

## Explosion of a hydrocarbon storage tank

20 February, 2001

Lespinasse (31)

France

Explosion  
Flammable liquid  
tank farm  
Storage tank  
Gasoline  
Floating screen  
Management /  
Works  
Victims  
Material damages  
Internal  
Contingency Plan

### THE INSTALLATIONS IN QUESTION

#### The site

The site operates a liquid hydrocarbon storage tank, created in 1972. The company employs 9 people. The site is located to the north of the city of Lespinasse, between the channel lateral to the Garonne, the railway line to the west and the RN 20 national highway to the east.

It is subject to the "Seveso" directive and is under the condition of Safety Report presentation.

The depot includes 9 main tanks with either a roof or floating screen. The products are supplied by train and then shipped by truck. The site's authorised capacity is approximately 57,000 m<sup>3</sup>.

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

#### The accident

The tank involved in the accident was commissioned in 1991 and had a capacity of 5,090 m<sup>3</sup>. The tank is of fixed roof type with a floating screen. Cleaning operations were taking place on the tank at the time of the accident.

On the day of the accident, the tank is empty although normally contained premium type gasoline.

The operations, conducted by employees from an external company, consisted in scraping the floor to remove residual deposits. The tank's screen was at a height of approximately 1.2 m. In this case, the working space was limited.



At roughly 4 pm, an explosion occurred while the 2 contractors were inside the tank.



Photos: DRIRE Midi-Pyrénées

**The consequences**

The 2 contractors were seriously injured: they were able to exit the tank by themselves and were subsequently hospitalised when the emergency rescue team arrived. They are both burnt, one of them seriously.  
 The tank was totally destroyed. Activity at the depot was stopped for approximately 2 months.



Photo : DRIRE Midi-Pyrénées

The costs of the accident raise:

- ✓ 1 M Euros for the property damage ;
- ✓ 0.6 M Euros for the operating losses ;
- ✓ 0.2 M Euros for securing and dismantling operations.

The accident did not initiate any domino effect.

**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 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 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 that comprise these indices and the corresponding rating method are available at the following address: <http://www.aria.ecologie.gouv.fr>.

The level 1 of the index concerning the quantity of dangerous materials released (in the meaning of the SEVESO Directive) expresses the effects of the explosion limited to the site of the company (parameter Q2).

The level 2 given to the human and social consequences is due to the two contractors who were seriously injured during the explosion (parameters H4).

The level 2 given to the economic consequences qualify the costs of the material damages caused by the accident, that raises 1.2 M€ (parameter €15).

Finally, there is not any noticeable consequence regarding the environmental aspects.

## ORIGIN, CAUSES AND CIRCUMSTANCES OF THE ACCIDENT

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The tank involved by the accident was equipped with only one manhole. Configuration during the cleanup operations:

- ✓ all of the vents were not open,
- ✓ the ventilation used to remove fuel fumes was stopped for the intervention,
- ✓ operations were started before reaching a gas concentration lower than 10% of the LEL (lower explosive limit).

The employees had limited space to move around which constitutes an unfavourable element.

The hypothesis of a spark created by one of the worker's tools (boot soles points, metallic scraper, steel snaphook, etc.) is the most plausible. Within an explosive atmosphere, this could have caused an explosion.



Photo : DRIRE Midi-Pyrénées

## ACTIONS TAKEN

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The operator engaged the internal contingency plan. The firemen arrived at the site and brought the accident under control within 45 minutes. Traffic on the national highway nearby was stopped for a few minutes.

On the proposal of the Registered Installations Inspectorate which visited the site on the day of the accident, the Prefect drafted an order requesting that emergency measures be undertaken before operations resumed:

- ✓ a study on the precise causes and circumstances of the accident,
- ✓ determination of the measures to be taken to prevent such an event from happening again,
- ✓ verification of the safety of the installation concerned, as well as the neighbouring installations,

Locally, the operator takes the following measures to prevent such an accident from reoccurring:

- ✓ Modification of the procedure for maintenance/servicing inside a hydrocarbon tank:
  - compilation of procedures adapted to the site and to the tanks (all tanks are not identical in terms of equipment, which changes the precautions to be taken prior to the operation)
  - cleaning/degassing operations are to be performed only after validation by the depot manager or an assistant.
  - vapour concentrations (explosive atmosphere) specified in the procedures are to be reached before the start of any maintenance/servicing in the tanks (no anticipation).
  - improvement of the ventilation by opening branch connections, removing valves, or opening manholes, ...
  - maintain forced ventilation throughout the entire operation
- ✓ Reminder of intervention principles for external companies performing tank maintenance/servicing operations

## LESSONS LEARNT

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Notably after this accident, the GESIP, the French petrochemical industry association, created a working group to specify certain rules.. A few of these rules, derived from the document entitled "Guide de sécurité pour l'exploitation des dépôts d'hydrocarbures liquides" (Safety guide for operation petroleum products marketing terminals) and dealing with the degassing of fixed roof tanks with screen, are outlined below:

- ✓ low level extraction of vapours and possibly forced ventilation,
- ✓ the need for at least 2 renewed atmospheres/hour and an injection speed greater than 20 m/sec.
- ✓ compressed air-powered equipment, with conduits and equipped with a shunt/ground bond with the tank structure.
- ✓ opening of the roof and the screen.
- ✓ work authorised using Personal Breathing Apparatus and when cold if % LEL is less than 10.
- ✓ explosimeter measurements to be taken in carefully selected zones (30 cm above slurries, far from the manhole,...)

In summary, it is obvious that the intervention of individuals in a confined space must be preceded by the appropriate verification of the atmospheric conditions of the work area, with the help of intervention instructions and documents such as "fire licenses". The work atmosphere must also be monitored and controlled through the entire operation.