 bar), pressure reducer and control gauge (0-24 bar) for proper maintenance and release valve.

The cylinder filled with N<sub>2</sub> at 150/200 bar (propellant) is fitted with a brass model valve with a burst disc at 210/290 bar, a control gauge for 0-315 bar (5140-P315) for proper maintenance, a solenoid, manual release and fixing hardware. SIEX™ IND includes the syphon tube, flange, protector plug and all accessories for transport.

SIEX™ IND has many tanks ranging in capacity between 120 kg and 2000 kg of dry chemical for designing the best installation in each case, streamlining system cost.

#### SIEX™ IND: Pre-Engineered Modular Systems

SIEX™ IND pre-engineered dry chemical systems are easy to design and install in locations where only a small quantity of agent is required.

They can be activated electrically and manually, and pneumatic and mechanical actuation is also possible for completely standalone systems. SIEX has suitable release heads for all possible solutions, in order to provide the best protection for each space.

SIEX™ IND has many modular cylinders ranging in capacity between 8 kg and 85 kg of dry chemical pressurized with N<sub>2</sub> for designing the best installation in each case, streamlining system cost. The cylinders work at a pressure of 25 bar, fitted with valves and burst discs at 45 bar, and a pressure control gauge to ensure proper maintenance of the installation.

Its low 25 bar working pressure means that conventional pipework and fittings can be used, resulting in cost savings on installation material.

## ELECTRICAL ROOMS

Electrical rooms, such as control rooms or electrical panels, store all the facility's automation systems. These are critical hubs to ensure proper production.

Electrical rooms are considered as enclosures capable of being occupied because authorized personnel may enter at any moment, so a clean agent must be used. The main solutions adopted for this type of hazard are HFC-227 and inert gases.

The main causes of fire which can occur in this sort of installation are due to internal factors such as sparks from breakers, shortcircuits, overloads, static electricity, and external factors such as dirt, heat-generation installations, sunlight, and environmental thermal conditions.

The most effective protection method for spaces of this type is total flooding, involving the release of an agent into the enclosure so that a minimum concentration is reached throughout the hazard area, for the protection of both the entire room and the panel itself.

Depending on actual dimensions we can choose a general gas-based extinguishing system at high pressure or a system using inert gas with selector valves to protect multiple spaces with a single cylinder bank and save space.

The hazard protection can also be done individually, placing extinguishing systems within electrical panels using small systems that can discharge the agent inside the panel itself. That makes this system very simple and convenient. Our company has specific small systems specially designed for this type of hazard. SIEX™ SMS systems meet all these requirements.



INERT-SIEX™ has the widest range of environmentally friendly agents to suit every need. Its high pressure allows the use of long pipe runs and selector valves. Extinguishing agent could thus be saved by having buildings devoted solely to this hazard or having various clean rooms for this use, with the associated savings in money, space and weight load on the building structure.



The SIEX-HC™ 227 system has cylinders from 6 to 514 litres, with working pressures from 25 to 60 bar. Meanwhile, SIEX™ SMS has capacities from 2 to 13.4 litres and a working pressure of 15 bar.

It delivers very stable performance, ensuring great reliability both during storage and at the moment of discharge.

Users can be assured that HFC-227 that has not been used for a long time will not underperform.

## TOTAL FLOODING SYSTEMS WITH GASEOUS EXTINGUISHING AGENTS

*Installation design is calculated by SIEX using our **VdS-certified** proprietary software for proper calibration of nozzles and sizing of pipe diameters for each of our systems.*

## CONTINUOUS WEIGHING SYSTEMS

*SIEX has a very reliable VdS-approved weighing device. This allows efficient, accurate and totally reliable load control—visually and electronically—for cylinders in each system.*

## REGULATIONS FOR SYSTEM DESIGN

*For the design of extinguishing systems, our equipment is based on national and international technical rules of which the most important are:*

- NFPA-2001: INERT and CHEMICAL AGENT system
- NFPA-12: CO<sub>2</sub> system
- NFPA-11: FOAM system
- NFPA-17: DRY CHEMICAL system

## OTHER SPECIAL HAZARDS PROTECTING BY SIEX:

SERVICE STATIONS

ARCHIVES AND LIBRARIES

DPCs

PAINT SPRAY BOOTHS

ELECTRICAL PANELS

INDUSTRIAL KITCHEN

TURBINES AND GENERATORS

ROAD TUNNELS

NATURAL GAS PLANTS

CLEAN ROOMS

CABLE TUNNELS

TELECOMMUNICATION CENTRES

HOTELS

HOSPITALS

EDUCATIONAL ESTABLISHMENTS

TRAIN AND UNDERGROUND STATIONS

TRAINS

TRANSFORMERS

OFFSHORE PLATFORMS

SOLAR THERMAL PLANTS

MACHINE TOOLS

PRINTING INDUSTRY

HISTORIC BUILDINGS

ROBOTIC PARKINGS

WIND TURBINES

STEEL INDUSTRY

BANKS

OFFICES

LARGE VEHICLES

CONVEYOR BELTS

GAS PUMPS

OIL & GAS

TIMBER INDUSTRY



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