

# Explosion och brand på en kemikaliefabrik.

830806 MARS 1800\_48

En skenande polymerisationsreaktion orsakade en explosion i reaktionskärlet varvid brand uppstod. Troligen hade kylsystemet havererat och därmed hade temperaturregleringen av reaktionen fallerat. Brandlarmet gick och räddningstjänsten tillkallades. Räddningstjänsten bekämpade branden och förhindrade branden att nå två lagertankar för etylenoxid respektive trimetylamin. Anläggningen totalförstördes.

## Inblandade ämnen och mängder

	CAS Nr.	Mängd
trimetylamin	75-50-3	
etylenoxid	75-21-8	
epiklorhydrin [1-klor-2,3-epoxy-propan]		

## Skador:

Människor:	En person skadades av explosionen och fick föras till sjukhus.
Materiella:	Epiklorhydrinanläggningen totalförstördes. Utanför fabriksområdet krossades fönster på närliggande byggnader.
Miljö/ekologi:	Inga effekter rapporterade.
Infrastruktur:	Allmänheten varnades.

**Erfarenheter redovisade (Ja/Nej): Nej**

## Report Profile

### Identification of Report:

country: FA ident key: 1800\_048\_01

reported under Seveso I directive as major accident reports: SHORT+FULL

### Date of Major Occurrence: Time of Major Occurrence

start: 1983-08-06 start:

finish: finish:

### Establishment:

name:

address:

industry: 2001 general chemicals manufacture

Organic Chemical (Production of Glycidyltrimethylammoniumchloride)

Seveso II status: not applicable: Yes art. 6 (notification): No

art. 7 (MAPP): No

art. 9 (safety report): No

### Date of Report:

short: full:

### Authority Reporting:

name:

**address:**

**Authority Contact:**

**rep\_cont\_name:**

**rep\_cont\_phone:**

**rep\_cont\_fax:**

**Additional Comments:**

a) - not applicable -

b) - not applicable -

c) - not applicable -

d) - not applicable -

e) - not applicable -

## Short Report

**country:** FA **ident key:** 1800\_048\_01

**Accident Types:**

**release:** No **explosion:** Yes

**water contamination:** No **other:** No

**fire:** Yes

**description:**

ACCIDENT CASE HISTORY DESCRIPTION:... see Appendix Short Report / description of accident types

**Substance(s) Directly Involved:**

**toxic:** Yes **explosive:** Yes

**ecotoxic:** No **other:** No

**flammable:** Yes

**description:**

The whole amount of substances involved in the accident has been estimated in about 5,000 Kg but no data are available about the single amounts of Trimethylamine (C.A.S. CODE: 75-50-3) and Ethylene Oxide (C.A.S. CODE: 75-21-8).

**Immediate Sources of Accident:**

**storage:** No **transfer:** No

**process:** Yes **other:** No

**description:**

The accident involved a vessel in a process plant for the epichlorhydrine [1-chloro 2,3-epoxy-propane] production. This process plant, part of an organic chemical industry for the production of glycidyltrimethylammoniumchloride, was located... see Appendix Short Report / description of immediate sources

**Suspected Causes:**

**plant or equipment:** Yes **environmental:** No

**human:** No **other:** No

**description:**

CAUSES:... see Appendix Short Report / description of suspected causes

### **Immediate Effects:**

**material loss:** Yes

**human deaths:** No

**human injuries:** Yes **community disruption:** Yes

**other:** No

**ecological harm:** No

**national heritage loss:** No

**description:**

EFFECTS ON PEOPLE:... see Appendix Short Report / description of immediate effects

### **Emergency Measures taken:**

**on-site systems:** Yes **decontamination:** No

**external services:** Yes **restoration:** No

**sheltering:** Yes **other:** No

**evacuation:** No

**description:**

INTERNAL TO THE ESTABLISHMENT:... see Appendix Short Report / description of emergency measures taken

### **Immediate Lessons Learned:**

**prevention:** Yes **other:** No

**mitigation:** No

**description:**

MEASURES TO PREVENT ANY RECURRENCE OF SIMILAR ACCIDENTS:

After the accident, an inspection of the plants by a team of experts was decided.

## **A Occurrence Full Report**

**country:** FA **ident key:** 1800\_048\_01

### **1 Type of Accident**

**remarks:** Probably because of the failure of the cooling system of the epichlorhydrine reactor, the polymerization heat (not removed) caused a pressure increase and an explosion (code 1304) inside the vessel and afterwards a fire (code 1202).

### **2 Dangerous Substances**

**remarks:** The total establishment and the potential directly involved inventories of trimethylamine and ethylene oxide refer to the whole amount involved in the accident (it has been estimated in about 5,000 Kg). No data are available about the singl... see Appendix Full Report A / dangerous substances

### **3 Source of Accident**

**illustration:** - not applicable -

**remarks:** The accident involved a vessel (code 4002) in a process plant for the

epichlorhydrine [1-chloro 2,3-epoxy-propane] production. This process plant (code 3102), part of an organic chemical industry (code 2001) for the production of glycidyltr... see Appendix Full Report A / source of accident

- remarks

#### 4 Meteorological Conditions

**precipitation none: fog: rain: hail: snow:**

No No No No No

**wind speed (m/s):**

**direction (from):**

**stability (Pasquill):**

**ambient temperature (°C):**

**remarks:** - not applicable -

#### 5 Causes of Major Occurrence

**main causes**

**technical / physical** 5101 operation: vessel/container/containment-equipment failure

5106 operation: runaway reaction

- not applicable -

- not applicable -

- not applicable -

**human / organizational** 5307 organization: process analysis (inadequate, incorrect)

5308 organization: design of plant/equipment/system (inadequate,

inappropriate)

- not applicable -

- not applicable -

- not applicable -

**remarks:** Probably because of the failure of the cooling system (code 5101) of the epichlorhydrine

reactor, the polymerization heat (not removed) caused a pressure increase that led to an

explosion inside the vessel (code 5106). The underlying causes... see Appendix Full Report

A / causes of major occurrence

#### 6 Discussion about the Occurrence

- not applicable -

**Type of Accident** country: FA ident key: 1800\_048\_01

**event:**

**major occurrence** 1304 explosion: runaway reaction explosion (usually exothermic)

**initiating event** - not applicable -

**associated event** - not applicable -

**event:**

**major occurrence** 1202 fire: pool fire (burning pool of liquid, contained or uncontained)

**initiating event** 1304 explosion: runaway reaction explosion (usually exothermic)

**associated event** - not applicable -

## Dangerous substances

country: FA ident key: 1800\_048\_01

### a) total establishment inventory

CAS number: 75-50-3 identity: Trimethylamine

name from Seveso I Directive: - not applicable -

name from Seveso II Directive: - not applicable -

category from Seveso II: - not applicable -

other hazards (1): - not applicable -

other hazards (2): - not applicable -

maximum quantity (tonnes): 5

use of substance as: NORMAL FINISHED PRODUCT

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 5 potential quantity: 5

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir\_pot\_quant: -1

### a) total establishment inventory

CAS number: 75-21-8 identity: Ethylene Oxide

name from Seveso I Directive: - not applicable -

name from Seveso II Directive: - not applicable -

category from Seveso II: - not applicable -

other hazards (1): - not applicable -

other hazards (2): - not applicable -

maximum quantity (tonnes): 5

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 5 potential quantity: 5

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir\_pot\_quant: -1

## Source of Accident - Situation country: FA ident key: 1800\_048\_01

### situation

#### industry

initiating event 2001 general chemicals manufacture

associated event - not applicable -

#### activity/unit

major occurrence 3102 process: chemical continuous reaction

initiating event 3102 process: chemical continuous reaction

associated event - not applicable -

**component**

**major occurrence** 4002 reaction vessel; pressurised

**initiating event** 4002 reaction vessel; pressurised

**associated event** - not applicable -

## **B Consequences Full Report**

**country:** FA **ident key:** 1800\_048\_01

### **1 Area concerned**

**affected**

**extent of effects installation:** Yes

**establishment:** Yes

**off-site; local:** Yes

**off-site; regional:** No

**off-site; transboundary:** No

**illustration of effects** - not applicable -

**remarks** The epichlorhydrine production plant was completely destroyed. Outside the estab... see Appendix

Full Report B / area concerned - remarks

### **2 People**

**establishment popul. emergency personnel off-site population**

**total at risk**

**immediate fatalities**

**subsequent fatalities**

**hospitalizing injuries** 1

**other serious injuries**

**health monitoring**

**remarks** Inside the establishment 1 person was injured (and hospitalized) by the explosio... see Appendix

Full Report B / people

### **3 Ecological Harm**

**pollution/contamination/damage of:**

- **residential area (covered by toxic cloud)** Suspected

- **common wild flora/fauna (death or elimination)** Suspected

- **rare or protected flora/fauna (death or elimination)** Suspected

- **water catchment areas and supplies for consumption or recreation** Suspected

- **land (with known potential for long term ecological harm or** Suspected

**preventing human access or activities)**

- **marine or fresh water habitat** Suspected

- **areas of high conservation value or given special protection** Suspected

**remarks** In the Original Report there is no evidence of significant ecological harms.... see Appendix

Full Report B / ecological harm

## 4 National Heritage Loss

effects on:

- **historical sites** not applicable - **historic monuments** not applicable

- **historic buildings** not applicable - **art treasures** not applicable

remarks No data available.

## 5 Material Loss

**establishment losses off site losses**

**costs (direct costs to operator) (social costs)**

**in ECU ECU**

**material losses**

**response, clean up, restoration**

remarks The epichlorhydrine production plant was completely destroyed. Outside the estab... see Appendix

Full Report B / material loss

## 6 Disruption of Community Life

**establishment/plant evacuated disabled/unoccupiable destroyed**

- **nearby residences/hotels** No No No

- **nearby factories/offices/small shops** No No No

- **schools, hospitals, institutions** No No No

- **other places of public assembly** No No No

**interruption of utilities etc. no / yes duration**

- **gas** No

- **electricity** No

- **water** No

- **sewage treatment works** No

- **telecommunications** No

- **main roads** No

- **railways** No

- **waterways** No

- **air transport** No

**significant public concern none local level national level**

- **off site populations** No Yes No

- **media interest** No No No

- **political interest** No No No

remarks Outside the establishment, the windows' glasses of the nearby houses were ruptur... see Appendix

## 7 Discussion of Consequences

# C Response Full Report

country: FA ident key: 1800\_048\_01

## 1 Emergency Measures

**taken - on site** - not applicable - - not applicable -

- not applicable - - not applicable -

- not applicable - - not applicable -

- **off site** - not applicable - - not applicable -

- not applicable - - not applicable -

- not applicable - - not applicable -

**still - on site** - not applicable - - not applicable -

**required**

- not applicable - - not applicable -

- not applicable - - not applicable -

- **off site** - not applicable - - not applicable -

- not applicable - - not applicable -

- not applicable - - not applicable -

**continuing contamination or danger**

-**on site** not applicable

-**off site** not applicable

**remarks** - not applicable -

## 2 Seveso II Duties

**pre-accident evaluation**

**Article item not due yet not done done/submitted evaluated**

**6 notification** No No No No

**7 policy (MAPP)** No No No No

**9 safety report** No No No No

**9, 10, 11 update** No No No No

**11 internal plan** No No No No

**11 external plan** No No No No

**13 informing public** No No No No

**9, 12 siting policy** No No No No

**post-accident evaluation**

**Seveso II duty was actual were actual compared with actual**

**contingency consequences consequences, the**

**addressed? addressed? predicted extent was?**

**Article item**

**7 policy (MAPP)** not applicable not applicable not applicable

**9 current safety report** not applicable not applicable not applicable

**11 internal plan** not applicable not applicable not applicable

**11 external plan** not applicable not applicable not applicable



13 informing public not applicable not applicable not applicable

9, 12 siting policy not applicable not applicable not applicable

evaluation of safety organisation

organisational element element existed did element relate to actual circumstances of

yes / no no / partly / yes adequate?

- written policy objectives No

- specified management No

structure

- specified responsibilities No

- specified working procedures No

- specified procedures for No

assessment/auditing of

management system

- specified procedures for No

review and update of

management policy

- specified general training No

procedures

- specified emergency No

training procedures

evaluation of ecological impact control

organisational element element existed did element relate to actual circumstances of

yes / no no / partly / yes adequate?

- ecological status review No

before incident

- potential ecological No

consequences assessment

- ecological impact review No

after incident

- ecological restoration No

procedures

- subsequent review of No

restoration success

remarks - not applicable -

### 3 Official Action Taken

legal action

- not applicable -

other official action

- not applicable -

### 4 Lessons Learned

measures to prevent recurrence

After the accident, an inspect... see Appendix Full Report C / lesson learned - prevent

**measures to mitigate consequences:**

- not applicable -

**useful references:**

- not applicable -

**5 Discussion about Response**

- not applicable -

## **Appendices for the FA / 1800\_048\_01 report**

**Appendix Short Report / description of accident types:**

ACCIDENT CASE HISTORY DESCRIPTION:

Probably because of the failure of the cooling system of the epichlorhydrine reactor, the polymerization heat (not removed) caused a pressure increase and an explosion inside the vessel and afterwards a fire. The plant was destroyed. The fire threatened the safety of storage tanks containing ethylene oxide and trimethylamine, as well as the nearby plants. The population was alerted.

**Appendix Short Report / description of immediate sources:**

The accident involved a vessel in a process plant for the epichlorhydrine [1-chloro 2,3-epoxy-propane] production. This process plant, part of an organic chemical industry for the production of glycidyltrimethylammoniumchloride, was located nearby many tanks for the storage of ethylene oxide and trimethylamine.

**Appendix Short Report / description of suspected causes:**

CAUSES:

Probably because of the failure of the cooling system of the epichlorhydrine reactor, the polymerization heat (not removed) caused a pressure increase that led to an explosion inside the vessel.

**Appendix Short Report / description of immediate effects:**

EFFECTS ON PEOPLE:

Inside the establishment 1 person was injured (and hospitalized) by the explosion.

MATERIAL LOSS:

The epichlorhydrine production plant was completely destroyed. Outside the establishment the windows' glasses of the nearby houses were ruptured due to the shock wave generated by the explosion. No data are available about the cost of the material damages.

COMMUNITY DISRUPTION:

Outside the establishment the windows' glasses of the nearby houses were ruptured due to the shock wave generated by the explosion.

**Appendix Short Report / description of emergency measures taken:**

INTERNAL TO THE ESTABLISHMENT:

The internal alarm was sounded and the fire brigade intervened on-site. As the fire was threatening the safety of storage tanks containing ethylene oxide and trimethylamine, as well as the nearby plants, fire brigade avoided the propagation of fire to them.

EXTERNAL TO THE ESTABLISHMENT:

The population was alerted.

**Appendix Full Report A / dangerous substances:**

The total establishment and the potential directly involved inventories of trimethylamine and ethylene oxide refer to the whole amount involved in the accident (it has been estimated in about 5,000 Kg). No data are available about the single amounts of trimethylamine and ethylene oxide.

**Appendix Full Report A / source of accident - remarks:**

The accident involved a vessel (code 4002) in a process plant for the epichlorhydrine [1-chloro 2,3-epoxy-propane] production. This process plant (code 3102), part of an organic chemical industry (code 2001) for the production of glycidyltrimethylammoniumchloride, was located nearby many tanks for the storage of ethylene oxide and trimethylamine.

**Appendix Full Report A / causes of major occurrence:**

Probably because of the failure of the cooling system (code 5101) of the epichlorhydrine reactor, the polymerization heat (not removed) caused a pressure increase that led to an explosion inside the vessel (code 5106). The underlying causes that led to the accident were, both, inadequate process analysis (code 5307) and system design (code 5308).

**Appendix Full Report B / area concerned - remarks:**

The epichlorhydrine production plant was completely destroyed. Outside the establishment, the windows' glasses of the nearby houses were ruptured due to the shock wave

generated by the explosion.

### **Appendix Full Report B / people:**

Inside the establishment 1 person was injured (and hospitalized) by the explosion.

### **Appendix Full Report B / ecological harm:**

In the Original Report there is no evidence of significant ecological harms.

### **Appendix Full Report B / material loss:**

The epichlorhydrine production plant was completely destroyed. Outside the establishment the windows' glasses of the nearby houses were ruptured due to the shock wave generated by the explosion. No data are available about the cost of the material damages. The main problem after the incident were the large amounts of white asbestos scattered around and outside the establishment. Sufficiently protected fire brigade personnel took care of the removal of the asbestos on the days immediately after the explosion. (1) the fire water was contaminated with gasoline due to violation of procedures (back-flow through a hose, connecting a hydrant and a drum) (2) no safety advice during contract negotiations for renting the mobile pump. The Internal Emergency Plan was activated (code 7100). Gaz de France put in operation the safety resources (personnel and materials [code 7201]) available at Beynes (Yvelines). The release was halted with the assistance of a specialized contractor (code 7205) called in by the manufacturer, who covered the escape source with sludge and brought the bar to its original position by increasing the loading on it (code 7501). The External Emergency Plan was activated and the Authorities were alerted (code 7200). The Fire Brigade was mobilized but its intervention was not necessary (code 7201). The Police (code 7203) kept curious people away at a safe distance of 300m (code 7207). No emergency measures are still required, neither on-site nor off-site (code 7703).

### **Appendix Full Report B / disruption of community life:**

Outside the establishment, the windows' glasses of the nearby houses were ruptured due to the shock wave generated by the explosion. The population was alerted.

### **Appendix Full Report C / lesson learned - prevent:**

After the accident, an inspection of the plants by a team of experts was decided.