

Large-scale fire in a wood chip storage facility

21 August 2017

Gasville-Oisème (Eure-et-Loir County) France

Fire
Wood
Intervention

THE INSTALLATIONS CONCERNED

The site is a sorting, transit and grouping centre for cardboard and the selective sorting of household waste. The waste received at the site is inert waste, non-hazardous waste such as metals, wood, paper/cardboard, plastics, used tyres, furniture waste, green waste, and hazardous waste such as waste electrical and electronic equipment (WEEE) not containing refrigerants.

The site's activities consist of receiving, sorting and grouping the waste before it is sent to the recovery or disposal facilities. Most of the waste comes from the Eure-et-Loir and neighbouring counties.

The wood waste sorting, transit and grouping activities, concerned by the accident described in this document, are subject to section 2714.1 of the ICPE nomenclature, whose authorisation threshold is 1,000 m³. The amended prefectural decree of authorisation of 16/12/2009 mentions a total quantity of 5,120 m³ of waste, including 370 m³ of wood. On 18 May 2016, the facility operator sent the prefecture a request to modify the operating conditions in order to increase the volume of its wood storage to 13,321 m³. As the Classified Facilities Inspection authorities had made requests for additional information, the inquiry could not be finalised.

The establishment is located in a business park in the municipality of Gasville-Oisème (Eure-et-Loir County). It has a surface area of 5.2 hectares, of which about 3.5 hectares are used for operations. The site is bordered by fields and the RD 136 county highway. The site is located near a cardiology clinic, just 400 m to the west, and the A11 motorway 500 m to the east and south. The nearest residential areas are located 1 km away.

THE ACCIDENT, ITS CHRONOLOGY, EFFECTS AND CONSEQUENCES

The accident:

On 21 August 2017, at around 3 a.m., a deep-seated fire broke out in an outdoor recovered facility. The storage area, of about 50,000 m³, consisted of a single stack roughly 24 m high, 100 m long and 40 m wide. This mound of chips was located on the facility's property line. The burning portion was located at the back of the pile which filled up both sides of the storage area. White smoke was emitted, but there was no flame.



Woodchips (source: SDIS 28)

After being alerted by a site employee, the emergency services mobilised their forces to the fullest. The firefighters had difficulty accessing the site with their equipment due to the volume of the pile. After difficult discussions with the neighbouring farmers, an access road was made by clearing part of the adjacent land. The priority

was to move as much as possible of the 12,500 m³ of non-burning chips to gain access to the heart of the fire. An excavator with an arm of more than 20 metres was sent in for this purpose. Rotations were conducted using 30 m³ skips to unload the storage area. External storage areas had to be found due to the lack of available space on site.

Given the expected complexity of the intervention, an expert specialised in deep-seated fires from the General Directorate of Civil Security and Crisis Management was called upon. BARPI was also consulted for its expertise in intervention strategies thanks to the analysis of feedback available on wood waste fires. The Classified Facilities Inspection authorities went to the site.

On 22 August, gusts of wind caused the fire to flare up on the surface of the heap, and flames were visible. The entire pile of chips was rapidly affected.



Aerial view of the pile of chips (source: SDIS 28)



Pile of chips and intervention equipment (source: DREAL Centre Val-de-Loire)

A significant amount of smoke was visible over the urban area and the A11 motorway. The smell of burnt wood was also noticeable. Comments appeared on social networks.



Billowing white smoke (source: SDIS 28)

On 22 August, the CASU (the INERIS Emergency Support Unit) was asked to provide models of smoke dispersion, given the possible human consequences in the vicinity and knowing that the shredded wood was likely to have been treated (varnish, paint, etc.). Air quality analyses were conducted daily. The following gases were detected at a distance of 1 to 2 metres from the pile: cyanide (5 to 7 ppm), phenol (1 to 2 ppm) and traces of benzene. No significant readings were measured 100 m from the incident. In addition, the wind was favourable and directed the smoke away from the areas of immediate concern, i.e. the motorway and clinic.

Starting from 22 August, water and soil analyses were also conducted to monitor the impact of the accident on the environment. Gauges and samplers were set up in preparation for a possible post-accident mission.

Thermal cameras (overflight by helicopter) and probes placed 2 m into the ground were used to take the temperature in the pile and monitor changes at the seat of the fire. Starting on 25 August, a core drilling process was used to locate hot spots. Temperatures in excess of 300 °C were recorded in these locations. Six-metre rods were used to collect chips at the heart of the heaps. Pyrolysis analysis of these samples provided a more accurate determination of the composition of the smoke.

The strategy adopted was to gradually flatten and spread the mound and water it down. The operations had to be undertaken carefully to avoid collapsing the perimeter walls. The chips collected were then transported and unloaded on a vacant 4-hectare site located 3 km from the previously prepared and secured site. A geomembrane was installed to create a waterproofing layer, as well as a bed of gravel to receive the chips. Runoff water was collected at the lower part of the slightly sloping land.

After 48 hours of cooling on this transit area, the burnt wood chips were sent to a storage facility or to a wood panel manufacturing plant.

The problem concerning the water supply arose throughout the intervention. The site's 430 m³ fire reserve was quickly emptied. On 22 August, the fire brigade was confronted with the depletion of the drinking water supply for the municipality of 1,350 inhabitants. The inhabitants were invited to consume bottled water for a couple of days, the time required to resupply the community's water tower and conduct the various analyses. The motorway's stormwater basin, containing 3,000 m³ (located just 200 m from the site) was used. On 26 August, in order to ensure a sufficient water flow rate (8,000 l/min), the emergency services had to deploy 5 km of hoses, fed by a fire hydrant located in a nearby industrial estate.

The water supply problem quickly overlapped with the extinguishing water retention problem. The site's 1,000 m³ retention basin rapidly filled to capacity. On 26 August, this retention basin overflowed into the natural environment (flowing into a ditch and the field near the site).



Overflow of the retention basin and flooding into the neighbouring field
(source: DREAL Centre Val-de-Loire)

Six semi-trailers were used to drain the polluted water and transport it to a former WWTP facility in the area. In addition, three flexible tarps were installed to increase the retention capacity by an additional 1,050 m³.

After two weeks of intervention, all the extinguishing water collected in these various containers was re-used for watering purposes. Faced with a new threat of disrupted supply, a stormwater basin of 20,000 m³ located 7 km away was put into operation.

On 7 September, thanks to continued scraping and excavation operations, the heart of the fire was finally extinguished. Approximately 700 t of wood chips were evacuated daily by road.

The emergency rescue services reduced their involvement and gradually transferred disaster management to the facility operator. The list of objectives to be achieved was established by prefectural decree. On 11 September, the fire was considered under control. The fire brigade left the site and allowed the operator to manage the equipment and water supply alone. Four oscillating monitors placed in the four corners of the pile were left installed after the County Fire and Emergency Service (SDIS) had left.

The intervention was concluded in late November, i.e. after three months of continuous combustion.

The consequences:

Human consequences: The accident had no human consequences. No impact was noted at hospitals around the site (no increase in calls to emergency services for respiratory pathologies).

Social consequences: The accident caused moderate disruptions: disruption of the drinking water supply; traffic on the A11 motorway was not interrupted, but motorists were told to remain vigilant and pay attention to messages displayed on info panels.

Environmental consequences: Despite visual (smoke) and olfactory (burnt odours) pollution, air quality remained good. No measurable air pollution was reported. Post-accident analyses are being conducted on crops located in the fields near the site (500 m perimeter around the site), in association with the governmental agencies DRAAF (food and agriculture) and DDT (environment and development).

Economic consequences: The economic impact of the accident was quite serious. The intervention by the emergency services was of rare complexity: it lasted nearly 4 weeks and required substantial human and technical resources. Thus, the Eure-et-Loir County Fire and Emergency Service (SDIS) deployed more than 350 professional and volunteer firefighters from all the intervention and rescue centres throughout the county. Reinforcements were also required from the SDIS of neighbouring

counties. During the first week, 60 firefighters were deployed daily. It should also be noted that the accident occurred during the summer holiday period, which meant that emergency personnel were less available. Initial estimates suggest that the intervention cost approximately 100,000 € per day during the first 7 days. The accident's total cost amounts to more than € 1 million.

European scale of industrial accidents:

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 for hazardous substances and in light of available information, this accident can be characterised by the following four indices:

Dangerous materials released		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Human and social consequences		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Environmental consequences		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Economic consequences		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The parameters associated with these indices and their rating scale are available at the website: <http://www.aria.developpement-durable.gouv.fr>.

THE ORIGIN, CAUSES AND CIRCUMSTANCES SURROUNDING THIS ACCIDENT

The cause of the accident was attributed to uncontrolled fermentation in the wood chip pile. The stratification of the successive layers (dry/wet) associated with rainfall created areas favourable to the development of spontaneous heating. The combined episodes of heat and rain preceding the accident accelerated this fermentation, creating pockets of gas and rising temperatures. The combustion started several weeks before the fire was detected, with no external sign. Once the combustion began, the wind was an aggravating factor that fanned the flames.

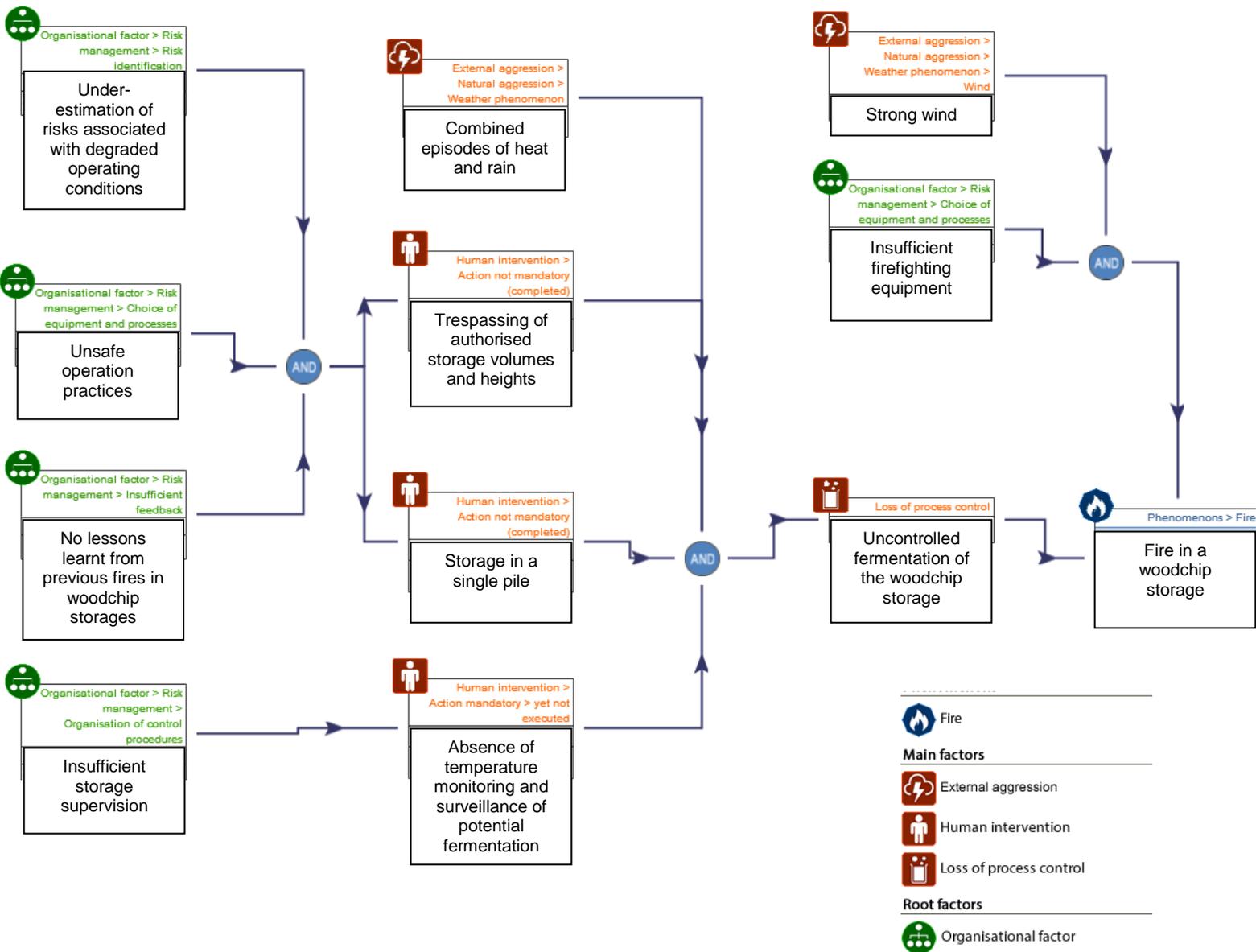
The accident occurred at a site which was non-compliant with regulations. The prefectural decree pertaining to the site indicates a maximum authorised tonnage of 5,120 m³ for all waste, including only 370 m³ for wood. During an inspection conducted on 24/03/16, the Classified Facilities Inspection authorities noted a non-compliant wood storage facility of 620 m³. The facility operator had sent the prefecture an authorisation request to increase its wood storage volume to 13,321 m³. The Classified Facilities Inspection authorities had issued requests for additional information but had not received a response from the operator by the date of the accident.

On 21 August 2017, 50,000 m³ of wood chips were present on site. According to the operator, this overrun was due to a significant weakening of the wood industry (reduction in the consumption capacities of boilers and chipboard manufacturers).

Under the conditions prevailing at the site in August 2017, the facilities could not be safely managed. The volume of waste present, which was also stored in a single island pile, casts doubt on the adequacy of the firefighting resources available. Several factors thus impeded the emergency services' management of the incident:

- The impossibility of encircling the fire given that the storage area was located against the property line. This configuration prevented the installation of emergency equipment on at least two different corners, in violation of the prefectural decree.
- The impossibility of reaching the entire storage facility due to its size: the extinguishing system could not reach the top of the pile (at least 24 metres high).
- The nominal extinguishing rate during the attack phase was 240 m³/h. The site's resources could handle such a rate for less than 2 hours.
- Undersized retention volume;
- The lack of an area to spread out the wood chips.

The model provided below, using the tool developed by BARPI, schematically represents the circumstances of this event.



ACTIONS TAKEN

Administrative and criminal proceedings

Following the observations made by the Classified Facilities Inspection authorities on 21 August 2017 and the following days, an offence report was issued for exceeding the maximum authorised tonnage. To supervise the firefighting intervention and to organise the environmental impact analyses, a prefectural emergency order was issued on 23 August 2017. A second prefectural decree was issued on 1 September 2017 to supervise the technical and human resources to be implemented by the facility operator to bring the intervention to a close and secure the site. A formal prefectural notice

dated 1 September 2017 completed this procedure, which required that the wood waste be removed from the site.

Monitoring of environmental and health consequences

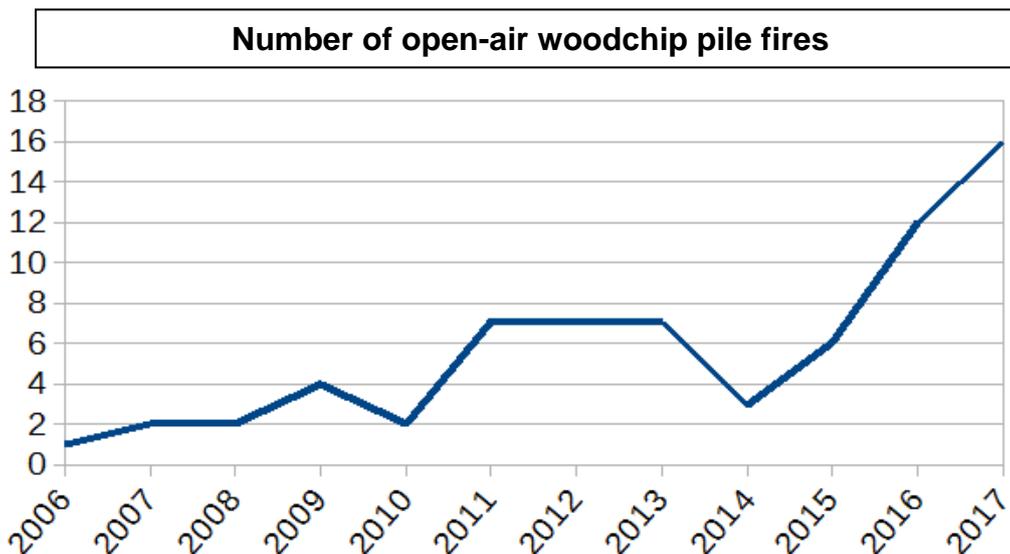
Post-accident analyses are being conducted on crops located in the fields near the site (500 m perimeter around the site), in association with DRAAF and DDT.

LESSONS LEARNT

This accident is not unprecedented. Other fires involving very large volumes of wood, long interventions with the mobilisation of large-scale human and technical resources and problems with the supply of water and environmental pollution are recorded in the ARIA database (ARIA 35796, 41435, 42604, 46988, 48293, 50082, 41208, 43267, 42604,...).

This event was exceptional for the duration of the intervention (3 weeks for the active phase, from 21 August to 11 September 2017, and more than three months in all) and by the complexity of the logistics involved. The proximity of human presence, on the motorway and at the cardiology clinic, in particular, greatly influenced how this emergency situation was managed. This explains the particularly severe economic repercussions.

The accident is all the more interesting in terms of feedback as it took place amid a significant increase in fires in open-air wood waste storage facilities. The year 2017 was thus marked by 16 such accidents (ARIA 49357, 49541, 49614, 49591, 49892, 49863, 49868, 49940, 50309, 50082, 50141, 50270, 50268, 50359, 50580, 50696, 50856), which is a notable increase over previous years, as shown in the graph below.



Several factors contributed to this situation:

- over-capacity in the wood industry, linked to a cyclical decline in outlets for wood waste;
- storage in anticipation of “wood energy” projects.

In this context, and this is what happened in the case of the sorting and transit centre discussed in this document, operators may end up storing volumes much larger than those authorised, without adapting their practices, particularly in terms of storage methods (volume of very large piles, extended storage time) and without reassessing their firefighting resources.

Following the accident, and considering the feedback and the advice offered by the fire and rescue services, the operator implemented the following measures:

- Limitation of wood storage on the site to 10,388 m³;
- Creation of storage islands separated by 10 metres;
- Installation of a 20-metre space between the back of the islands and the property limits;
- Installation of 2-hour firewalls to contain the storage islands;
- Creation of spaces from 4 to 9 metres wide allowing the fire and rescue services to go around the islands outside the heat flows of 3 kW/m²;
- Creation of a 2,356 m² area to spread out wood waste in the event of a fire;
- Installation of a 360 m³ water reserve, in addition to the existing 400 m³;
- Limitation of the storage height to 5 metres.

More generally, here are some good practices derived from the feedback, aimed at reducing the occurrence of wood chip fires and facilitating emergency response:

- Limit the height of the piles so as to facilitate intervention by the fire brigade but also to limit the settling phenomena which, when combined with humidity, is conducive to the development of fermentation;
- Monitor the temperature of the waste regularly to detect any fermentation phenomena;
- Avoid conical pile shapes that create a chimney effect;
- Compartmentalise the piles in order to facilitate intervention by the fire brigade through partitioning and to allow a more regular rotation of the piles;
- Provide firefighter access all around the piles to permit intervention regardless of where the heart of the fire is located;
- Check the condition and capacity of the retentions;
- Adapt the available volumes of extinguishing water to the volumes of wood waste stored;
- Provide an area on site for spreading out the piles in the event of a fire.

According to the emergency services, the feedback collected from this accident proved to be useful during a similar incident in Yonne County in late December 2017 (ARIA 50856). Despite the configuration (a fire started on a 70,000 m³ x 15 m high wood pile on an outdoor storage platform for unprocessed and recycled wood from a particleboard factory), the intervention was much faster.

Some positive aspects in the feedback from this accident – the collaboration and consultation between the various players involved (DREAL, INERIS, expert networks, fire brigades, operator, etc.) – are worth mentioning. Interdepartmental management proved to be effective. During the first days, daily meetings involving the prefecture, DREAL, SDIS, gendarmerie, experts and the facility operator allowed all those involved to share ideas and jointly validate their decisions. Press releases were issued frequently, on a daily basis during the first few days, in order to present the situation to the general public in a transparent manner.

BIBLIOGRAPHICAL SOURCES

- Article “Feu de copeaux de bois” (Woodchip fire) which appeared in the review “Sapeurs Pompiers de France – Le Mag” in May 2018