

Atmospheric pollution after the burning of transformers containing PCB

June 18, 2001

Vénizel – [Aisne]

France

Fire
Paper mill
PCB
Dioxins / Furans
Electrical failure
Safety assessment
Waste
Sanitary study

THE INSTALLATIONS IN QUESTION

The industrial site is occupied by two plants on 76 ha:

- the first manufactures only corrugated paper to be used in the manufacture of corrugated cardboard boxes from regional hardwood (160,000 t/year) and recycled paper (80,000 t/year), as well as lignin sulfonate coproducts from regional hardwood.
- the second manufactures corrugated cardboard.

The plant has a workforce of 241 people.



Photo: DRIRE Picardie

THE ACCIDENT, ITS BEHAVIOUR AND CONSEQUENCES

The accident:

On June 18, at roughly 2.50 am, a "fire alarm" is indicated in the Energy shop's control room. The duty foreman went to the location and noticed smoke in the corner of the electrical room. The amount of smoke seemed to increase and come from the cable tunnel located under the electrical room. The exact origin of the fire could not be located, as no flame could be seen.

At 2.58 am, the foreman asked the guard shack to call the fire department. The procedures foreseen to shut down and evacuate the installations concerned were implemented (evacuation of the Cellulose shop, shut-down of boilers' gas supply, ...).

At around 3.10 am, the managerial staff on duty, the people in charge and the site's security personnel as well as the site's firemen arrived.

The firemen arrived at 3.17 am and stopped approximately fifty meters from the burning facility. At that distance, they were able to already notice abundant, thick smoke falling back down on the floor. At that time, flames were not visible, the problem being to locate the origin of the smoke.

Between 3.34 am and 3.53 am, while the firemen were looking for the fire, the room burst into flames, with fire suddenly appearing above the walls and reaching heights of 5 to 10 meters.

At 4.47 am, the firemen requested reinforcement from the CMIC (Cellule mobile d'intervention chimique", mobile chemical response unit) following the discovery of transformers containing pyralene.

Up to 5.30 am, the firemen battled the fire with spray nozzles with an estimated output of 100 m³/h. The firemen declared the fire under control at around 5.30 am. The actual duration of fire was estimated between 1 and 2 hours. The fire was declared out at 6.20 am.

The consequences:

Engulfed in the flames, 4 transformers were totally emptied, a fifth transformer was emptied half way, releasing the dielectric containing PCBs. In addition to the PCBs considered toxic to man, the products resulting from their decomposition must also be dealt with. At temperatures above 500°C and in the presence of oxygen, their decomposition can result in the release of highly toxic compounds such as dioxins and furans. After investigation, the amount of PCB lost was estimated at 600 kg from an initial quantity of 2,800 kg; the quantity of dioxins released was about 13 kg.


Considering the trajectory of the smoke, a cone-shaped zone of 2.5 km in length is subject to the monitoring and restrictions banning the consumption of vegetable produce. Roughly one hundred samples of soot, construction elements, soils, water and vegetables showed the presence of dioxins and furans at higher concentrations close to the emission point.

A medical examination was conducted on the 96 people present at the time of the accident (including firemen, employees, 2 journalists and 7 residents living next to the site). A year-long sanitary study was foreseen on the persons concerned.

The room involved in the fire was very damaged, and the amount of damages was estimated at 15.2 M euros.

European scale of industrial accidents

By applying the rating rules of the 18 parameters of the scale made official in February 1994 by the Committee of Competent Authorities of the Member States which oversees the application of the 'SEVESO' directive, the accident can be characterised by the following 4 indices, based on the information available.

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

The parameters that comprise these indices and the corresponding rating method are available at the following address: <http://www.aria.developpement-durable.gouv.fr> .

The level 6 rating relative to the quantities of dangerous substances released corresponds to the emission of 13 kg of dioxins (2,3,7,8-TCDD), which is a product classified according to 'SEVESO 2' Directive 96/82/EC (parameter Q1).

The 96 people receiving medical attention for 1 year explains the level 4 rating of the 'human and social consequences' index (parameter H9).

The 6 ha of contaminated ground explains the level 3 rating for the 'environmental consequences' index (parameter Env13).

And finally, the first assessment of the damages costs at 15.2 M€ account for the level 4 rating of the 'economic consequences' index (parameter €15).

ORIGIN, CAUSES AND CIRCUMSTANCES OF THE ACCIDENT

The exact causes of the fire were not formally established by the experts or by the operator itself. Both parties however lean more toward the possibility of an electrical defect without establishing if the fire's point of departure was due to a short circuit or a faulty a faulty electrical component.

ACTIONS TAKEN

When the fire was brought under control, the manufacturer considered that there was no more risk and wanted to resume activity. Only the part of the facility that was destroyed was secured.

The Classified Installations Inspectorate was advised of the accident at around 10 am. An inspector went to the site to propose first safety measures to be implemented, including: restricting access to the site to all personnel, evacuation of third parties living in homes neighbouring the site, determination of a security perimeter...

Following the Classified Installations Inspectorate propositions, the *Prefect* ordered the emergency shut-down of the site based on the risk of dioxin and furan contamination as a result of the transformer fire. This order required:

- ✓ that investigations be conducted to determine the extent of the contamination (analysis on and off site up to 2.5 km downwind from the site, analysis of the impacts on people and environment, and the management of waste and firefighting water),
- ✓ the suspension of the plant's activities, with restart contingent upon the explicit authorisation by Prefectoral order and the submittal of the documentary evidence.

The results of the investigations would enable the environmental impact of the transformer fire to be evaluated:

- ✓ the quantity of dioxins released was estimated at approximately 13 kg. The results of the analyses showed that a significant part of the dioxins and furans produced by the fire was concentrated near the heart of the fire,
- ✓ further, the results of the analyses conducted are near the lower reference limits recorded on French soil within a rural zone (between 0.02 and 1 ng TEQ/kg of soil) or urban zone (between 0.2 and 17 ng/kg of soil) and much below the reference values for French industrial zones (between 20 and 60 ng TEQ/kg of soil).

An order, dated 4 August 2001, gave the conditions for resuming activity partially and progressively (soil stripping and cleaning) and required the inventory and destruction of the PCBs equipment on site before one year.

The following measures were taken:

- ✓ according to the criteria set by the prefectoral order for the decontamination, all zones near the heart of the fire (6 ha) have been decontaminated : soil scraping on a 5 cm thick layer, cleaning of the car park, the administrative building and the dispatch area.
- ✓ the 26 transformers containing PCBs present at the site were progressively eliminated until August 2002.

Regarding the results of 3 analyses on vegetables, soils and water showing that the PCBs and dioxins concentration can't lead to the exceeding of the acceptance daily intake. The restrictions regarding the land outside the site (cattle pasturing, fruit and vegetables consumption, agricultural harvest segregation, drinkable water in several towns) were lifted 25 days later.

On summer 2008, despite the measures taken by the Classified Facilities Inspectorate for several years, the operator still has not eliminated the building waste, the damaged transformers and the scraped soil stored under a tarpaulin.

LESSONS LEARNED

The "transformer fire" scenario had not been included in the danger study conducted in 1992, mostly likely because such equipment is fairly common in many establishments. This accident shows that this scenario must not be neglected.

The personnel who discovered the accident did not know the exact location of the transformers. It is important that a precise establishment map be created, indicating the location of this type of equipment.

This accident shows the necessity of:

- a closely consultation in between the different administrative services.
- a real-time communication for the stakeholders
- the control of the operator's imposed measures.