FIRE IN A GOODS SHIPPING BUILDING

01/10/2021

Crissey (Saône-et-Loire)

France

Fire
Scaling
Extinguishment
Training

THE FACILITIES

The site:

The site is a specialised product warehousing and storage centre. It is classified Seveso Upper Tier under the regulations covering facilities classified for protection of the environment. It is located in an industrial park and surrounded by other industrial facilities. The closest homes are located approximately 450m from the boundary lines. It is an approx. 23-hectare site including logistics warehouses, mechanical workshops, and an administrative building housing both parcel and express delivery business lines.

The unit:

The incident occurred in a building that had been acceptance-tested a year and a half earlier and housed the group's headquarters, including administrative, sales, and IT business lines (featuring a dedicated computer server room) and also a transit hub for both the parcel and express delivery transport business lines.

The building was built on a reserved area of group-owned land located near logistics warehouses housing business lines including hazardous substance storage, which resulted in the site being classified Seveso Upper Tier. The building has a reinforced concrete infrastructure and a steel frame.

This building is physically separated from the logistics section by fences and access barriers.

The building has 2 sections : one is a transit hub section (including a parcel delivery - mail unit) which has a floor area of 8,000m² and is on one floor, and the second section assigned for offices has a floor area of 600m² spread across 3 floors

The transport business lines, known as mail and express lines, are relatively similar business lines: the main differences come down to delivery lead times and the characteristics of the packaging of the products sent, ranging from parcels to pallets.

The type of products managed by the transport business lines is varied and can include hazardous products.

130 employees work on the site, which has the following opening hours:

- Monday: 04.00-19.30 / 22.00-00.00;
- Tuesday to Friday: 24h/day
- Saturday: 00.00 - 13.00.

The building features 113 loading docks.

The building is equipped with a fire detection system. The parcel delivery dock is equipped with 24 pairs of optical linear smoke detectors. There are also dome cameras and video is recorded in another logistics building.

The building is also equipped with an intrusion detection system.

All alarms, whether fire or intrusion, are transferred to a remote monitoring company.

In terms of fire safety systems, the building does not have a sprinkler system. The transit hub features fire hose cabinets and extinguishers. Smoke is extracted from the transit hub via vents built into the central section of the barrel vault rooflight, covering 2% of the roof's total surface area.

THE ACCIDENT, ITS CHRONOLOGY, EFFECTS AND CONSEQUENCES

The accident:

On the morning of Saturday 20 November, a fire broke out at the transit hub.

The chronology of the event is described below.

Between 07.45 and 08.15, the drivers who had started their shift at 07.00 to load their distribution vehicles, left the site.

At approx. 08.20, parcel delivery dock workers, who had started work between 22.00 and 00.15, left the site. Freight requiring unloading was unloaded and sorted into the right delivery round bays. When staff left, the dock was tidied, and its sectional doors were closed. Employees did not notice anything unusual.

At approx. 08.30, the final handler left the site. A single employee stayed on site: the “trucking” manager. They had to finish computerising round data, carry out job-related administrative tasks, answer telephone calls, welcome anybody who came to pick up their parcels on site, and finally debrief drivers, who can return as early as 11.00.

At approx. 10.00, someone visited the site to pick up a parcel when the alarm went off for the first time. The employee thought it was the “intrusion” detection system alarm and, as they couldn’t shut it off, called the operations manager.

At the same time, the remote monitoring company detected the fire alarm. It attempted to contact the site by telephone. However, the employee did not hear the telephone ringing as the noise was drowned out by the alarm.

Following the instructions issued, the remote monitoring company triggered a response from the safety company, requesting verification.

At 10.15, the alarm went off for a second time. The employee, who was located in the eastern section of the building, noticed smoke at the other end of the dock, in the western section. They reported this to their operations manager and external emergency services by telephone.

At 10.17, the operations manager reported the incident to the group safety manager.

At 10.22, the safety manager arrived at the site’s offices. They took stock of the people located on site with the employee. They noticed thick smoke in the dock and, as a result, considered that it was not possible for them to respond and attempt to bring the incident under control or contain it while waiting for external emergency services to arrive. The security company employee tasked by the remote monitoring company with verification arrived at the same time.

At 10.24, the safety manager called the group’s emergency number requesting that all the members of the emergency unit be contacted and told about the fire ongoing in the building.

The safety manager and the “trucking” manager left the offices and began to move various trucks located on the building’s loading docks further away.

The main firefighting water retention basin valve was closed to isolate it.

At approx. 10.30, external emergency services arrived. Flames began to emerge from the roof.

The fire then spread to the transit dock, setting light to docked vehicles.

Thick black smoke rose, and explosions were heard.

Around 100 firefighters and approx. 50 emergency vehicles were called out to fight the fire from all across the department.

ENGIE (electricity supplier) cut off the building’s general power supply.

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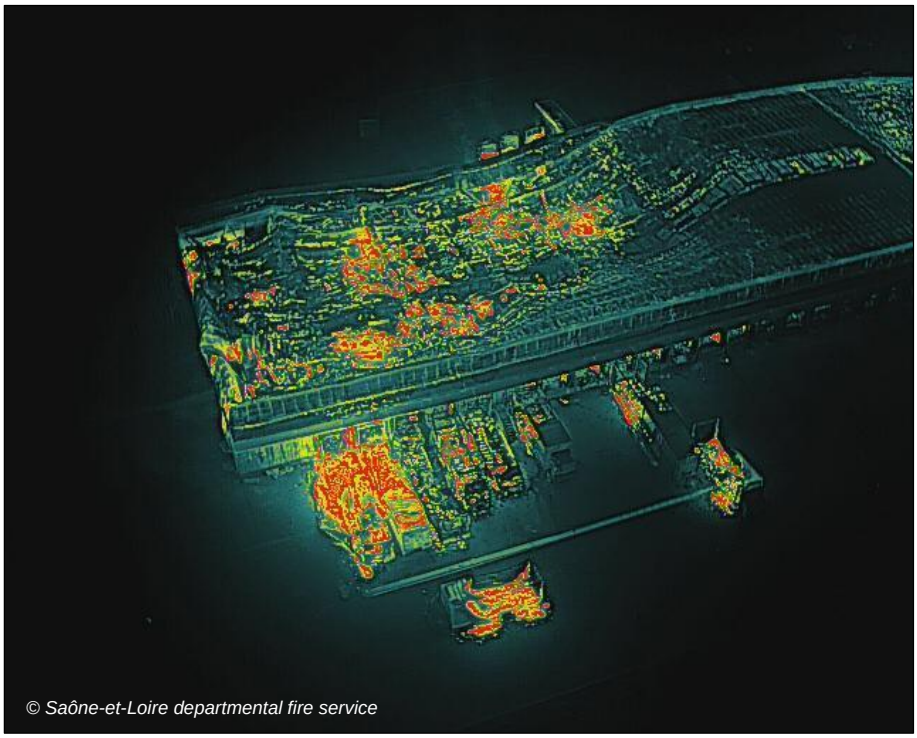
At approx. 11.00, the road running past the building was closed by the police department and a diversion was put in place. Four nearby homes were locked down as a safety measure.

The Departmental Operations Centre (DOC) was set up at the Prefecture. A Command Centre was set up with the deputy prefect. The mayors of the three affected municipalities were in attendance.

A government press release was issued.



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At approx. 13.00, emergency services considered that the situation was under control, but the fire had not yet been put out. The buildings with the highest risk potential (due to storage of hazardous substances) were not affected.

Initial atmospheric analyses did not demonstrate any risk for public health and the environment.

At approx. 14.00, a further government press release was issued. The DOC was shut down.

At approx. 17.30, the closed road was re-opened to traffic.

Monitoring teams stayed in place all night and for the next two days to make sure no fires broke out again.

The next day, part of the site's employees moved and cleaned equipment. Security guards protected the site. All the offices' external windows that were damaged by the fire are condemned. There are closed with screwed boards to avoid any intrusion.

Two days after, the "express" service started delivering again. An all-staff memo was sent to all employees working on the site to inform them of the hazards and risks due to the fire.

Three days after the incident, the parcel delivery business line started up again.

Four days after the incident, the fence that had been cut by the emergency services to access fire hydrants on the northern side was repaired to shut the site off again and prevent unauthorised access. The emergency services confirmed that there was no longer any risk of fire breaking out again.

The week after the fire, the police department flew over the site with a drone and brought a dog specialised in identifying accelerating agents to determine whether the origin of the fire was criminal.

Thirteen days later, signs were set up outside the burnt-out building to prevent unauthorised access to the site and highlight hazards. Smoke was observed again on the dock. External emergency services were alerted. It was rising from a section of a wooden beam that was hot enough to smoke. The emergency services sprayed and removed the wood to stop it from smoking further.

All the vehicle bodies and waste on the traffic lanes were removed. The lanes were cleaned.

Modelling of the smoke plume and the investigation of possible impacts to the ground by the combustion residues contained in the fumes are carried out by the operator

The consequences:

The incident did not cause injuries to any of the business's employees. One member of the external emergency services sustained a minor shoulder injury during the response. Their condition did not require them to be taken to the hospital.

Major damage to the building was observed. On the eastern side, no damage to the gable was observed. However, on the western side, the gable was seriously affected by the heat. The southern side of the building was also seriously affected. In terms of the roof, the central zone and the western zone collapsed but the eastern zone and the offices zone sustained no or only minor damage. Overall, the operator estimated that 85% of the hub was destroyed. N.B.: on the north-western side of the building, a 12m length of cladding fell flat on the tarmac. This type of wall is usually expected to collapse inwards.

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Damage was also observed in the administrative and operations offices, rendering them unusable in their current condition.

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Twenty-two 12T trucks and seven HGV trailers were destroyed. N.B.: a certain number of vehicles were not docked but out for delivery.

All the goods at the transit hub were destroyed during the incident. As the fire occurred on a Saturday, the docks were under maximum load but there was still some free floor space. N.B.: on this hub, freight is placed on the floor rather than being stacked. The computer records demonstrated that more than 250 tonnes of varied goods were on site during the incident, including 3.7 tonnes of hazardous substances (particularly including flammable liquids).

All the dock equipment (trolleys, pallet trucks, chargers, etc.) was also destroyed.

Other consequences of the event included operating cost overruns and loss of sales.

Overall, the amount of the claim was estimated to have cost €15m.

In terms of environmental effects, the firefighting water did not generate any impact on the external environment. As a matter of fact, the valve to shut off the main firefighting water retention basin was closed very quickly after the start of the incident and the basin covered with a geotextile, and a watertight geomembrane meant that the firefighting water could be contained.

This firefighting water underwent physical and chemical analyses to determine the appropriate treatment method. 134 tank trucks were mobilised over two weeks to pump off and transport 3,877 tonnes of contaminated water.

1,732 tonnes of sludge at the bottom of the basin were disposed of once all site waste (burned out vehicles bodies, etc) has been removed, the strucutre of the hub has been completely / fully demolished and the surrounding has been cleaned. The operations were completed at the end of April 2022.

As for the fumes from the fire, the operator arranged for a study to assess the toxic effects of the fumes. This demonstrated that there were no toxic effects beyond the boundary lines. In terms of effects due to unburned particles, the report specified that it was likely that no significant effect had been perceived during the fire. The operator also stated that on the day after the fire no traces of soot were detected in the surroundings except for a few minor traces identified by the departmental fire service. These traces were washed off by a rainy episode before the operator became aware of them.

European industrial accident scale:

By applying the rating rules applicable to the 18 parameters of the scale officially adopted in February 1994 by the Member States' Competent Authority Committee for implementing the "SEVESO" Directive and in light of available information, this accident can be characterised by the four following indexes:

- ■ □ □ □ □ □ — Dangerous materials released
- □ □ □ □ □ □ — Human and social consequences
- □ □ □ □ □ □ — Environmental consequences
- ■ ■ ■ ■ □ □ — Economic consequences

The parameters composing these indices and their rating methodology are available here.

Based on parameter €15, relating to on-site property damage, the accident was rated 4 for economic consequences. It was therefore a major accident in accordance with the Seveso directive.

THE ORIGIN, CAUSES AND CIRCUMSTANCES SURROUNDING THIS ACCIDENT

Analysis of the remote monitoring video recordings and the alarm transfer demonstrated that the fire broke out inside the building in the western zone. The fire spread from the western side to the eastern side, ending up by the offices. N.B.: a freight-free zone in the middle of the building was spared by the fire. The south end of the building was spared from the fire.
The expert investigation demonstrated that the most probable primary cause of this incident was an issue with a pallet truck lithium-ion battery and its charger.
The battery might have been involved in a collision, or a cardboard box positioned in front of the charging base blocked the vents and caused a progressive temperature increase during charging. However, the expert did not rule out a product safety fault.
Two years before the incident, the site had been equipped with electrical pallet trucks for delivery drivers.
15 devices were on site on the day of the fire (including four additional batteries so some devices could be used day and night).
In the building, wooden guards, held by metal bases, were added to protect the columns of the structure. On some of these guards, iron plates were installed to hold electrical pallet truck chargers.
On the day of the fire, the video monitoring camera recordings demonstrated that the charger was not set up on one of the bases but placed directly on the ground, behind the wooden guard.
As a matter of fact, the equipment is allocated to a specific worker and the driver in question is a versatile driver who therefore charges its equipment depending on the bay allocated.
Analysis of the video monitoring camera recordings also demonstrated that the driver placed a parcel near the charger without nevertheless demonstrating whether this parcel was in physical contact with the charger/battery set.
This analysis also demonstrated that this zone was not significantly cluttered, and that the driver did in fact check before leaving the premises.
According to the operator, electrical pallet trucks are only maintained if they break down and this maintenance only covers pallet trucks and their equipment. It does not cover either charging bases or batteries.

The operator had not brought this new construction to the attention of the Inspection authorities for classified facilities. It should be noted that the State was officially informed of the construction of this building within the framework of an application for environmental authorization submitted by the operator for another building 5 months before the incident. The Inspection authorities for classified facilities had issued a request for additional information prior to the incident.

The department examining the building permit application for this building did not send the accessibility and external fire safety protection systems files to the Saône-et-Loire departmental fire service (SDIS 71). SDIS 71 learned about the building during a visit to the premises two months earlier and had mentioned that there were no water supply facilities for this building, particularly no water supply facility less than 100 metres from the building's main entrance (administrative section), and no water supply facility accessible to the west of the building. Water need had been calculated following the visit and was estimated to be 500m^3/h, according to the recommendations of the practical guide providing assistance with scaling water needs for external fire safety systems (D9). At the time of the incident, the departmental fire service was awaiting simultaneous flow rate measurements for the fire hydrants in the zone before suggesting a technical solution.
During the accident and given there was no water supply facility to the north of the building where the first engines focused their actions, water supply facilities in the sector were identified. The first engines were supplied via a private fire hydrant belonging to a neighbouring company located 200m from the engine. Next, a vehicle equipped with a very high-power foam cannon featuring a 11,000L water tank and a high-capacity unit (12,000L of water) were used to supply a crane-mounted hose until all the supply lines could be set up. As a precaution, the hydraulic system was secured by setting up lines between the site's own tank and the one on a neighbouring site. As the system meant the system's hydraulic capacity could be maintained, these media were not primed.
N.B.: furthermore, one fire hydrant was non-compliant and non-operational during the incident, because its flow rate was below 30m³/h under a dynamic pressure of 1 bar (26 m³/h). Another hydrant had also been moved and not reconnected to the municipal system by the service provider tasked with doing so, meaning it did not discharge any water on the day of the fire.

ACTIONS TAKEN

Although no employees were injured during the incident, the operator deemed that such an event could have had psychological consequences on employees, and actions were taken to (a) identify anyone who may have been affected, (b) inform the different heads of departments of signs of psychological distress, and (c) inform all employees that they could ask to see a psychologist.

Following the event, the site encountered a rainy episode, which caused on-site issues over how to manage the firefighting water. As a matter of fact, the firefighting water was contained in a basin used not only to regulate discharges of rainwater into the external environment, but also as a basin to retain firefighting water and, as appropriate, retain pollution due to storage of hazardous substances.

As a result, the operator decided to create a new buffer basin to collect and channel uncontaminated rainwater. The scaling of this basin took account of the most unfavourable rainy episodes, and a flow restrictor was fitted to the basin's outlet to guarantee the expected leakage rate. In case of an exceptional rainy episode, an overflow means rainwater can flow into the main basin.

© Operator RM

In terms of fire detection and to avoid any siren identification issues, the operator will make sure, when reconstructing the new building, to set up the intrusion siren so it is not confused with the fire alarm (if this siren is kept). Special care must be taken over annual staff training on this issue.

Furthermore, in terms of remote monitoring, direct reporting to external emergency services in case of fire detection alarm transfer will be considered without requiring verification by an external service provider.

As for fire safety, the operator is considering equipping the building, which will be rebuilt, with an independent, dedicated sprinkler system.

In terms of battery-powered pallet trucks, the operator decided, based on the expert investigation into the cause of the fire, to isolate them along with the chargers and batteries so this equipment is no longer used for now. It is examining solutions to re-use the equipment completely safely. One of the options under consideration is to equip the site with charging cabinets specifically designed to resist in case of a battery fire. In any case, the operator will create a charging room in the new building to store all the hub's charging equipment in one place.

In terms of vehicle key management and to reduce response times, the use of fleet vehicle numbers (rather than registration numbers) will be considered.

Finally, in terms of emergency management, the headquarters and parcel delivery building will be added to the site's main internal emergency plan.

LESSONS LEARNT

This event highlights several points about fire risk management:

- In terms of hazard identification:

In case of fire, it is essential for the operator to, firstly, make an inventory of combustible, flammable, or explosive products or waste (specifying their physical state, physical/chemical characteristics, and conditions of use and storage). Secondly, ignition sources must be identified. In the case at hand, a mechanical collision is one of the potential causes of the incident under consideration. The operator must also identify not only risky operations, including potential malfunctions involved in the processes performed. In the case at hand, limited battery charger cooling is also one of the potential causes of the incident under consideration. Finally, the operator must identify external hazard sources properly (e.g., high temperatures, ill will, spread of an off-site fire, etc.).
This hazard identification may cause the operator to modify its organisation. In the case at hand, the operator has started looking into setting up a dedicated Lithium-Ion battery charging room.

- In terms of the organisation put in place in case of fire

Although the operator has an Internal Emergency Plan, it had chosen not to add the building affected by the incident to it, as it deemed that it was not classified as a facility classified for protection of the environment. However, the fire affecting this building caused a major accident in accordance with the Seveso Directive.
The regulations clearly make this point in annex V to the Order of 26 May 2014 on preventing major accidents at classified facilities mentioned in section 9, chapter V, title 1 of book V of the French Environmental Code:

"For every foreseeable situation or event that could play a decisive role in triggering a major accident, description of measures to be taken to bring this situation or event under control and limit its consequences: this description must cover safety equipment and available resources"
However, this provision was introduced by the Order of 24 September 2020 for updates after 31/12/2021.
As a result, all buildings and/or business lines on a Seveso site must be taken into account when creating or updating the internal emergency plan.

The modification of vehicle key management by the operator after the incident demonstrates that practical measures in case of fire must be anticipated but also tested to identify whether they are properly operational. As a result, regular drills must be organised, if necessary, in conjunction with external emergency services.

- In terms of staff training

Staff fire risk management training is essential.
Although the "trucking" manager and the safety manager had been trained as first responders for several years (more recent training respectively 14 and 2 months earlier), they were not able to take first firefighting measures given the scale of the incident by the time they became aware of it. However, they moved various trucks away from the building and prevented them from burning in the fire.

- In terms of fire detection

This incident highlights just how important it is for operators to be able to detect fires as early as possible.

In the case at hand, viewing of the monitoring camera footage subsequently demonstrated that the fire detection system functioned as soon as the first fumes appeared. Although the siren was triggered automatically, the on-site operator was not able to identify why it was going off and, as a result, was unable to use first response equipment. Furthermore, the fire detection alarm was successfully transferred to the remote monitoring company, but it was unable to warn the operator. Sending a worker for verification did not help operationally to detect the fire more quickly, due to the travel time from the security company. Viewing the monitoring camera footage would have meant the remote monitoring company could confirm the fire detection report as quickly as possible and inform external emergency services more quickly.
As a result, automatic fire detection is very effective, but the operator alarm chain must be the centre of attention, particularly when extinguishing systems are not automatically triggered.

- In terms of fire safety systems

The building was not equipped with a fixed extinguishing system. Furthermore, firefighting system failures were identified, complicating the response of the external emergency services.

- In terms of firefighting water management

Although the fire was on a large scale and a high volume of firefighting water was used by the external emergency services, the incident did not generate any pollution due to the firefighting water. This was possible as the main firefighting water retention basin was closed quickly, and the retention basin's capacity was appropriate.
This accident also highlights just how important it is to anticipate firefighting water management (who to contact for analyses, how to dispose of it, etc.), which must be considered prior to any incident. As a matter of fact, a rainy episode (as in the case at hand) or the potential possibility of another fire requires the retention capacity to be emptied as quickly as possible.

Finally, there is one last noteworthy positive in this accident: recording the video monitoring cameras on a computer server located in another building was a good decision, making it subsequently possible to view the images and learn more about how the fire happened.