

## Fire within a food processing plant

30 July 2007

Renaison (Loire)

France

Fire  
Pollution  
Food processing industry  
Fire-fighting water  
Electrical defect  
Retention facilities  
Environmental analyses  
Communication /  
information / crisis

### THE FACILITIES INVOLVED

#### The site:



The pastry making facilities burned during this accident were located east of Renaison, 2 km from the centre of town and a few kilometres from the city of Roanne.

After the first plant, devoted to preparing cakes and desserts, was built in 1980, a second unit was added in 1986 for the cookies side of the operation. These two production units were combined in 1990. Then, in 1996, a Dutch group bought the site and integrated a pastry-filling shop and storage warehouse during 1998. The entire operation employed a staff of 120, running two 8-hour shifts. The plant produced pastry shells ready to be filled, including charlotte, Bavarian cream, *Genoise* sponge cake, pastries made from cream puff dough, frozen filled pastries either decorated or ready to be decorated; output was intended for food industry professionals and large and medium-sized retailers.

#### Administrative aspects:

The company, in accordance with regulations relative to the environmental protection of hazardous facilities, was required to comply with declaration formalities for: the liquefied gas filling/distribution plant; warehousing operations for wood, paper, cardboard and combustible materials; preparation or conservation of botanical products; and refrigeration/compression installations. This declaration requirement officially took effect on January 20, 1998.

### THE ACCIDENT, ITS CHRONOLOGY, EFFECTS AND CONSEQUENCES

#### The accident:

The fire broke out on Sunday, July 30, 2007 at 2:08 am within an idle unit. Notified by the firm assigned to perform remote monitoring of the site, the Head of Maintenance sounded the alarm. Some 100 fire-fighters arrived at the scene equipped with twelve fire nozzles and three aerial ladders. They shut off the site's gas and electricity supply and had the authorities close local secondary road D9 in order to pump water from a pond located 800 m away. By 6:00 am, the blaze had been brought under control and was completely extinguished 15 hours after fire-fighters arrived. Since the fire-fighting water had been partially contained onsite, the rescue team set up a filtration barrier using bales of hay.

Around fifteen emergency personnel remained at the scene the following day to check for eventual re-ignition. The mayor and the press also visited the site during the day.

**Consequences of the accident:**

The quantities of water used to fight the fire were extremely high, and neither the retention basin nor the pre-treatment facility were able to fully retain the 200 m<sup>3</sup>/h of fire-fighting water flowing into the drainage ditch designed for road runoff from the light industrial zone; this water then flowed into the Oudan River 800 m down-slope.

9,000 of the 10,000 m<sup>2</sup> occupied by the facility were destroyed; the loss was particularly heavy due to the considerable presence of combustibles (sugar, flour, cardboard, etc.). The refrigeration installations charged with R404a refrigerant (an azeotropic mix of fluoroethanes, whose thermal decomposition releases highly toxic and corrosive vapours: hydrogen fluoride) were damaged. The two storage silos filled with 60 m<sup>3</sup> of sugar and flour however were completely spared. The accident resulted in no victims, but 120 staff members had to be made redundant. The entire installation would be rebuilt at a cost of € 15 million.



Debris collected in the garden of a residence  
3.8 km south-southwest of the accident



Animals grazing a few kilometres south of the site  
were covered with soot from the fire

The captain of the fire brigade indicated to the facility inspection team on July 30, 2007 that a significant amount of black particles of varying sizes was released during the fire. The storage of cardboard and other packaging materials was found to be the source of these particles.

The day after the fire, a nearby farmer informed inspection authorities of the presence of soot, greasy to the touch, covering vegetables in his garden; moreover, debris was strewn over his pastureland. Both the coat and mucosa of his cattle revealed an unfamiliar grey sheen.

Investigations conducted onsite corroborated this observation: blackish soot was present to varying degrees on plants in vegetable gardens and on residential decks within a corridor 3 km wide by 6 km long oriented south-southeast.

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

Dangerous materials released	  <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"/>
Environmental consequences	 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Economic consequences	    <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

The parameters composing these indices and their corresponding rating protocol are available from the following Website: [www.aria.developpement-durable.gouv.fr](http://www.aria.developpement-durable.gouv.fr).

The parameter "quantity of dangerous materials released" Q1 was rated 1 due to both the dioxin level detected in canal water following the fire and the hydrogen fluoride content released during combustion of the R404a refrigerant fluid.

The fire did not produce any human or social consequences.

The parameter tied to environmental consequences was assigned a zero rating since the watercourse did not necessitate any special cleaning or decontamination procedure; moreover, the results of analyses conducted on both the soils and crops/plants intended for human and animal consumption remained below threshold values.

The "economic consequences" parameter received a 3 rating due to the property damage sustained, estimated at some €10 million (with a €15 million reconstruction price tag).

## THE ORIGIN, CAUSES AND CIRCUMSTANCES SURROUNDING THE ACCIDENT

The accident was caused by a short circuit in the electrical panels, which were installed in 1980 when the first unit was built; since then, the panels had been inspected once a year.

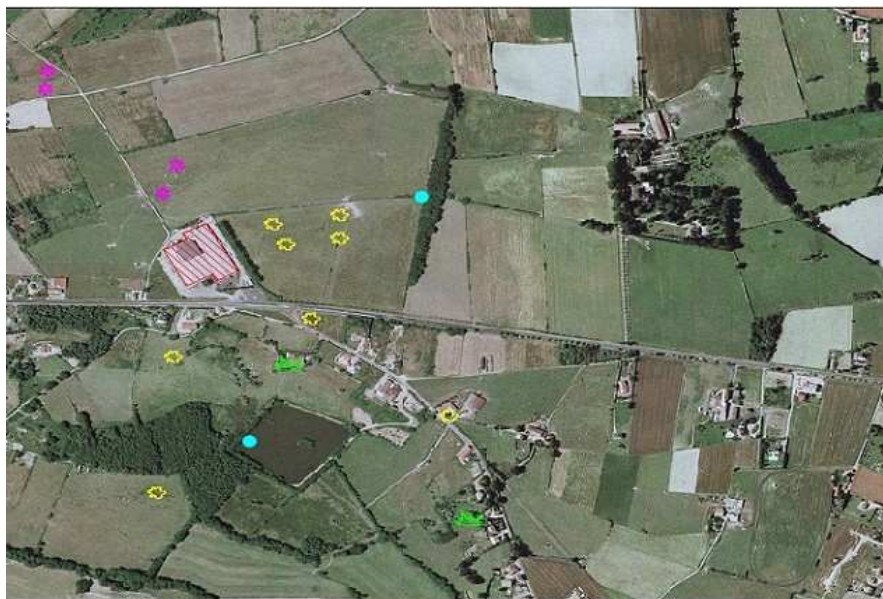
The fire turned into a strong blaze because it broke out in the middle of the night of Sunday to Monday; located at the periphery of a small village in a zone of low population density, the site was empty of employees at the time.






The fire scenario had been examined in the plant safety report, yet the conclusion was drawn that any fire outbreak would be quickly brought under control. Not designed to receive such large quantities of fire-fighting water, the retention facilities overflowed.

## ACTIONS TAKEN

An emergency order was issued on August 2, 2007, requiring the plant operator to immediately file an accident report so as to evaluate the environmental impacts.

On the same day, the local Prefect sent a memorandum to the mayors of all nine municipalities within the sector potentially affected, notifying them that investigations (soil, water, flora) were underway and emphasising the following recommendations: for residents to carefully wash and peel all fruits and vegetables before consumption; and for the area's cattle growers not to feed their animals with fouled plants and grass.



-  Site
-  Local geochemical background noise
-  Water sampling
-  Soil sampling
-  Plant and soil sampling

Map of sampling operations

This fallout of soot and debris, combined with the spill of fire-fighting water, raised fears of environmental contamination from dioxin, PCB (polychlorobiphenyl), PAHs (polycyclic aromatic hydrocarbons), hydrocarbons and heavy metals. At the request of the inspection authorities for classified facilities, a sampling campaign was undertaken on August 3, 2007 within a corridor 3 km wide by 6 km long along a south-easterly direction with respect to the site; this specific zone had been established on the basis of both meteorological data and onsite observations. This study provided an initial and approximate impact assessment of the fire outside the site: on soils and plants intended for beef cattle consumption, on the liquid effluents generated by fire-fighting actions (water used for extinction), and lastly on residents' vegetable gardens to determine whether consumption was safe. The results of analyses performed on soils and crops/plants

intended for human and animal consumption yielded values below the threshold; however, they also revealed areas of residual pollution due to the fire, namely on the canal used to discharge fire-fighting water.

### Impact of the accident on the environment external to the site:

A canal monitoring effort was launched, along with three follow-up measurement campaigns: December 2007 for surface water and sediments; January 2008 for surface water; and March 2008 for sediments.

These water and sediment quality monitoring efforts allowed reaching the conclusion, in March 2008, that water and sediments in both the canal and the Oudan River were free of any exceptional pollution due to dioxin, PCB, hydrocarbons, PAHs and heavy metals capable of causing unacceptable risks for either the habitat or activities located in the vicinity of these watercourses. These pollutants were no longer present at more than trace quantities, which would be characteristic of background noise levels.

A comparison of analysis results upstream and downstream of the site showed that the presence of arsenic and PAH was in fact uncorrelated with the Renaison plant fire (since concentrations levels were higher upstream).

### Impact of the accident at the site itself:

Investigations conducted onsite found that:

- The bare ground exhibited no exceptional levels of pollution.
- The screed laid at the former office zone (south-eastern part of the site) also exhibited no exceptional pollution.
- The covering materials (resin, tile, screed) in the former food product storage zone (north-eastern part) and debris collected presented exceptional levels of pollution with respect to organic matter, hydrocarbons and BTEX (benzene, toluene, ethyl-benzene and xylene). These coverings and debris were sent to an underground waste containment centre.

In addition, the obstructed pipes, potentially cluttered by polluted residue, were cleaned out and the waste was removed and transferred to a suitable treatment facility.

Plant reconstruction was initiated on the same exact site; 18 months after the fire, production resumed. The new installation is equipped with fire detection and sprinkling systems; furthermore, it now features adequately-sized (840 m<sup>3</sup>) retention capabilities.

## **LESSONS LEARNT**

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In conclusion, this accident raised a number of concerns that could be manifested during many other types of events; these concerns need to be addressed, or even anticipated, at other sites:

- ✓ The effective involvement of all actors from State agencies working in the field (classified installation inspection authorities, veterinarian services, public health, sanitation, plant protection, etc.) enabled adopting an action plan that was coherent and rapid (identifying the polluting substances to target, zone of investigation).
- ✓ The heavy volume of telephone calls from affected and concerned populations proved difficult to manage for inspection authorities. A well-organised and efficient communications system that associates the various actors would help resolve this problem.
- ✓ Subsequent to the accident, the veterinarian unit with the installations inspection office of the Loire Department developed an emergency plan for issuing initial indications on how to respond in the case of a similar problem. This plan includes: a file listing the main pollutants (standards specific to component matrices, their origin, level of noxiousness in human exposure), a directory containing contact details of all participating actors and other entities (State agencies, animal rendering, the department's largest dairies, etc.), and standard correspondence and procedures explaining how to respond in case of emergency.
- ✓ Any analysis of accident scenarios must take into account, among other things: quantities of combustibles present onsite, protection and mitigation means (firewalls, smoke vents, etc.), detection devices and alarm relay protocols, internal emergency resources available and training for employees called to use such resources, and the availability and distance to the water supply.
- ✓ Retention is a key component in the set of mitigation measures available: system design must be adapted, and all devices must be regularly maintained.