

Fire in a factory manufacturing adhesives

December 8th 2000

Haguenau (67) - France

Toluene
Fire
Electrostatic discharge
Crisis
Confinement
Environmental analyses
Impact on health

THE INSTALLATIONS CONCERNED

The company operated a factory for the production of adhesives and filler pastes, authorised by decree from the Prefect dated February 14th 1990. Since that date, the company progressively re-oriented its production towards manufacture of prepolymers for polyurethane (including polyurethane fillers for the automobile industry).

On May 9th 1995, concurrently with the reorganisation of their production, the company declared a stock of MDI (4,4'-diphenylmethane diisocyanate) of over 20 t. Following inspection of the establishment, on July 1st 1996, the management of the company was requested to submit a request for authorisation to regularise this extension of activities. A first file was submitted in September 1999. This file, incomplete, was re-worked and submitted again on November 8th 2000. At the time of the fire, the installations were being operated without the required authorisation.

THE ACCIDENT, THE SEQUENCE OF EVENTS AND THE CONSEQUENCES

The accident:

The fire ignited around 10 o'clock when an employee was pouring toluene from a 1 000 litre container into a 25 litre metal bucket using a fire-resistant pump and an anti-static flexible tube, in premises protected by inert halon gas. The employee saw sparks flying followed by instant ignition. Despite quick intervention by the personnel, the fire spread rapidly, first to the central workshop, the fire-door between the workshop and the solvent store having been left open, and then to the storage area for finished products: these two areas were insulated by a firewall; however the thermal flow generated by the fire caused the melting of the skylights of the storage hall and the conditioning workshop (lighting elements of the "sky-dome" type), spreading the fire to these areas.

The emergency services intervened rapidly. A large cloud of black smoke partially attained the urban area of Haguenau. The atmospheric conditions did not favour the rise and dispersion of the smoke cloud, the emergency services invited the population to remain indoors. The event was widely covered by the media via the broadcast on local radio of instructions to remain indoors. Three schools in the axis of the smoke cloud were evacuated. The fire was brought under control after 2h30. With the fire extinguished, the confinement measures were lifted around 13h30. The emergency services maintained surveillance for the whole day.



R. D.

The consequences :

The environmental effects were small: the analysis of the smoke fumes up to 100 m of the fire source showed values of 4 ppm of hydrochloric acid and 100 ppm of benzene closer to the source. The sanitary enquiry revealed no cases of toxic reactions. In the absence of any retaining capacity, part of the water (1 800 m³) ran off into the drainage network without causing any dysfunction of the water treatment station, which had been alerted in time. The results of analyses of the soil and the waters brought to light no significant pollution.

Material damages, of the order of 70 MF, were serious: plastic materials, essentially PVC, solvents (toluene and xylene) and finished products (polyurethane fillers and packaged adhesives) constituted the major part of the substances involved in the fire. The MDI store and the barrels in production, protected by the firewalls, were not affected.



R. D.

EUROPEAN SCALE OF INDUSTRIAL ACCIDENTS

Using the scoring rules of the 18 parameters of the scale approved by the Committee of Competent Authorities of the Member States for the application of the 'SEVESO' directive, the accident can be characterised by the 4 following indices, taking into account the available information.

The Haganau accident can be characterised by the following indices:

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

The parameters comprising these indices can be found at the following address: <http://www.aria.ecologie.gouv.fr>

Forty tonnes of toluene were burnt during the fire. The Seveso threshold for this substance being 50 000 t, the quantity released corresponded to 0.08% of the threshold. The index relating to dangerous materials released for this percentage is equal to 1 (see parameter Q1). Whereas 5 people were injured, (3 employees and 2 members of the emergency services) the index relating to human and social consequences is equal to 5 on account of the confinement measures applied to the population, 30 000 people were retained indoors for 2h30 (see parameter H). The total cost of the damage was evaluated at 120 millions francs (or 18.3 millions euros), leading to an index relating to economic consequences equal to 4 (see parameter €).

THE ORIGIN, THE CAUSES AND THE CONSEQUENCES OF THE ACCIDENT

The origin of the fire was probably due to an electrostatic discharge during the transfer of the solvent. The pallet truck was not earthed, the operator was not wearing anti-static shoes; neither was therefore earthed. The initial panic of the

operator and the rapid spread of the fire made it impossible for the employees to attack the fire and they left the workshop within a few minutes.

THE MEASURES TAKEN

Following the extinction of the fire, a series of initiatives were taken to cover the follow-up of the situation:

× **Precautionary** measures:

- ✓ Inspection of all the installations and check of the operating conditions on the site (regulatory and administrative),
- ✓ A decree from the Prefect, forbidding the resumption of activity and prescribing the measures to be applied for de-pollution, storage and elimination of the debris.

× Measures **in the field of public health**:

- ✓ **briefing of 360 doctors on the consequences to health of exposure to the smoke fumes,**

× Measures concerning the **environment**:

- ✓ Implementation of a campaign of analysis of soil and vegetation in the affected zone,
- ✓ Analyses from the surveillance of the effluents from the extinction of the fire, the water from the clean-up and the water from the water treatment station.

Results obtained:

- × **As regards public health and the environment**, there was little impact.
- × At the time of the event, the company was operating in a situation of anticipation of the authorisations requested (in particular as regards the increased quantities of MDI to be stored)
- × The inspection of the installations brought to light the absence of a system to retain extinguishing water, insufficient water supply available for fire extinction, a store of waste without any means of retention and in the open air and the submission of an incomplete file to bring the plant into line with the regulations.
 - × The damaged installations and those which were not in conformity with the regulations were closed.

THE LESSONS LEARNED

On the technical front:

The firewalls and the intervention of the emergency services enabled a rapid control of the incident, however the sky-dome positioned too close to the firewall made the firewall ineffective. It is important to take into account the risk of ignition of fusible materials through a thermal effect rendering protection systems such as firewalls ineffective.

Furthermore, during the transfer of a solvent with a low flashpoint, safety recipients should be used. The notion of equality of electrostatic potential must be taken into account. This link to establish equal potential must be set up before the transfer of the product.

In the risk studies, it is important to describe the products of degradation in the event of fire and to evaluate the consequences in order to adapt the measures of prevention, protection and intervention.

Administrative aspects :

The operation of installations without the required authorisation must give rise to demands for compliance in conformity with article L514-2 of the environmental code.

Crisis management:

The event was subjected to heavy media coverage through the broadcast on local radios of the orders to remain indoors, information which was re-broadcast on national radio stations. Several press organisations immediately despatched teams of reporters who arrived on the scene before a first evaluation of the situation had been made and even before an operational HQ had been set up. This, almost instant, media coverage created a heavy pressure on the emergency services to provide information even before structures had been created to gather and coordinate reliable facts about the event and consequences that not been taken into account in the risk studies.