



Fire protection solutions
for coal-fired power plants

*Cool down.
Fire Protection by*

MINIMAX

A CLASSIC MODEL

electricity from coal

In recent years, global power requirements have continued to increase. This is not only attributable to industrialisation, particularly in emerging nations, but also to growing electrification. In order to meet the demand, the energy sector is currently embarking on the new construction and rehabilitation of power plants.

Power plants are characterised by their complex overall systems made up of a range of different operating modules. In addition to this, conditions such as extremely hot surfaces and lubricating oils pose huge fire risks.

If the beginnings of a fire in a power plant are not recognised automatically and extinguished immediately, the costs of damage can quickly run up into millions. Even fire damage in a secondary area can cause prolonged down times for the entire power generation process. In coal-fired power plants, in particular, reliable operation is an absolute must, because they are a crucial pillar of the basic energy supply.

In order to protect people, objects and the environment, a sophisticated and made-to-measure fire protection concept is necessary. In power plants, almost the whole spectrum of modern fire protection equipment comes into use. If such equipment comes from one source, fewer interfaces are required, thus ensuring perfect installation and operation.

Minimax has been dedicated to providing power plants with fire protection concepts from one single supplier for over 30 years.



FIRE PROTECTION

Fire protection concepts
recommended by Minimax

Fire protection systems
Sprinkler systems
Minifog water mist systems
Deluge systems
Hydrant systems
Foam systems/monitors
Oxeo inert gas systems (Ar/N₂)
MX 1230 systems (Novec™ 1230)
Fire detection systems¹

Storage and transport of fuels								
Coal stockpile				●	●			●
Coal bunker					●			●
Coal conveyor-belt systems		●	●					●
Energy generation								
Oil tanks			●		●			●
Boiler house				●				●
Burner		●	●					●
Steam turbine including oil chambers/oil ducts		●	●					●
Cable channels, cable rooms/galleries	●	●						●
Electric control rooms						■	●	●
Transformers		●	●					●
Peripherals								
Administration building	●	●		●				●
Server rooms						■	●	●

¹ Where appropriate, with WinGuard (facility management system).



SOLUTIONS FOR

Optimal fire protection in power plants requires specialist solutions for every area to prevent the loss of buildings, valuable equipment and ensuing business interruptions. As a comprehensive supplier for fire protection solutions, Minimax offers a uniquely full range of proven as well as innovative fire protection systems and components that meet the highest standards in every detail and complement each other to form a highly efficient and value-for-money overall solution.

Sprinkler systems: Universal protection

In a wide range of applications where human lives and material assets are to be protected against the effects of fires, Minimax sprinkler systems offer excellent solutions. They detect and notify fires, automatically initiate the water-based suppression process and thus offer reliable protection at all times. Sprinkler systems are highly efficient due to the concept of selective fire fighting: In the event of a fire, only the sprinklers located in immediate proximity to the fire source will be activated. Immediate suppression action using water is taken, while the remaining sprinklers remain closed.

Minifog systems: Fire fighting with water mist

The innovative and efficient Minifog water mist fire fighting systems provide a highly efficient fire protection for certain applications, while reducing water consumption at the same time. In power plants, such water mist suppression systems can be installed in low pressure versions for use at coal conveyor systems, steam turbines and cable channels as well as in office and administrative areas.

Deluge systems: Fast, with overall coverage

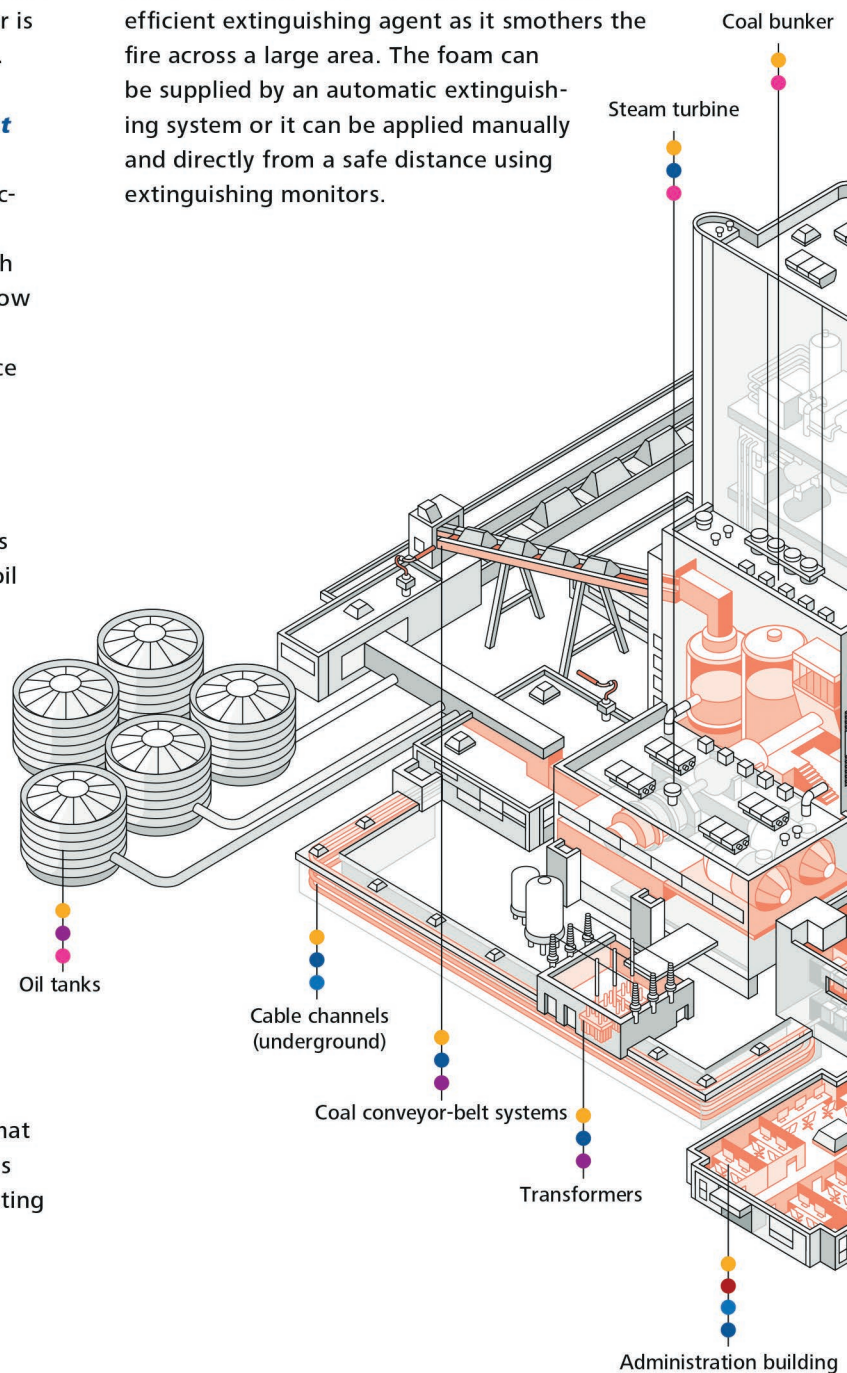
Minimax deluge systems are suitable for use in areas where a fire can spread particularly quickly, e.g. in oil tanks, on coal conveyor systems and transformers. Equipped with hydraulic, pneumatic or electric triggers, deluge systems attack the fire at lightning speed due to the open nozzles. They prevent re-ignition by cooling down the burnt objects. In certain risk areas, a film-forming foaming agent is added to the deluge system to reinforce the suppression effect.

Hydrant systems: Be prepared for action

Wall and external hydrants are merely the visible end of a reliable supply of suppression water. Minimax has reliable water supply components such as filling and draining stations which are also adapted to the local conditions. The Minimax maximat components often assure the safe supply to hydrants and quick intervention from the fire brigades, operating staff or building users

Foam extinguishing systems and extinguishing monitors: When access is difficult

No matter where materials such as oil and coal are stored, there are always specific fire risks. It's not just large quantities that create a hazard, but when solid matter is stored on a stockpile or in a bunker, the trapped air and difficult access from above that present a problem. Foam which penetrates into the stored goods or floats on a liquid fire in a three-dimensional capacity is in this case the most efficient extinguishing agent as it smothers the fire across a large area. The foam can be supplied by an automatic extinguishing system or it can be applied manually and directly from a safe distance using extinguishing monitors.

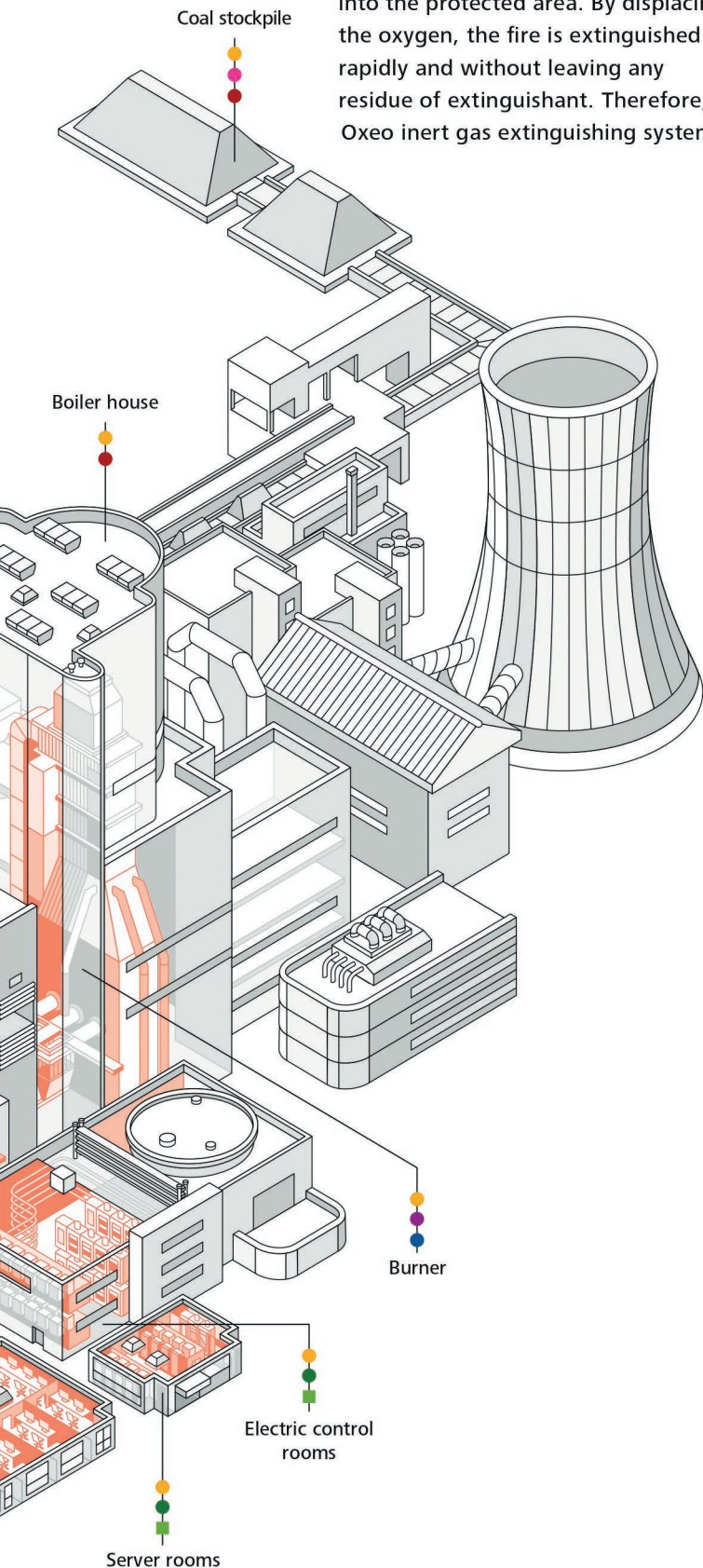


COAL-FIRED power plants

Oxeo inert gas systems:

Residue-free extinguishing

Oxeo extinguishing systems ensure a reduction of the oxygen content in the event of a fire, by introducing inert gases such as argon or nitrogen into the protected area. By displacing the oxygen, the fire is extinguished rapidly and without leaving any residue of extinguishant. Therefore, Oxeo inert gas extinguishing systems



are especially suitable for the protection of high-quality systems, sensitive equipment or valuable assets that might be damaged by the use of non-gaseous extinguishants. Argon and nitrogen are natural components of the ambient air. Moreover, the gases are not harmful for people and electrically non conductive.

MX 1230 chemical extinguishing systems:

Efficient and compact

MX 1230 systems extinguish fires using the chemical extinguishant Novec™ 1230 by 3M™. This extinguishant is neither corrosive nor electrically conductive. It is thus especially suitable for protecting rooms containing electric and electronic equipment. MX 1230 systems, too, extinguish fires without leaving residues on the protected objects, while offering a high level of personal and environmental protection at the same time. They have the added advantage of a particularly compact extinguishant supply; this makes for an attractive solution especially for smaller and medium-sized rooms.

Fire detection systems and suppression system controls: Optimum overview and high flexibility

Flames, smoke, gas emissions, heat – a fire that is spreading is a multi-faceted fire. Minimax has the right type of fire detectors for every kind of fire. All fire detectors transmit their signals to the FMZ 5000 fire detection control panel – taking the short route, via a loop. The FMZ 5000 panel controls alarm devices and transmits alarm notifications to a permanently staffed post and to the fire department. Moreover, it can monitor the available suppression systems continuously for proper functioning and can trigger these systems - except for sprinkler systems - electrically in the event of a fire. The FMZ 5000 also offers additional features such as communication with hazard or facility management systems or via web interfaces with Internet-capable devices.

FUELS

Coal stockpiles and coal bunkers

Coal is stored as a rule outdoors on a stockpile without protection against dampness and moisture. Coal bunkers, on the other hand, provide the means to store the fuel in a dry environment. Coal-fired power plants are often equipped with both storage options.

Risks: Especially damp coal can auto-ignite quickly. This enormously increases the fire hazard on coal stockpiles. In coal bunker, coal dust can create an explosion-prone atmosphere.

Fire protection: In order to provide fire protection for coal storage areas, extinguishing monitors are used, which combat fires from a safe distance and cool objects at risk of ignition as a preventative measure. Depending on the version, the monitors can be aligned with the target manually, electrically or hydraulically by remote control. For outdoor areas, a hydrant system is recommended as well. For monitoring purposes, thermal cameras showing the development of heat in coal stockpiles are used. In coal bunkers, on the other hand, gas emission detectors are used to detect fires. The detectors respond to the carbon monoxide emitted by a fire.



STORAGE

and transport

Coal conveyor-belt systems

Coal is transported on encased belts which run across coal processing stations, such as the coal crushing station, or diversions and junction towers.

Risks: In these areas, which are partly very difficult to access, a fire hazard is mainly created by overheated roller bearings, causing dust particles to ignite, or by sparks generated during maintenance or welding works that easily ignite thermal loads. Damp coal can also ignite and therefore presents significant ignition propensity.

Fire protection: The installation of linear heat detectors, gas emission detectors or multiple criteria detectors in non-visible areas is a necessary protective measure in order to ensure prompt fire detection and activation of the suppression system. The deluge system is a tried and tested solution for such circumstances, given that based on the extremely rapid spreading of coal conveyor fires, immediate and wide-spread activation or extinguishing is

required across the entire protected area. The Minifog ProCon water mist system is an attractive alternative for conveyor systems with top belts and bottom belts. A significant advantage is that this system uses considerably less extinguishing water compared to deluge systems.



Minifog ProCon water mist systems

By using innovative low pressure water mist technology, Minifog ProCon systems offer a particularly efficient way of fighting fires in many power plants areas, e.g. at steam turbines or cable channels. The Minifog ProCon uses up to 70 percent less water than classic deluge systems. Efficient fire protection and low consumption of water reduce down times and business interruptions following a fire to a minimum. In addition, the water mist reduces the ambient temperature during the extinguishing process; this, in turn, is an effective means to protect people.

Minifog ProCon is at the same time a cost-efficient solution, because it uses low-pressure components and can be connected to a classic water suppression system, e.g. to a sprinkler system. In this case, it is not necessary to install a separate pump unit to supply water to the Minifog ProCon.

In its construction and functionality, the Minifog ProCon system resembles a classic deluge system. In the event of a fire, the fire fighting process in the extinguishing zone affected by the fire is initiated by the Minimax fire detection and extinguishing control technology. The water is then finely sprayed through the special ProCon nozzles and can produce the special extinguishing effects of the water mist technology.

A suitable ProCon nozzle is available for each application. Impulse nozzles, nozzles and twin swirl hollow cone nozzles are being used most often. Due to the robust construction and the integrated protective caps, the ProCon nozzles are also suitable for use in rough environmental conditions and areas with a high exposure to dirt or contaminants.

*Detailed Minimax product  information.

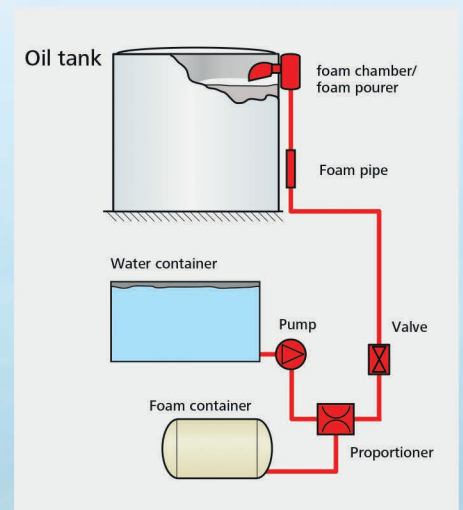


IDEAL PROTECTION

In coal-fired power plants, fuel stored in tanks or fuel oil is used for start-up operations to heat the boiler, before the combustion process is switched to the actual fuel.

Risks: Ignition of the gases in the oil tank, lightning strike or generation of sparks due to electrostatic charges.

Fire protection: In this situation, foam extinguishing systems offer optimal protection due to the MX TankFoam RTK system kit. The system generates low expansion foam, which is applied, in the event of a fire, on to the burning surface of the liquid from above. The foam has an immediate cooling effect, smothers the flames and protects the area already extinguished against a repeated outbreak of the fire. At the same time, the side walls and, if appropriate, the roof of the tank are cooled down with a deluge system.



FOR OILTANKS



MX TankFoam RTK

Foam pipe, foam chamber and foam pourer: These three components adapted for combined use form the „MX TankFoam RTK“ system kit. It produces low expansion foam and is specially designed as fire protection for flammable liquids in fixed roof tanks (including those with floating cover or nitrogen blanketing).

The jet of foam-and-water mixture sprayed with great force in the event of fire sucks in air through the holes in the foam pipe. Due to strong turbulences, low expansion foam is generated. The foam is homogenised in the piping to the foam chamber and undergoes a further qualitative improvement. The foam pressure causes the rupture disc to burst releasing the foam into the tank. The resulting extinguishing foam blanket cuts off the oxygen supply to the flames and prevents re-ignition of the fire.

All common foaming agent concentrates can be used with the RankFoam RTK system kit. Special designs with particular active ingredients can also be supplied.



BOILER HOUSE

Need for effective fire protection

Boiler house

As a rule, the boiler house is located directly adjacent to the machine house with the steam turbine. The specific conditions in boiler houses mean that the area is particularly dirty, e.g. due to coal dust.

Risks: Pollution in the form of coal dust deposits can quickly ignite when sparks are generated. In the event of a fire, extremely rapid spreading is often the consequence.

Fire protection: In order to fight the fire right at the outset, fire extinguishers are installed in plain sight in this area for quick manual extinguishing action. The new generation of Minimax fire extinguishers never fails to impress with its high performance capacity. Alongside the fire extinguishers, a wall hydrant system with corresponding standpipes offers an optimal fire protection solution.

Burner

Two types of burners are located in the burner levels: Firstly, the coal burner for standard operation, where the coal pulverised to dust is burnt and converted to thermal energy in the process; secondly, the oil burner, which is used for the start-up operation, until the coal burner has reached the right temperature for burning coal.

Risk: The fire hazard is concentrated on the level of the oil burners. Oil emerging from leaking hoses or flange connections can easily ignite on the hot surfaces in the area of the burners or at the distribution stations of the oil supply. In these areas, fires can spread extremely quickly with high thermal loads.

Fire protection: Hence, targeted fire fighting action at the source of the fire is especially important at the burner levels. Minimax uses efficient Minifog ProCon water mist systems for these areas. Multiple jet controls secured with sprinkler bulbs ensure that water is only emitted by impulse nozzles in whose vicinity a critical temperature (e.g. 93°C) has been exceeded due to a fire.



Fire extinguishers and wall-mounted hydrants: For immediate manual fire-fighting

To extinguish fires detected early – where appropriate by a fire detection system – fire extinguishers and wall hydrants are installed. Where appropriate, they permit fire brigades, operating staff or users of the building to respond quickly and focussed to a fire. As a rule, both fire extinguishers and wall-mounted hydrants are located in the vicinity of escape and rescue routes. Often a manual call point is also installed in the vicinity, which will trigger a fire alarm if pressed. Wall hydrants are merely the visible end of a reliable supply of water. Minimax has the reliable water supply components such as filling and draining stations which are also adapted to the local conditions.

Maximat components ensure the secure supply of the hydrants. The FMZ 5000 fire detection control panel monitors the functionality of all wall-mounted hydrants and controls the filling and draining station.





AND BURNER

STEAM TURBINES

optimally protected

Whether hydraulically controlled valves, turbines or generator bearings, oil supply pumps, turbine conditioning rooms or oil tank and pipe rooms, all of these sections are part of the steam turbine area.



Risks: The fire hazard emanates from flammable liquids that spread over hot surfaces due to leaks in the lubrication or control oil system.

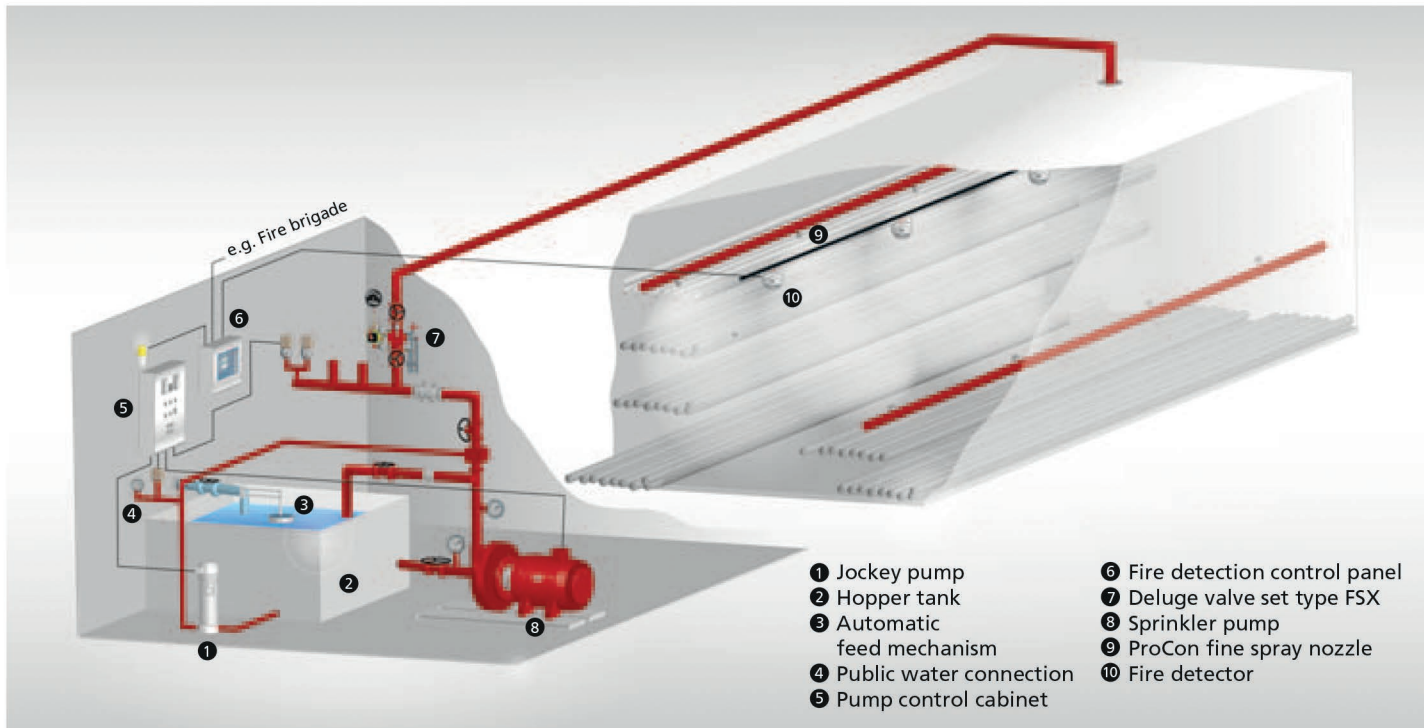
Fire protection: Concerning steam turbines, fire protection focuses on protecting objects in the various sections. In the first place, the intelligent UniVario flame and heat detectors ensure automatic fire detection. They can also be used to monitor processes. Extinguishing is carried out by preference by activating the automatic or semi-automatic spray ProCon water mist system. The substantially lower consumption of water, compared to classical deluge systems, significantly reduces the risk of thermal distortion of hot turbine components (e.g. turbine bearings).



Reliable protection for cable rooms and cable galleries

Risks: The main reason for fires in such spaces is overheating with subsequent short circuits, which usually occur as a result of excess load. At the same time, the enormously high risk of the fire spreading at a very high speed, favoured by the draft air and the numerous cables, must be taken into account. Fire which spreads through winding and often inaccessible cable ducts can quickly cause interruptions to operation in the whole power plants.

Fire protection: In areas where cables are installed, fire detection systems with optical smoke detectors are used. Ideally, active smoke aspirating systems are employed. These systems help to detect fires even earlier. The Minifog ProCon water mist system is used in cable channels as well as in cable rooms and galleries. Designed with impulse nozzles in cable ducts, and with twin swirl hollow cone nozzles in cable rooms and galleries, this water mist system is particularly notable for its minimal consumption of water. The suitability of Minifog ProCon was proven by DMT in several tests.



UniVario intelligent industrial fire detectors can be used even in the most extreme conditions, thanks to its sturdy casing and assembly technology. They respond to infra-red or ultraviolet radiation or to heat. Thanks to their modular concept and use of the latest signal processing technology these devices meet individual specifications in an extraordinarily wide range of uses. They can be used indoors as well as outdoors, and can be directly integrated into a loop.



E-ROOMS

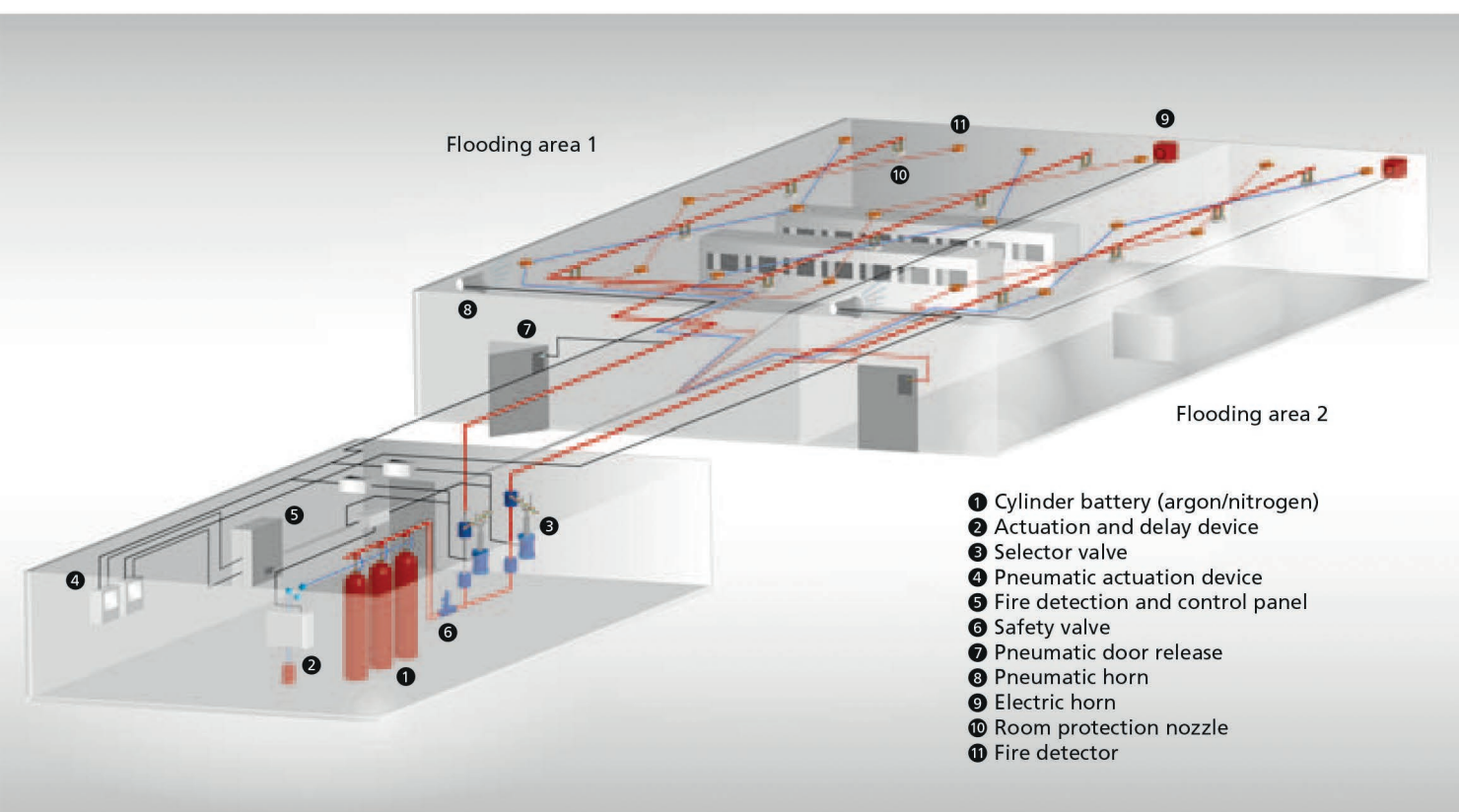
and control rooms protected against fire

E-rooms such as control rooms and systems are extremely sensitive and highly valuable facilities. They serve to control the elementary process in a power plants. This makes them simply indispensable.

Risks: In these locations, fires mainly occur as a result of short circuits caused by overheated cables or electric/electronic components.

Fire protection: Concerning fire protection solutions for these areas, the type of extinguishing solution used is crucial. In order to prevent damage to the facilities through the extinguishing solution, completely residue-

free extinguishing is fundamental. For these areas, Minimax recommends Oxeco inert gas extinguishing systems using argon or nitrogen. Another option is the MX 1230 fire extinguishing system using the Novec™ 1230 extinguishant. Both systems have been especially designed for sensitive rooms and objects and meet all corresponding requirements. A fire detection system with point smoke detectors or a HELIOS AMX5000 smoke aspirating system ensures reliable fire detection at the earliest possible stage.



HELIOS AMX5000 aspirating detector

The latest-generation aspirating smoke detector HELIOS AMX5000 is a highly-sensitive, active smoke detection system. In addition to a pre-signal and contamination assessment, the detector also offers the possibility of adjusting sensitivity in accordance with the unit's use. The Helios AMX5000 detects even the most minute smouldering fire and can be used almost anywhere.



TRANSFORMERS

with optimal fire protection

Transformers make sure that electricity is ready for network distribution. They function as links between the turbine, the turbine generators and the network. They consist typically of the transformer housing with a cooler, expansion deposits and oil-filled insulators.

Risks: The main fire hazard is caused by faults, such as short circuits, within the transformers. This creates a risk of overheating and conditions in which oil can quickly ignite. Older versions of transformers are particularly susceptible to such faults.

Fire protection: As soon as overheating is detected, the transformer is automatically deactivated in order to prevent a fire from breaking out. The basis for the fire

protection is the Buchholz relay. This relay ensures prompt identification of cooling required for components at risk of overheating. A fully-automatic or semi-automatic deluge system developed by Minimax on the basis of the latest research results, protection aims and testing schemes supplement the concept. The special UL-approved nozzles, Viking Model A and Model C-1, achieve an even and consistent distribution of water when activated. In doing so, the system successfully meets the protection aims of "control" and "suppression". At the same time, the consumption of water can be reduced to a level significantly below that of classic deluge systems.



ADMINISTRATION AND IT up to every assignment

Server rooms

IT areas, equipped with computers and servers, which nowadays monitor and control all essential processes, are especially at risk if there is a fire.

Risks: Faulty or overloaded electronic components can easily cause a smouldering fire or open flame fire.

Fire protection: MX 1230 fire extinguishing systems provide ideal protection for server rooms. Fast flooding of the extinguishing zone and reliable, residue-free extinguishing action ensure the best level of protection for sensitive equipment in the event of a fire. Due to the Minimax 50 bar technology, it is also possible to implement multi-zone solutions. Alternatively, Oxeo inert gas extinguishing systems using argon or nitrogen can be used. These systems also extinguish fires quickly and, above all, free of residue. For server rooms, Minimax recommends reliable fire detection at the earliest stage by means of a fire detection system with point smoke detectors or a HELIOS AMX5000 smoke aspirating system.

Administration building

In administration areas, people work above all during the day. As a rule, these areas will be unoccupied for a certain time.

Risks: Overheated, faulty electronic devices are often the cause of fires in administrative buildings. Spreading fires can very quickly affect other parts of the building. It cannot be guaranteed at all times that employees will be present to monitor the occurrence of a fire and to take quick extinguishing action.

Fire protection: Sprinkler systems, as well as fire detection systems, provide proper protection for office and administrative areas. Water-conserving Minifog EconAqua water mist sprinkler systems that can be connected to an existing sprinkler system are also an option. Minifog EconAqua uses significantly less water than classic sprinkler systems. For fast, manual fire fighting action, fire extinguishers, and often also wall hydrant systems, are usually installed in office or administrative areas.



ALL AT A GLANCE

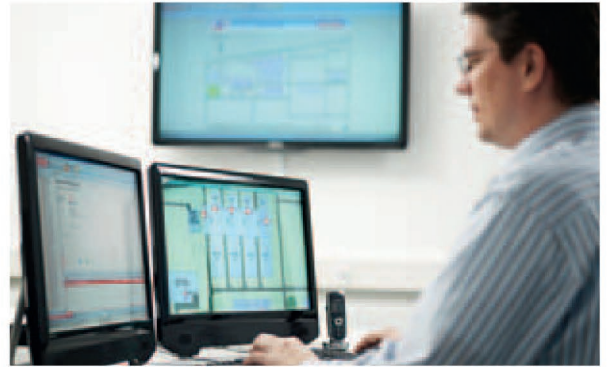
on the safe side

FMZ 5000 Fire detection control panel

The core of active fire protection in a power plant is constituted by the fire detection control panel. This unit collects and registers all fire alarms activated from the manual, smoke, heat and flame detectors and extinguishers distributed throughout the premises. Maximum flexibility is offered by the guideline-compliant FMZ 5000 fire detection control panel:



the technology with freely programmable control and needs-based 'snap and go' function modules makes it possible to adapt this system to all requirements. Of course, it is also available in a ring bus version. Up to 126 participants can be operated on the detector loop. Whether automatic fire detectors, special detectors or UniVario industrial detectors, Minimax has an endless range of models with a variety of response behaviour characteristics for the detection of countless different types of fire.



WinGuard: The PC acts as the fire protection monitor

The WinGuard software displays the fire and hazard detection systems clearly on the PC and is used to control key functions. The system integrates safety and building management, thus offering an ideal monitoring function in power plants with complex system and building structures. With WinGuard, events of the Minimax fire detection and control panels can be transferred. The user sees additional information and help for each message on the screen and can therefore introduce the necessary measures based on the sound information he has received.

Inspection and maintenance: Service for sustainable safety

Regular inspections are a fundamental requirement in order to guarantee the perfect functioning of the fire protection systems whilst ensuring full operational readiness at all times. Minimax service offers the prompt inspection of all fire protection and extinguishing systems in strict accordance with the applicable legislation. Such equipment is checked, maintained and, in the event of a fault, repaired with meticulous care by specially trained Minimax staff members. In addition to system servicing, specific measures and programmes exist to ensure that all protective equipment continues to function correctly and corresponds to the latest technological developments even after years on standby. Legal provisions usually require operators to carry out continuous monitoring procedures on their fire protection systems. If faults are identified, rapid reactions are called for. Minimax offers round-the-clock safety with a sophisticated fault detection management system to ensure that errors and faults are always remedied at top speed, regardless of their location.



REFERENCES

Fire protection solutions for power plants

For over 30 years, Minimax has been committed to developing fire protection solutions especially for power plants. Thanks to the range of product innovations, fire protection technology is regularly adapted to the technical advances made in the energy sector, always in complete accordance with the applicable laws and regulations.



As an integrated solutions provider, Minimax offers everything from one single supplier:

Fire protection advice

Fire protection planning

Sprinkler systems

Deluge systems

Minifog water mist systems

Foam systems/monitors

Oxeo inert gas systems

CO₂ systems

MX 1230 fire systems

Oxeo Prevent oxygen reduction systems

Fire detection systems

HELIOS smoke aspirating systems

UniVario flame and heat detectors

Hydrant systems

Fire extinguishers

Inspection and maintenance

Repairs

Training courses



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