



**MINIMAX**  
Experts in fire protection

## Fire protection solutions for **recycling facilities**

Custom fire protection solutions for every application.

INDUSTRIES

RECYCLING





Fire protection,

that keeps the  
cycle running.

Recycling plants process millions of tons of material on a daily basis: paper, plastic, metal, electronics, e-waste. This gives rise to a variety of fire hazards along the process chain. Sparks from shredders, auto-ignition of stored materials, overheated roller bearings, or faulty lithium-ion batteries are capable of starting a fire that, in the worst-case scenario, can rapidly spread throughout the entire plant via conveyor belts. Minimax develops integrated fire protection concepts for every area of a recycling plant: from the delivery hall to the server room.

What do a lithium-ion battery, an aerosol, a load of cardboard, and a defective compressor have in common? They all end up in recycling plants on a daily basis. Under the wrong conditions, they can all cause a fire.

Recycling plants are complex systems where many risks are present simultaneously. Shredders produce sparks that can ignite materials in the waste stream. Conveyor belts connect all areas of the plant to one another and represent the fastest propagation path in the case of fire. Organic material mixtures can auto-ignite, hydraulic oils in machines create additional fire loads, and overheated roller bearings develop into an ignition source without being noticed. Further dangers are posed by faulty lithium-ion batteries that have not been identified during sorting and become a fire hazard in the shredder. The risks are diverse, difficult to predict, and often present simultaneously.

**There is no safe distance when a fire breaks out at a recycling plant. Combustible material is everywhere, and the conveyor technology automatically transports it onward from station to station. What begins in one area spreads through the entire plant in no time.**

### Consequences for operators

Sprinkler systems that are designed for conventional buildings quickly reach their limits when faced with these risk dynamics. Production downtime lasting weeks, damaged systems, disrupted supply chains: the economic consequences can be potentially ruinous. For this reason, insurance companies require comprehensive fire protection concepts as a basic requisite for insurability.

### Our solution: comprehensive fire protection

Minimax develops integrated protection schemes for recycling plants on the basis of a detailed risk analysis of the entire process chain. Infrared cameras detect heat generation before a fire develops. Spark extinguishing systems stop ignition sources in milliseconds before they spread in the conveyor system. Fire alarm control panels automatically activate fire extinguishing systems. Specialized technologies, such as MXOne fire-fighting turbines or deluge systems with foam proportioning, specifically protect critical process areas. Certified according to VdS and FM Global, the solutions also ensure optimal insurability. Planning, installation, and service are all provided from a single source.

#### We accompany operators from A–Z:



##### Risk analysis & engineering:

Systematically record all risk potentials



##### Planning & system design:

Tailored concepts according to international standards



##### Installation & commissioning:

Professional implementation from a single source



##### Maintenance & upgrades:

Comprehensive service for permanently high operational security



**A recycling plant is not just one protection zone, but many.** Each with their own risk profile, ignition sources, and detection and extinguishing requirements. What works in the delivery hall is of little help in the server room. Minimax understands these differences and develops the right solution for each area: certified, proven, and from a single source.

- ① Delivery area
- ② Mechanical conveyer systems
- ③ Separating and crushing system
- ④ Pneumatic suction and conveyer systems
- ⑤ Sorting cabins
- ⑥ Agglomeration systems
- ⑦ Storage area
- ⑧ Electric, control, and server rooms
- ⑨ Office and administration buildings



- Hydrant systems
- Sprinkler systems
- Deluge systems
- Minifog water mist systems
- MXOne™ extinguishing turbine

- Fire detection and suppression control systems
- Oxeo inert gas systems (Ar/N<sub>2</sub>)
- MX 1230 extinguishing systems
- Spark extinguishing systems
- Foam-based suppression systems



## Delivery & storage areas

1

What is delivered is not always what is stated on the delivery note. Faulty batteries, aerosols, auto-igniting mixtures: the delivered material comes with its own risks, whether stored indoors or outdoors.

### Risks

- Delivery of risky products (aerosols, lithium-ion batteries)
- Smoldering fires in delivered material
- Auto-ignition of stored materials
- Potentially explosive atmosphere due to dust

### Fire protection

Infrared cameras monitor every storage area around the clock. If a camera detects a hot spot, the MXOne firefighting turbine or a fire monitor is automatically aimed towards the source and fights it with water mist or foam. Internal storage areas are additionally protected by sprinkler or deluge systems. Wall hydrants are available for a rapid initial manual response.



## Mechanical conveyor systems

2

Literally nothing runs in a recycling plant without conveyor belts. They connect all areas of the plant to one another and reliably transport recyclable material from station to station. In the case of fire, this is precisely the problem.

### Risks

- Overheated roller bearings
- Sparks generated during maintenance or welding work
- Auto-ignition of conveyed material

### Fire protection

Because fires spread rapidly on conveyor belts, a rapid, comprehensive response is required. UniVario flame detectors and multisensor combustion gas detectors reliably detect fires at an early stage. Deluge systems immediately carry out suppression across the entire protection zone. Minifog ProCon water mist systems are an effective alternative for the direct protection of conveyor systems.



## Sorting cabins

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Here, people carry out what machines are not yet capable of: the precise pre-sorting of recyclables and sub-fractions. Sorting cabins are enclosed areas where conveyor belts pass through and people work. For fire protection, this means: life safety is the top priority here.

### Risks

- Defective electrical ventilation or air-conditioning units
- Overheated roller bearings in mechanical conveyor systems
- Ignition of dust particles

### Fire protection

In sorting cabins where people and conveyor belts work together in a confined space, sprinkler systems provide reliable basic protection. Fire extinguishers and wall hydrants are available for a rapid initial response. A fire detection system raises an early alarm and thus protects people at their workstations.



## Separation & shredding

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Shredders, grinders, magnets, wind sifters: In the separation and shredding area, it gets loud, cramped, and intense. A lot of material in little space, a lot of friction, many sparks. Consequently, the fire load is quite high.

### Risks

- Overheated roller bearings or compressors with a technical fault
- Sparks during maintenance and welding work
- Auto-ignition of conveyed material
- High concentration of material in a small space and therefore high fire load

### Fire protection

UniVario flame detectors and multisensor combustion gas detectors reliably detect fires at an early stage, even under the toughest process conditions. Deluge systems with fluorine-free foam concentrate have proven particularly effective for this risk profile. The fire alarm control panel additionally ensures that nobody in the plant is caught off guard in an emergency.



## Pneumatic suction & conveyor systems

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In recycling plants, air transports more than just material. In pneumatic suction and conveyor systems, sparks, hot particles, and glowing embers travel through the entire system. The increased fire risk comes along for free, so to speak.

### Risks

- Sparks, hot particles, or glowing embers from processing machines that reach conveying systems
- Dust explosions

### Fire protection

Minimax spark extinguishing systems are the first choice here. Spark detectors identify sparks and glowing particles in milliseconds and activate the extinguishing unit. Self-closing nozzles spray water directly into the conveyor flow. The glowing particles come into contact with the water spray curtain, the fire is stopped, and operation continues.



## Agglomeration systems

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Materials that were previously carefully separated are bundled together by baling presses and briquetting systems. This makes sense. The fact that the hydraulic systems used develop leakages and can release flammable liquids, less so.

### Risks

- Deposits of hydraulic and thermal oils from processing machines
- Leakages in oil-carrying lines
- Ignition of combustible liquids on hot surfaces

### Fire protection

UniVario flame detectors detect fires quickly and immediately send a signal to the fire alarm control panel, which activates the fire extinguishing system. Deluge systems with foam proportioning effectively protect hydraulic systems in the machines. Where space is limited, Minifog ProCon water mist systems are the better option.



## Electrical, control, & server rooms

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If the control center fails, everything comes to a halt. Servers, switchgears, electrical rooms, and control stations are the recycling plant's nerve system. This is where all threads come together. A fire in this area is not a local problem, but a plant-wide one.

### Risks

- Short circuits
- Overheating of technical equipment
- Highly flammable materials
- Significant damage, including from small fires

### Fire protection

Here, servers, switchgears, and sensitive electronics are the protected objects. The extinguishing agent must not damage anything left untouched by the fire. Oxeo inert gas extinguishing systems with argon or nitrogen extinguish fires without leaving residues and without endangering people. For small rooms, MX 1230 with the extinguishing agent FK 5-1-12 is the right choice.



## Office & administrative buildings

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Offices may seem unspectacular compared with shredders or conveyor belts. But fires also occur there: due to short circuits, overheated devices, and unattended batteries. And at night, when the employees are gone, nobody is there to notice them.

### Risks

- Defective electrical devices, computers, or printers
- Overheating of illumination
- Short circuits in machines

### Fire protection

Minifog EconAqua water mist suppression systems require little space, little water, and can be connected directly to an existing sprinkler system. With ceiling heights of over 5 meters, protection is provided by traditional sprinkler systems. Fire detection and fire alarm systems ensure early alerting. Wall hydrants and fire extinguishers are available for an initial manual intervention.



## Fire protection solutions faster than the fire itself.



**A lithium-ion battery that was not separated during the manual pre-sorting process lands on the conveyor belt. It happens. Every day. At virtually all recycling plants. Usually without consequences. But not this evening.**

The battery began to thermally discharge. The surface temperature rose to a critical level within a few minutes. No visible flame, no smoke, no alarm. A conventional fire detection system would have nothing to report at this point in time. Lithium-ion batteries are an insidious source of fire: their thermal runaway begins invisibly, develops rapidly, and is often identified too late with conventional fire detection. In recycling plants where hundreds of such batteries show up in the material stream every day, this is not an exceptional situation. It is a daily occurrence and requires a response that is faster than the fire itself.

The Minimax concept for this plant consisted of two core components. Infrared cameras monitored all areas at risk of fire around the clock. They detect heat generation before a fire can develop and transmit signals to the fire alarm control panel in real time. The MXOne firefighting turbine was assembled in an elevated position above the conveying area and was automatically and precisely directed towards the identified heat source on the basis of the camera coordinates.

No human intervention required. No loss of time.

Water mist reached the hot spot shortly after initial detection. The battery cooled down. Thermal runaway was stopped. The conveyor belt continued to run.

No production stop. No intervention by the fire department. No consequential damage. The shift supervisors were informed. The system took care of everything else autonomously. If the infrared camera had not responded, the battery would have continued moving through the process until an open flame on a fully loaded conveyor belt made the decision. Operators know what comes next: production downtime lasting weeks, millions in property damage, disrupted supply chains. And questions from the insurance company that nobody enjoys answering.

This is not an isolated case or a coincidence. It is the result of a detailed risk analysis, a protection scheme tailored to the conditions, and two technologies that work together: infrared detection and MXOne extinguishing. Both are certified, FM Global-approved, and planned, installed, and maintained from a single source. Anyone who takes this for granted has never experienced the damage an ignited battery on a running conveyor belt can cause in just a few minutes.

**Recycling plants do not need universal protection. They require precise protection:**

individually tailored to every area, every risk profile, and every potential ignition source.

To this end, Minimax offers a unique portfolio of certified systems from its own development and manufacturing facilities.

Over 120 years of experience in fire protection have gone into a product range that was developed for the extreme conditions of recycling plants and has prevailed in practice — from the delivery hall through sorting cabins and conveyor belts to the server room.

**Early detection:** Infrared cameras detect heat generation before a fire develops. Function-monitored spark detectors with integrated optical monitoring stop glowing particles in milliseconds – already in the pneumatic conveyor section – before they can cause damage. HELIOS smoke aspiration systems detect even the smallest smoldering fires at an early stage by means of active aspiration and analyses of air samples directly from the protection zone. UniVario industrial fire detectors work under the toughest operating conditions and detect flames, smoke, fire gases, and heat equally reliably, whether indoors or outdoors. All signals converge in the fire detection and suppression control panel, which automatically responds, issues an alarm, and electrically activates all fire extinguishing systems in a coordinated manner.

**Water-based suppression:** Deluge and sprinkler systems provide comprehensive protection for storage areas and conveyor systems, if necessary with a fluorine-free foam concentrate. Minifog water mist systems efficiently protect facilities using minimal quantities of extinguishing water and reduce potential consequential damage by water to a minimum. The MXOne fire-fighting turbine is designed for remote fire fighting

in large areas and hard-to-reach hot spots: With a flow rate of up to 6,500 liters per minute and a range distance of up to 100 meters, it sets international standards. FM-certified. And it can also be assembled on a tower or platform or portably on a trailer by request.

**Foam and gas:** Fluorine-free foam-based suppression systems reliably protect areas with elevated risks due to combustible liquids and prevent re-ignition. Oxeo inert gas extinguishing systems with argon or nitrogen as well as MX 1230 fire extinguishing systems with the extinguishing agent FK 5-1-12 protect sensitive electrical and server rooms without leaving any residues and without endangering people or sensitive equipment.

**Other technologies:** Smoke and heat extraction systems secure escape and emergency routes and prevent explosive flashovers. Fire extinguishers and wall hydrants are available for an initial manual response by personnel and the fire department. Structural fire protection reliably limits how quickly and how far a fire spreads by means of fire compartments, protective glazing, fire protection gates, and coatings.

**What all systems have in common:** They were not developed for standard applications, but for the specific conditions under which recycling plants work on a daily basis. Risk analysis, planning, installation, and ongoing service: all from a single source, tailored to the requirements of operators, insurance companies, and authorities.



# Everything for the **moment** when it matters.

Whether water-based suppression systems, gas-based extinguishing systems, fire prevention systems, or fire detection systems: Minimax can draw on a unique range of tested and certified components and systems from its own development and production facilities.



**FIRE**

1 detector group in alarm

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FMZ6000





**Fire detection systems:** Flames, smoke, fire gases, heat: a fire has many faces. Minimax has the right detectors for each manifestation and every ambient condition. All signals converge in the fire alarm control panel. From there, people and the fire department are alerted, authorities are informed, and all connected fire extinguishing systems are automatically activated in the case of fire.

*Applications: Entire facility*



**Fire detection and suppression control panels** are at the heart of active fire protection. They receive signals from detectors, alert authorities and the fire department, and automatically activate fire extinguishing systems in the case of fire. The functional conditions of all connected systems are continuously monitored. Minimax offers control panels for all system sizes: from the compact solution for smaller zones to high-performance large-scale systems.

*Applications: Entire facility*



**UniVario industrial fire detectors** work anywhere: indoors, outdoors, at close range, and from a distance. In clean areas as well as under the toughest conditions or in explosion zones. Flames, smoke, fire gases, heat: they detect every manifestation of a fire. Their modular design makes them the right detector for virtually every area of a recycling plant.

*Applications: Entire facility*



**Spark detectors with integrated optical monitoring:** Spark detectors identify sparks and glowing particles in pneumatic suction and conveyor systems in milliseconds. The signal activates the extinguishing unit immediately: self-closing nozzles spray water precisely into the conveyor flow. Glowing particles are extinguished before they can spread. Operation continues.

*Applications: Pneumatic extraction and conveying systems*

**HELIOS AMX5000 smoke aspiration systems** detect even the smallest smoldering fires before they become visible. The system actively takes air samples from the protection zone and analyses them in a measuring chamber for various signs of fire. In this way, the detectors reliably identify fires at an early stage before they pose a real danger. Their sensitivity can be individually adjusted according to the environment.

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*Applications: Entire facility*



**Infrared cameras** can detect thermal radiation and thus identify critical temperature changes. They send alarm signals directly to the fire alarm control panel, which initiates further action. Mounting the cameras on pan-tilt systems enables efficient monitoring of particularly large areas, even outdoors or in hazardous locations.

In the event of smoke development, the thermal image provides a significantly better view of the source of the fire, thereby supporting effective firefighting.

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*Applications: Entire facility*



**Inveron hazard management systems:** Inveron brings all messages and events from fire detection, extinguishing, and alarm systems together in a single user interface. All signals automatically converge there and are clearly displayed on the screen. Particularly in large, complex systems, Inveron maintains an overview. To do so, the system provides the operator with clear information and recommended actions for every event.

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*Applications: Entire facility*





**Sprinkler systems** detect and suppress fires immediately and autonomously. In the process, only the sprinklers located directly above the source of fire are opened. This saves water and limits consequential damage. Where appropriate, a foam concentrate can be added to the water to significantly increase the extinguishing effect.

*Applications: Delivery areas, storage areas, sorting bays, office and administrative buildings*



**Deluge systems** evenly flood the entire protection zone with extinguishing water. They immediately respond to fires that are spreading rapidly. They can also be used in a targeted manner so only a particular area is cooled or protected with a water spray curtain. Where necessary, a foam concentrate can be added to the water to increase the extinguishing effect.

*Applications: Receiving, storage areas, mechanical conveyor systems, separation and shredding*



**Minifog EconAqua water mist sprinkler systems** protect buildings with low-pressure water mist: efficient, space-saving, and with up to 85 % less water than conventional sprinkler systems. Water damage is kept to a minimum. The compact control panel can be directly connected to an existing sprinkler system. This makes EconAqua the ideal solution for retrofitting existing buildings.

*Applications: Sorting booths, office and administrative buildings*



**Minifog ProCon water mist suppression systems** spray water so finely through increased operating pressure that it evaporates within seconds. This combined cooling and oxygen displacement effect effectively suppresses fires with significantly less water than conventional deluge systems. Less water means less consequential damage. Depending on the application, different system variants are available for conveyor systems, machines, and equipment.

*Applications: Mechanical conveying systems, separation and crushing, agglomeration systems*

**Hydrant systems:** Wall hydrants and outdoor hydrants are the fastest way for the fire department and personnel to access extinguishing water in an emergency. There is more to this than meets the eye: pump systems and underground pipework, which are tailored to local conditions, maintain the pressure and permanently guarantee the supply. The system simply has to work when it matters.

*Applications: Delivery areas, storage areas, sorting bays, office and administrative buildings*



**MXOne firefighting turbine:** The MXOne fights fires from a distance of up to 100 meters. It hits its target even in strong headwinds: a propeller and intelligent control system ensure that the water jet is delivered precisely even under adverse conditions. With a flow rate of up to 6,500 liters per minute, the MXOne sets international standards. It works with town water, salt water, and fluorine-free foam concentrate and can be adjusted from a fine mist to a full jet. FM-certified.

Optionally, the MXOne can be portably assembled on a trailer or elevated on a tower or platform — indoors or outdoors. The higher the position, the greater the range distance and effective radius. This is particularly important when outdoor storage facilities or hard-to-reach areas are to be protected.

*Applications: Delivery areas, storage areas, outdoor areas*





**Foam based suppression systems:** In the case of fire, fluorine-free foam-based suppression systems extensively distribute foam over burning material via foam makers, monitors, sprinklers, or nozzles. The foam settles on the burning material, suffocates the fire, and reliably prevents re-ignition. The foaming ratio can be adjusted from low to extremely high according to the respective risk profile. Particularly suitable for areas with combustible liquids or plastics.

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*Applications: Delivery, storage areas*



**MX 1230 fire extinguishing systems** use FK 5-1-12 as the extinguishing agent: non-corrosive, electrically non-conductive, and ideal for rooms with electronic and electrical equipment. The system extinguishes without leaving residues and without endangering people or the environment causes no secondary damage on the sensitive equipment. Particularly suitable for small and medium-sized rooms. The extinguishing agent can be stored in a space-saving manner directly in the room or in an adjacent area.

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*Applications: Server rooms, electrical rooms, and switch rooms*



**Oxeo inert gas extinguishing systems** use argon or nitrogen to reduce the oxygen concentration in the air. The fire is extinguished before it can spread. Both gases are natural components of the air that are non-toxic, non-conductive, and residue-free. Servers, switch-gears, and sensitive electronics are undamaged, and people are not endangered.

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*Applications: Server rooms, electrical rooms, and switch rooms*

**Smoke and heat extraction systems:** In the case of fire, smoke and heat are more deadly than the flames themselves. Smoke and heat extraction systems therefore keep escape and emergency routes clear and make firefighting operations much easier. Pneumatic or electrical drives automatically open skylights and windows or activate extraction systems. Smoke, heat, and explosive flashovers are diverted before they can spread. Activation is carried out manually or automatically.

*Applications: Entire facility*



**Fire extinguishers:** Minimax portable fire extinguishers use water, foam, powder, or even carbon dioxide as the extinguishing agent and cover fire classes A, B, C, D, and F. In the case of fire, people can intervene immediately and prevent a fire from spreading before it develops. The entire range is developed and produced in-house and is available for systems of all sizes. Anyone who carries out regular maintenance will not be caught off guard in an emergency.

*Applications: Entire facility*

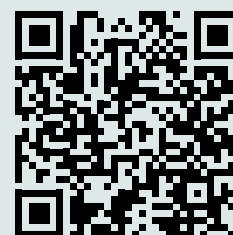


**Structural fire protection** takes effect before the first spark flies: through construction, materials, and room partitioning. Fire and smoke protection doors, fire-resistant glazing, fire protection gates, and protective coatings for steel structures limit how far and how quickly a fire can spread. Minimax solutions for ventilation systems additionally prevent smoke and fire gases from spreading via ducts and shafts in the building.

*Applications: Entire facility*



Learn more about our technologies at  
[www.minimax.com/technologies](http://www.minimax.com/technologies)



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Minimax GmbH &  
Minimax Fire Solutions  
International GmbH

Industriestraße 10/12  
23840 Bad Oldesloe  
Germany  
+49 4531 803-0  
recycling@minimax.de

**minimax.com**

**Visit us online:**

