

AUTOMATIC FIREFIGHTING  
SYSTEMS IN  
**SERVICE STATIONS**





## Types of installation

*Generally, service stations offer gasoline and diesel fuel, both of which are derived from petroleum.*

*Some stations provide alternative fuels such as liquefied petroleum gas (LPG), natural gas, compressed natural gas, ethanol, gasohol, biodiesel, hydrogen and kerosene. In some countries they sell butane bottles too.*

*With the rise of the electric car, charging stations are being established to supply electrical power for vehicles, as a complementary or exclusive service.*



The business of a service station is to provide a supply of fuel and lubricants for motor vehicles. Although they can be set up and acquired freely, service stations are usually associated with large distribution companies with exclusive contracts.

### **TYPES:**

#### **By use:**

- Public use.
- Private use. Supply authorized vehicles only, for example, a bus or military vehicle station.

#### **By location:**

- Urban.
- On conventional roads.
- On freeways (motorways and dual carriageways).
- On private and closed surfaces.

#### **By equipment and services:**

- Supply Unit. They supply only one or two fuels and generally do not have a service building, but just a pay booth.

- Service stations: have a service building and shop selling car accessories, associated products, food, etc. They may also have car washing areas.
- Service Areas: They occupy large areas and may have much larger facilities: bars, restaurants, car and lorry parks, repair shops, authorized dealers, car washing, etc. They tend to be a gathering point for private vehicles and public transport, in strategic locations which are used as resting points on long journeys.

It is essential to have the means to prevent sources of ignition taking hold and resulting in a large fire, which in most cases would have extremely adverse effects on the safety of people, the environment and the actual business.

# Object of study

The activity carried out at the pump is fueling the vehicle with the fuel of choice, from the tank to the vehicle's fuel tank. This operation is performed via a hose fitted with a coupling that fits the mouth of the fuel tank, thus minimizing, but not eliminating, the risks. The inherent risks of this operation are:

## SPILLS:

They occur during coupling, decoupling and fuel dispensing. Quite frequently drops of fuel tend to spill onto the ground or the vehicle body.

## SELF-SERVICE:

The danger is greatly greater when the fuel is dispensed by users, rather than by experienced personnel trained to perform this operation. The fact that consumers themselves are responsible for filling the tanks of their cars is now an everyday occurrence which is growing in popularity. This occurs in both self-service and unmanned stations.

Other risks associated with service stations are related to

## INSTALLATIONS:

### Fuel piping.

Mainly used for loading or filling of tanks, but also for suction or discharge of fuel from the tank to the pump, for tank of tanks and vapour recovery.

Flexible materials are mostly used currently, which allow small mechanical deformations and watertight fittings that prevent any fuel to spill onto the ground.

Further systems may be used to prevent any product spill though this may still happen.

### Main power supply

Generally composed of:

- Main distribution and protection panel.
- Power cables supplying the various pieces of equipment at the pumps or the entire station. These may be supply pumps, pumps, compressor, washing equipment, HVAC and other building elements such as ovens, hand dryers, etc.
- Lighting cables for both exterior and interior building lighting.
- Telecommunications wiring.
- Earth connections.

## OTHER ACTIVITIES IN THE SERVICE AREA

*Modern service stations are no longer exclusive places whose main activity is to supply the vehicles that need refuelling, but have multiple areas offering all kinds of services to meet the needs of users:*

- *Restaurant*
- *Hotel*
- *Car wash*
- *Vacuuming*
- *Gauges for checking and recharging air in tyres, if necessary.*
- *Quick mechanical service and lubrication centre*
- *Heating oil.*
- *Sale of butane bottles*



# Fire hazard

The service stations and, by extension, the service areas, constitute a hazard that cannot be ignored in view of the risks that may result in fires. These include:

## **Areas designated as “hazardous areas” where explosive atmospheres may exist.**

An explosive atmosphere is defined as the mixture of gases or vapours with air which, under normal atmospheric conditions, will propagate burning after ignition to the whole of the unburned mixture.

The existence of these locations requires special precautions in construction, installation and the use of electrical equipment.

To prevent sparks which could ignite the explosive atmosphere, protection must be provided to prevent against direct and indirect contact with the equipment connected material. To this end, a complete earthing system must be provided to include all metallic elements that might be affected, to ensure adequate protection of personnel and users against electric shock from the equipment. This equipment is also protected against damage, and inflammation of explosive atmospheres by the build-up of static electricity is prevented.

The moments of greatest exposure are:

Control of discharge of fuel

Inspection of tanks to determine the volume or check the operation of the automatic measuring probe

Checking pump measures

Fuel supply

Discharges and spills

## **Probability of presence and activation of ignition sources, including electrostatic discharges.**

Static electricity is a particularly important factor to be dealt with. The transfer of fuel through pipework allows this electric charge to accumulate. In particular, there should be a protection system for unloading tankers.

Regarding the ducting carrying the electrical wiring, since petrol vapours are heavier than air, they will tend to get into underground pipes and other areas (for example, inside the building, especially basements). This was the cause of many of the accidents caused by explosions inside theoretically safe areas.

## Fuel dispensers

The equipment responsible for measuring, calculating the price and dispensing fuel. Automatic systems, with a continuous jet and built-in or external pumping systems associated with electronic or mechanical metering and computer.

The fuel pumps are classified according to their flow rate and service (single product, multi-product).

They are essential components of the service station, together with the tanks.

## Canopies

Cover the supply area and serve to protect both employees and users from the weather during refueling, as well as the actual pumps.



## ***Environmental risks***

*Do not ignore factors that might cause fire such as: high temperatures, lightning, etc.*

*Another environmental risk to consider is the possibility of sparks reaching the facility from a fire in the surrounding area.*

## **THE HUMAN FACTOR**

*Employees of service stations, mechanics and other employees who refuel and provide other services to motor vehicles should be aware of the risks of fuels, lubricants and petroleum additives, as well as the waste with which they come into contact. They must comply with the safe work procedures and measures of collective and individual protection in force.*

*Since these are installations in which fuel is directly dispensed, service stations in general and self-service stations in particular are places where people pose a risk which must be taken into consideration, either due to factors that may be unavoidable such as sparks from car engines or electrical equipment, or due to carelessness such as cigarette ends.*

*Intended acts and vandalism by people with intent to cause property damage and another significant danger.*

# Recommendation of protection

## FUEL TANKS

Place the gas and vapour exhaust above the canopy and away from the premises and pumps.

Periodically review the compressed air system.

Install atmospheric valves on tank venting systems.

Perform hydraulic pressure tests on the compressor every 10 years

## PUMPS

Pumps must be fitted with safety devices such as emergency devices to retain liquid on both sides of a breakage point or anti-impact valves with fusible links at the base of the pumps, which close automatically in the event of impacts or fire.

The minimum rating of fire extinguishers shall be of type: 21A and 144B at the pumps and 89A and 690B in the tanker unloading area.

It is recommended that fire extinguishers be dry powder, portable or wheeled.

They must be spaced at a maximum of 10 m throughout storage areas and supply points.

The tanker unloading area requires a 50 kg type B wheeled extinguisher.

## THE EXTINGUISHING AGENT

**Unmanned  
installations  
should have  
automatic fire  
extinguishing  
equipment.**

## PERSONNEL SAFETY

Enforce safety rules for users.

Prohibition of smoking, use of mobile phones and/or refuelling with the engine running or with the lights on.

Mark the areas of greatest risk of fire and/or explosion.

To avoid spontaneous combustion, grease-stained rags should be stored in covered metal containers for recycling or disposal.

Install ventilation and/or exhaust systems in enclosed spaces.

## Protective measures for EXPLOSIVE ATMOSPHERES

Avoiding the risks

AVOID THE FORMATION OF ATEX

Evaluate risks which cannot be avoided

ASSESSING THE RISK OF ATEX  
IGNITION

Implement appropriate protective measures to ensure safety in the event that an explosive atmosphere is created

MITIGATE THE EFFECTS OF THE  
EXPLOSION

Protect portable lamps against breakage to reduce the possibility of a spark igniting flammable vapours in the event of the bulb breaking.

Keep these materials in separate, well-ventilated areas, isolated from heat sources.

Implement a system for the recovery of flammable gases.

**Use non-flammable  
containers**

## FLAMMABLE MATERIAL



# SIEX Solutions

## PROTECTION OF PUMPS

The SIEX™ IND-PE system, especially designed for the protection of service stations, ensures security of supply of fuel to vehicles regardless of the structure and configuration of the property.

**It consists of a fully standalone system which does not require electricity to operate, by using a fully automatic, thermal, pneumatic/manual detection and control system.**

This detection system makes it optimal, especially for unattended service stations. In addition, system reliability is maximized by its simplicity, minimal maintenance requirements and the fact that is designed specifically to be used outdoors in service stations.

The type of extinguishing agent used in these systems (BC dry chemical) is suitable for liquid fuels fires, such as the diesel or gasoline supplied these establishments.

Do you need to design automatic fire protection for a small, unmanned service station? Or to select a fire protection solution for a number of service stations? In either case the SIEX™ IND-PE system will provide you with a fully effective and reliable solution, ensuring flexibility to suit your needs, with the best cost-effectiveness in its class.

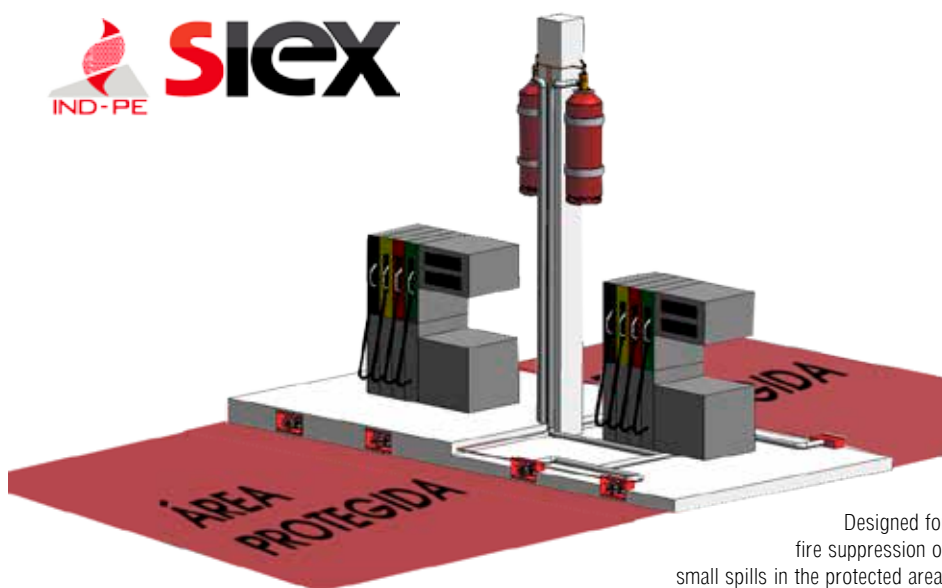
## OBJECTIVES

The SIEX™ IND-PE system is designed to extinguish spill fires on smooth surfaces. This system is not suitable for deep-seated flammable liquid fires.

It allows the occupants of parked vehicles to safely evacuate the area in case of fire caused by a fuel spill.

## DESIGN

The amount of power discharged in this type of hazard depends on the number of vehicles that can refuel on both sides of the pump being protected. Usually there are two areas for each pump. Protection is achieved with a single cylinder, with various capabilities, thus allowing total flexibility in the design of the extinguishing system; any service station can be protected regardless of its size and complexity and the number of pumps and islands.



Designed for fire suppression of small spills in the protected area.

## BENEFITS

The system design, which uses pressurized nitrogen at 25 bar to expel the BC dry chemical, enables longer pipe runs to be used in the distribution network.

Also, agent dispersion is improved in the protected area, significantly improving performance.

The system is remarkably robust and reliable, which is absolutely necessary for this sort of equipment, which is subject to harsh environmental conditions, moving vehicles, vandalism, etc., yet no damage or false activations have been reported.

Thanks to the simplicity of its design, maintenance is minimal and operation completely independent, with no need for external power.





## GENERAL PROTECTION

The SIEX™ FOAM PREMIX system is effective on the most adverse circumstances involving flammable liquids, and which require rapid intervention for control. It is designed to produce a homogeneous layer of low expansion foam on the surface of class B fires.

The foam is produced by adding air to a premixed solution of foam concentrate and water stored in tanks with specific extinguishing concentrations. This system requires no external water supply. The mixture is driven to the fire source by N<sub>2</sub> stored in cylinders attached to the foam tank.

*The foam layer is effective on this type of fire since it prevents the production of flammable vapours, removes air and cools the fuel and hot surfaces.*

This objective is achieved by suitable nozzle spacing and the efficient and instantaneous actuation of all system components involved in the discharge.

## OPERATION

In the event an outbreak of fire being detected, the foam mixture is released, usually by mechanical heat detectors, and forms a film which causes extinguishment due to the removal of O<sub>2</sub>, which is essential for the production of fire.

Inert gas stored in cylinders next to the tank propel the agent from the storage tank to where actuation is required.



## SELECTOR VALVES

The SIEX™ FOAM PREMIX system can protect multiple risks with a single tank with the use of selector valves.

This distinct advantage allows us to considerably reduce the equipment costs. Suppose we wish to protect a service station with several pumps, each independently. With this equipment the foam can be propelled to the desired area, preventing the spread of fire and using only the amount of foam calculated for one pump, thus minimizing the amount of agent and propellant which must be stored.

This configuration is particularly useful in very large service areas in which there is a large number of pumps, not necessarily grouped together.

## Our commitment

### CHOICE OF SYSTEMS

SIEX has the widest range of products and systems to suit different needs, both as regards pressures and extinguishing agents.

### COMPETITIVE PRICE

Optimizing all of our processes make us more and more competitive worldwide.

### SPECIALIZED ENGINEERING

Our highly qualified staff ensure the best service for customers both as regards technical advice on the choice of system, and solving any problems that might arise after installation. Backed up by our extensive experience and a track record of successful projects.

### INNOVATION

At the forefront of innovation in every product we develop, ensuring the technical features offered.

### QUALITY GUARANTEE

All products meet the highest quality requirements and internationally recognised official approvals.

## OTHER SPECIAL HAZARDS PROTECTING BY SIEX:

SERVICE STATIONS	TELECOMMUNICATION CENTRES	HISTORIC BUILDINGS
ARCHIVES AND LIBRARIES	HOTELS	ROBOTIC PARKINGS
DPCs	HOSPITALS	WIND TURBINES
PAINT SPRAY BOOTHS	EDUCATIONAL ESTABLISHMENTS	STEEL INDUSTRY
ELECTRICAL PANELS	TRAIN AND UNDERGROUND STATIONS	BANKS
INDUSTRIAL KITCHEN	TRAINS	OFFICES
TURBINES AND GENERATORS	TRANSFORMERS	LARGE VEHICLES
ROAD TUNNELS	OFFSHORE PLATFORMS	CONVEYOR BELTS
NATURAL GAS PLANTS	SOLAR THERMAL PLANTS	GAS PUMPS
CLEAN ROOMS	MACHINE TOOLS	OIL & GAS
CABLE TUNNELS	PRINTING INDUSTRY	TIMBER INDUSTRY



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