PREVENTIVE PROTECTION SYSTEMS FROM
firefly ab
SWEDEN

FIREFLY SOLUTIONS FOR PORT FACILITIES AND LOGISTICAL TERMINALS

Unique fire protection solutions within the bulk handling process

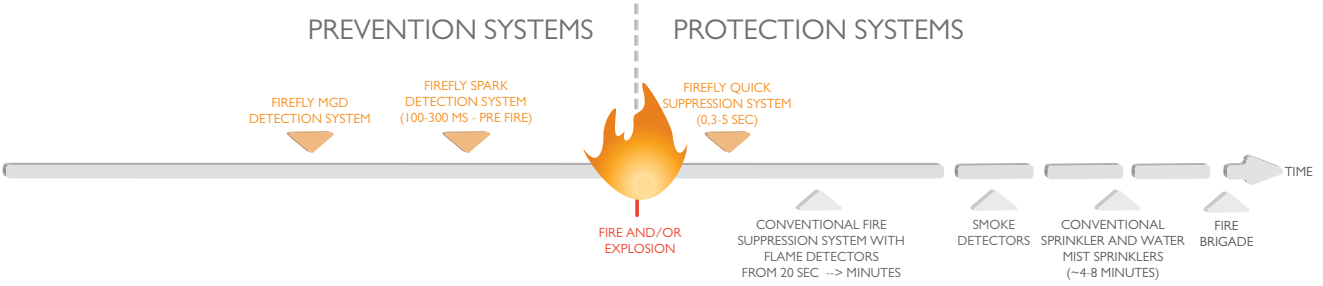
Fire and dust explosions

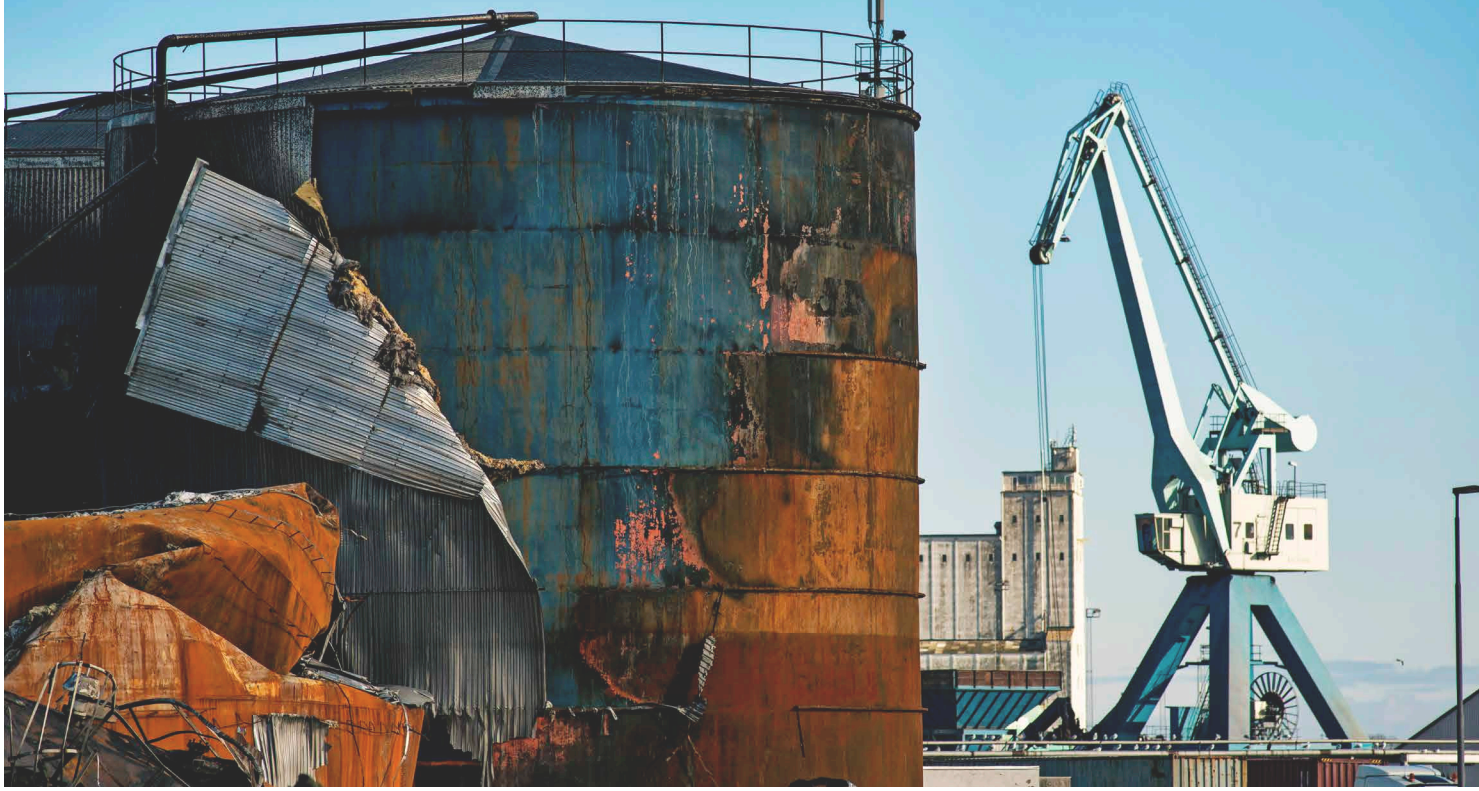
Every year, people are injured and even killed as a result of industrial fires and dust explosions. Port facilities and logistical terminals worldwide, lose millions of dollars per year in damages and production interruptions due to fire or dust explosions.

As opposed to taking action after the event of a fire or dust explosion, it is also possible to implement proactive measures to prevent a fire or explosion to occur in the first place.

Intelligent process design and proper housekeeping are examples of vital measures. The installation of a Firefly fire protection system is another.

In the process of ports and logistical terminals there are several high risk zones where fires or dust explosions can occur. Firefly offers a range of fire protection solutions for processes that include loading/unloading, conveyors, chutes, elevators, filters and silos.





Risks in the industry

Many areas in a bulk handling facility have a latent risk of a fire or even explosion. Much of the equipment involved in the process, such as conveyor belts, elevators, mills and other process equipment have a large number of moving mechanical parts. Elements such as roller bearings can be highly dangerous in case of failure or overheating due to friction.

The large quantities of bulk material being processed creates spillage and fine dust, which easily can spread and accumulate in different parts of the equipment. The root cause of a fire in this type of process can be, for example stalled rollers, mechanical failures (i.e. bearings), impurities in the material entering a mill. But also overheating of material deposited in high risk areas can create ignition sources. These ignition sources can easily be transported through the duct systems and cause fires or explosions further down the process, for example in chutes, conveyors, silos or dust collection systems.

If or when a fire occurs, the spreading can be very fast and have devastating consequences due to the difficulties in reaching the affected areas, which often is the case with conveyor belts and elevators high above ground.

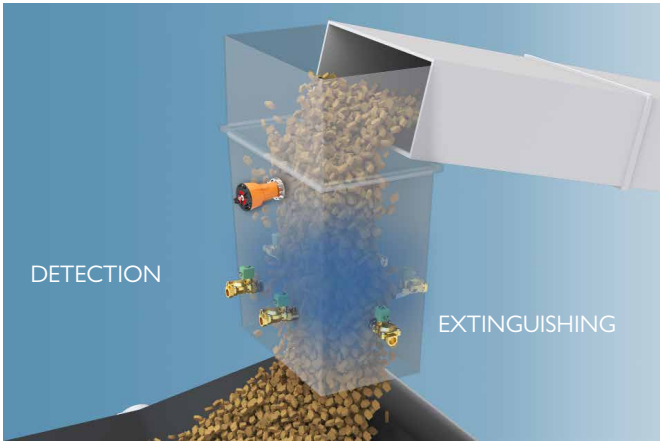
Dangerous scenarios in the process:

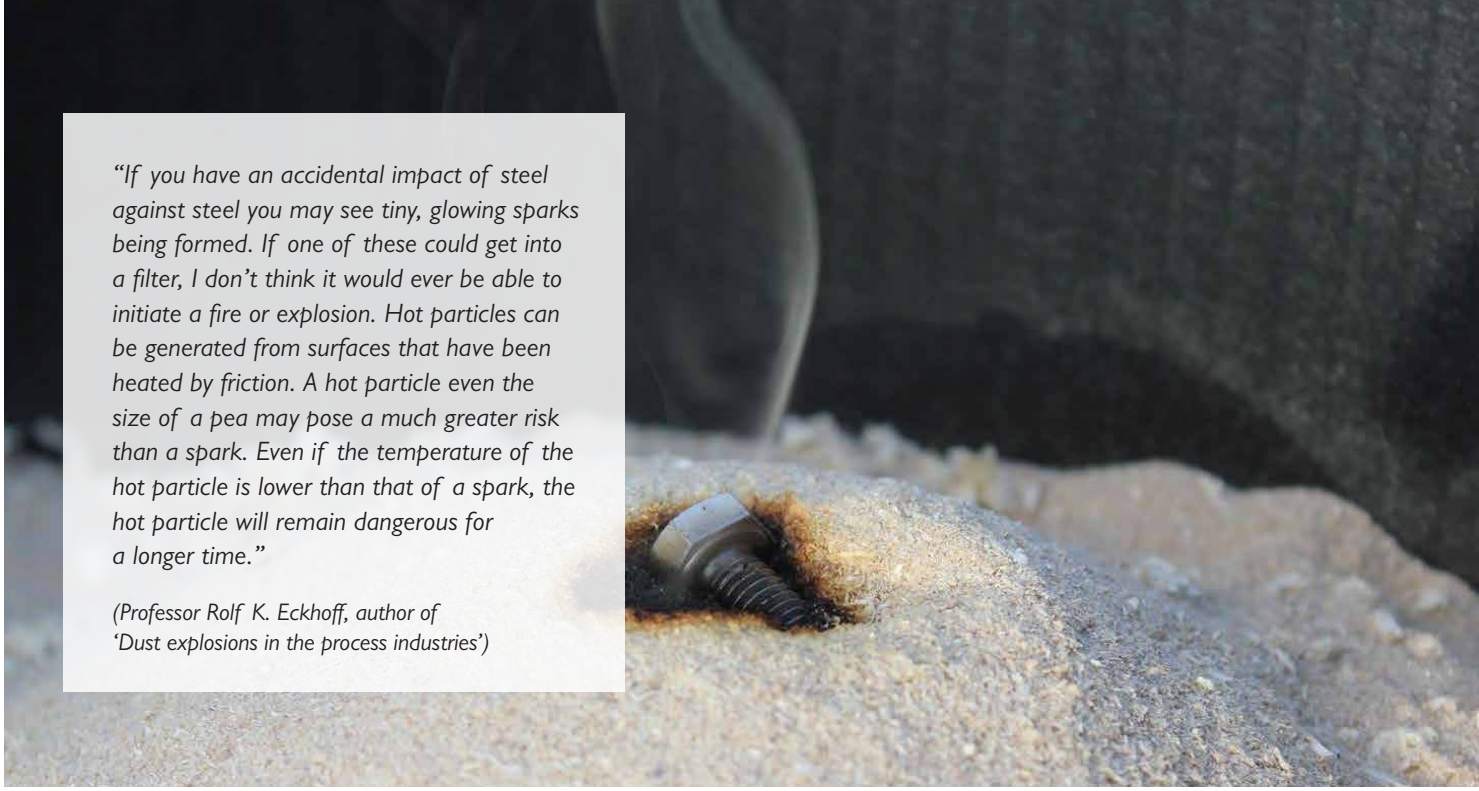
- Friction heat generation (i.e. stalled roller)
- Mechanical failure (i.e. bearing)
- Material build-up/dust accumulations
- Impurities in the processed material
- Limited access for maintenance or manual extinguishing
- Self ignition

The Principle of Firefly Spark Detection

A spark detection system consists of a detector that identifies dangerous particles (ignition sources) in a process flow. Once an ignition source is detected, it is extinguished automatically within milliseconds before it can create a fire or a dust explosion. The detection and extinguishing functionalities are controlled by a control unit. This proactive way of eliminating ignition sources is why Firefly spark detection systems are called preventive fire protection systems.

The installation of a Firefly spark detection system can save the industry from costly fires and dust explosions. By combining unique and patented technology with over 45 years of experience in the process industry, Firefly offers premium safety solutions that minimize false alarms and keep the industry in production.





"If you have an accidental impact of steel against steel you may see tiny, glowing sparks being formed. If one of these could get into a filter, I don't think it would ever be able to initiate a fire or explosion. Hot particles can be generated from surfaces that have been heated by friction. A hot particle even the size of a pea may pose a much greater risk than a spark. Even if the temperature of the hot particle is lower than that of a spark, the hot particle will remain dangerous for a longer time."

(Professor Rolf K. Eckhoff, author of 'Dust explosions in the process industries')

Ignition temperatures and energies

In order to design high performance spark detectors, scientific facts and ignition parameters must be taken into account. Different materials have different minimum ignition temperatures (MIT) and different minimum ignition energies (MIE), as can be seen in the table. Only when both the MIT and MIE levels are met or exceeded, ignition can take place. To be considered adequate, a spark detection system must detect ignition sources at these levels!

A hot particle will emit light, visible to the human eye when it has a temperature of about 700°C/1292°F or more*. Particles with a temperature over ~700°C/1292°F are therefore perceived by the human eye as sparks or glowing embers. Particles with a temperature lower than ~700°C/1292°F are perceived by the human eye as "black" particles. Note that almost all organic material have a lower ignition temperature (MIT) than 700°C/1292°F. This is why it is of outmost importance that the spark detector is also able to detect hot (black) particles.

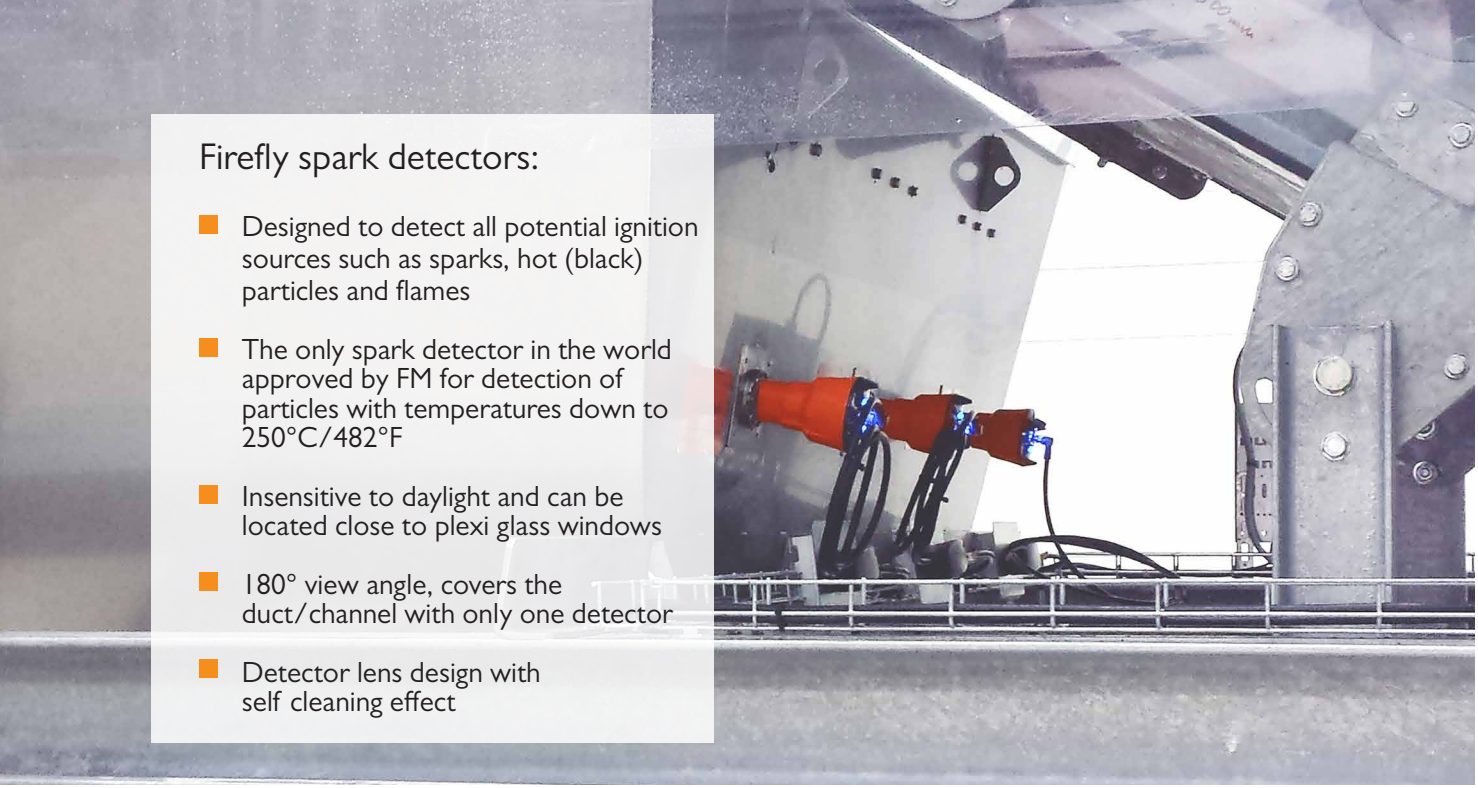
* ref. Wiens displacement law & Planck's law of radiation

Firefly True-IR spark detectors are designed to detect all dangerous ignition sources, that is, when both the MIT and MIE are met or exceeded.

MINIMUM IGNITION TEMPERATURE AND ENERGY LEVEL

	CLOUD		LAYER		MIN. CLOUD IGNITION ENERGY, J
	°C	°F	°C	°F	
WOOD	470	878	260	500	0,04
WHEAT FLOUR	440	824	440	824	0,06
CELLULOSE	480	896	270	518	0,08
SUGAR	370	698	400	608	0,03
COCOA	510	950	240	464	0,10
ALUMINUM	610	1130	326	619	0,01
COFFEE	720	1328	270	518	0,16
CORN	400	752	250	482	0,04
SOY FLOUR	550	1022	340	644	0,10
SULFUR	190	374	220	428	0,015
HOPS	460	860	290	554	0,03

Source: NFPA (National Fire Protection Association)



Firefly spark detectors:

- Designed to detect all potential ignition sources such as sparks, hot (black) particles and flames
- The only spark detector in the world approved by FM for detection of particles with temperatures down to 250°C/482°F
- Insensitive to daylight and can be located close to plexi glass windows
- 180° view angle, covers the duct/channel with only one detector
- Detector lens design with self cleaning effect

Detection

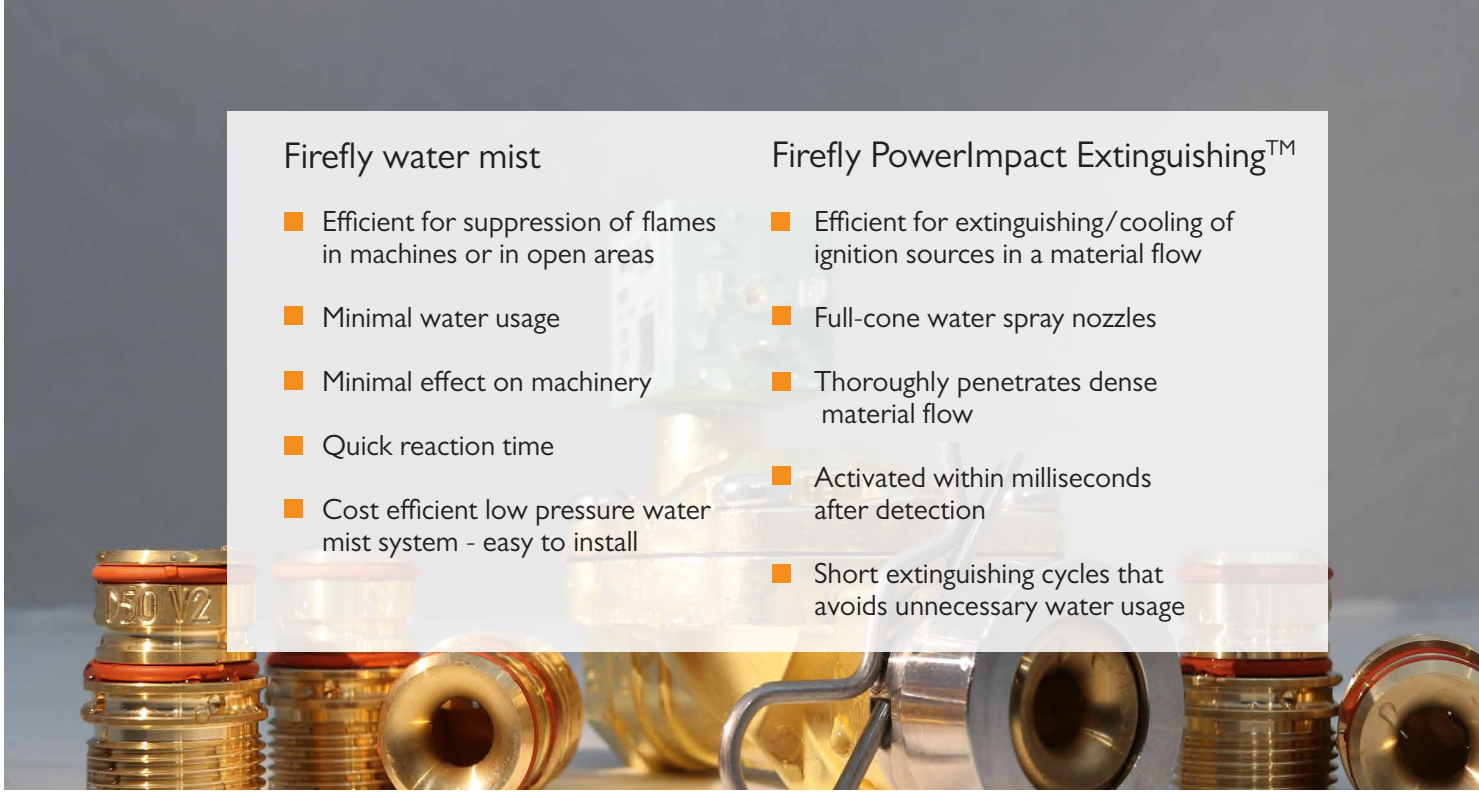
Firefly's state of the art, FM-approved, True-IR detectors are specially designed for detection of all types of ignition sources such as sparks, flames and hot (black) particles. All Firefly spark detectors works in the True-IR spectral range, which enables detection down to the MIT and MIE of the material and are at the same time completely insensitive to daylight.

Being insensitive to daylight is essential in order to avoid false positives and avoid unnecessary interruption of the process, which could be very costly. This will also make it possible to install the detectors in an area where there is a plexi glass window or if daylight is present.

The Firefly spark detection system offers premium detection functionality which is unrivalled on the market.

To consider when choosing suitable detector type:

- ☑ *determine the minimum ignition temperature (MIT) and minimum ignition energy (MIE) of the processed material.*
- ☑ *choose the detection technology that will meet the MIT and MIE of that material.*
- ☑ *analyze possible detection disturbance sources and make sure that the chosen detector will not cause false triggering.*



Firefly water mist

- Efficient for suppression of flames in machines or in open areas
- Minimal water usage
- Minimal effect on machinery
- Quick reaction time
- Cost efficient low pressure water mist system - easy to install

Firefly PowerImpact Extinguishing™

- Efficient for extinguishing/cooling of ignition sources in a material flow
- Full-cone water spray nozzles
- Thoroughly penetrates dense material flow
- Activated within milliseconds after detection
- Short extinguishing cycles that avoids unnecessary water usage

Extinguishing and suppression

Water is the most common method of extinguishing in port facilities. Nevertheless, water can be used in many different ways with completely different results. The Firefly PowerImpact Extinguishing™ is very efficient for extinguishing or cooling down ignition sources in a material flow. The Firefly Water mist system, on the other hand, is very efficient for suppression of flames in machines, conveyors and other equipment.

In processes where water is not suitable, Firefly has equipment to eliminate or divert dangerous particles from the process by means of mechanical diversion, isolation, steam or gas.

Water mist

Water mist can be used for suppression of flames in a number of different applications where traditional water extinguishing is not suitable. Water mist has proven to be very effective in fighting and controlling fires. It has a remarkable potential for suppressing flames and is causing minimal residual damage. Water mist systems work by spraying microscopic water droplets onto a fire. This results in efficient suppression using nothing more than water. When the water droplets evaporates into steam it absorbs more energy from the fire than any other extinguishing media. When the water evaporates it will expand 1.700 times which displaces the oxygen and ensures that the combustion cannot be sustained.

PowerImpact Extinguishing™

Firefly provides high-speed and powerful full-cone extinguishing with a unique nozzle design. The nozzles are placed in different directions for the water to penetrate and cover the entire material flow inside a pneumatic conveying system or chute.

Conventional extinguishing systems use hollow-cone spray nozzles with relatively small water droplets, often installed only from one direction. Consequently, conventional extinguishing provides less ability to penetrate the entire material flow and can leave uncovered areas inside a pneumatic conveying system or chute.

Firefly EXIMIO™

The Intelligent Fire Preventive Platform

With the Firefly EXIMIO™ platform you can integrate different fire protection systems and products that you need for your process from Spark detectors, Flame detectors, Multigas detectors, Temperature sensors and much more. All parts of the systems are controlled by The Firefly EXIMIO™ control unit. It has an intuitive and user-friendly interface called IntuVision™ which enables ultrafast response, data visualization, easy interaction, remote support and many other useful features.

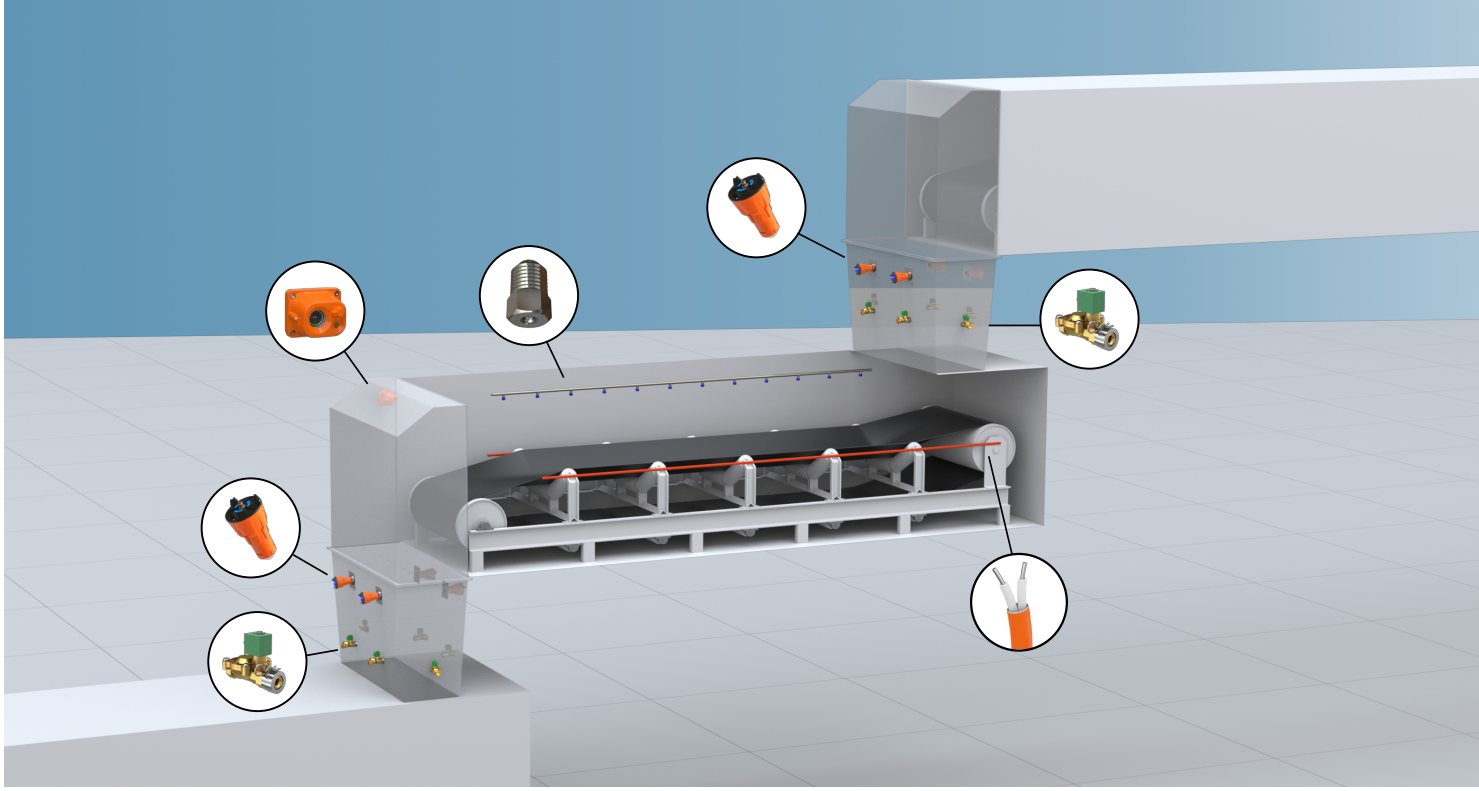
Firefly EXIMIO™ works without interruption, which means production continues despite of a Firefly system on the platform being activated protecting your production. In combination with Firefly's daylight insensitive detection technology it minimizes unnecessary production stops substantially.

Firefly EXIMIO™-System Architecture

Firefly EXIMIO™ is an intelligent system with a decentralized and modular system architecture. Detectors and extinguishing equipment is connected to local hubs, making cabling and installation easy. It is also easy to extend the system for future needs.

Operators will control the system via a colour touch screen with an IntuVision™ - operators interface, that comes as standard in every Firefly EXIMIO™ System. IntuVision™ is easy to use and includes lots of features and functions, for example ApplicationView™ where a drawing of the zone will be shown on the screen. By using IntuVision™ - Desktop, the customer can even connect the system to an external computer, for example in the control room.

The Firefly EXIMIO™ System can be connected via an Ethernet cable or a modem, to enable remote help and service.



Firefly ConveyorGuard™ solution

The purpose of the Firefly ConveyorGuard™ solution is to detect and suppress a fire and to stop the conveyor belt as quickly as possible. This is why a Firefly safety system always consists of three main integrated functionalities: detection, suppression and control.

By integrating different techniques into one solution, Firefly provides optimal safety for the protection of conveyors:

The system has been fire tested against the test protocol for free-standing conveyors, DFL 180719-1289-4 and verified by DNV.

For more information on our certifications and approvals, please visit: www.firefly.se/en/company/approvals

Open Area Flame Detectors
High performance Flame Detectors for fast and reliable detection of flames along the conveyors.

Water Mist Suppression
Quickly activated Water Mist System located along the conveyors. Remarkable fire suppression capabilities utilizing a small amount of water.

Spark and Hot Particle Detectors
Millisecond detection of hot particles, sparks and flames in the drop chutes.

Full-cone Water Spray Extinguishing
Powerful extinguishing designed to penetrate material flow and extinguish sparks and hot particles in the drop chutes.

Linear Temperature Sensing (LTS) cable
Temperature detection along the rollers etc.

Firefly ElevatorGuard™ – Protection of elevators

Problems with fires or even dust explosions in bucket elevators are well known to the industry. The dusty atmosphere inside an elevator is ideal for a fire or a dust explosion. The properties of a bucket elevator also makes it more complicated to protect.

A fire can start due to ignition sources* being fed into the elevator, but ignition sources can also be generated inside the elevator itself. It has earlier been believed that sparks, created by the buckets inside the elevator, are the highest risk, however, investigations show that friction related problems are a more common risk factor.

The Firefly ElevatorGuard™-solution includes FM-approved, TrueIR hot particle detectors and full cone water extinguishing nozzles at the inlet and outlet of the elevator. At the inlet, the Firefly system will minimize the risk of any dangerous ignition sources to enter the elevator. If the root cause is inside the elevator, the system at the outlet will give an early indication of a beginning problem inside the elevator and minimize the risk of ignition sources leaving the elevator to downstream process parts.

TrueIR hot particle detector
Millisecond detection of hot particles, sparks and flames. Firefly's spark detectors are FM approved and insensitive to daylight.

Full-cone water spray extinguishing
Powerful extinguishing designed to penetrate material flow and extinguish sparks and hot particles in the drop chutes.

Firefly IR-flame detector
With the unique 180 degree view angle in all directions, the flame detector makes it possible to detect flames in slots in between the buckets and the wall. Firefly's flame detector are FM approved.

Water mist system
The water mist system inside the elevator will automatically be activated by the flame detectors or by the hot particle detectors at the outlet of the elevator. It can also be activated manually by an operator.

Temperature Sensing
Temperature detection along the rollers etc.

Protection of Filters and Silos

Filter Protection

Dust extraction systems are vital to take care of dust generated in dry bulk handling processes. By limiting the amount of dust, the environment will be improved and the fire risks in bulk handling areas can be reduced.

However, by controlling the dust emissions, new risk zones are created, such as filters/dust collectors. The risk in these units is considered very high due to the high concentration of dust, there of the importance of implementing an appropriate spark detection system.

Silo Protection

Fires in silos are considered a worst case scenario. A silo fire can be started by ignition sources entering the silo, by mechanical failure inside the silo or by self ignition of the material stored in the silo.

Patented True IR detectors

Millisecond detection of hot particles, sparks and flames. Firefly's sparkdetectors are FM approved and insensitive to daylight.

Full-cone water spray extinguishing

Powerful extinguishing with a unique nozzle design and placement aimed to penetrate and cover the entire material flow. Activated within milliseconds after detection.

MGD™ Detector

Firefly's MGD™, a gas analyzer, commonly known as "electronic nose," is designed to detect the earliest stages of a combustion process, for example the self-heating process of an organic material. The MGD™ can be installed in the top of the silo or at the outlet tunnel from the silo to give an early warning of a combustion process inside the silo. Firefly's MGD™ are FM approved.

About Firefly

Firefly is a Swedish company that provides industrial fire prevention and protection systems to the process industry worldwide. Since 1973, Firefly has specialized in creating customized system solutions of the highest technical standards and quality. Based on customer needs and research Firefly has developed and patented products and solutions, creating a unique portfolio of innovative products and system solutions to increase the level of safety.

The company is noted on the OMX/NASDAQ First North Exchange in Stockholm, Sweden and holds national and international approvals on its products. In complement to worldwide sales, Firefly also provides its customers with field service, maintenance and a guaranteed long-term spare part supply.

The Firefly quality management system is certified according to ISO 9001 and EN ISO/IEC 80079-34. Firefly's products hold national and international third party certifications through FM, VdS, CSA, DNV, LCIE Bureau Veritas, Delta and RISE among others.

For more information on our certifications and approvals
please visit: www.firefly.se/en/company/approvals

Do you have a question about the fire and explosion risk in your plant?
Contact us, we are happy to assist you with our knowledge and experience.

Firefly - Keeps you in production

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