

# Läckage av flytande vinylklorid till följd av ett brustet rör på en kemikaliefabrik.

880817 MARS 1800\_005\_004

En korroderad rörledning i en avgasninganläggning på en kemikaliefabrik brast då flytande vinylklorid till följd av ett misstag leddes in i röret. När läckan upptäcktes strax efter 23.00 hade 4 ton hunnit rinna ut. Den bildade vinylkloridgasen – 2,5 gånger tyngre än luft – stannade nära markytan och hölls på plats av den kringgärdande banvallen. Efter 45 minuter lokaliserades läckaget och åtgärdades. Företagets brandmän samarbetade med räddningstjänsten för förhindra vinylkloridens spridning. Kontinuerliga mätningar med explosimetrar runt fabriken gav negativa resultat. Efter att läckan tätats avtog koncentrationen av vinylklorid kontinuerligt till dess att man klockan 01:30 kunde anse ångorna skingrade.

## Inblandade ämnen och mängder

	CAS Nr.	Mängd
Vinylklorid		

## Skador:

Människor: Inga skador rapporterade.

Materiella: Inga skador rapporterade.

Miljö/ekologi: Inga skador rapporterade.

Infrastruktur: Järnvägstrafiken i samhället Jemeppe avbröts mellan 23:32 och 03:08. Godståg stoppades, medan internationella tåg omdirigerades via Bryssel.

## Erfarenheter redovisade (Ja/Nej): Ja

I rapporten anges åtgärder för förbättrade inspektionsprocedurer och utbildningsrutiner. Detaljer kring olyckan finns i dokumentet "Accident which occurred on 17th August, 1988 at the SOLVIC monomer Centre at Jemeppe-sure-Sambre. Leak of liquid vinyl chloride. ANALYTICAL INFORMATION" som vidhäftats den ursprungliga rapporten.

## Report Profile

### Identification of Report:

country: FA ident key: 1800\_005\_04

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

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

start: 1988-08-17 start: 23:10:00

finish: 1988-08-17 finish:

### Establishment:

name:

address:

industry: 2001 general chemicals manufacture

Organicl Chemical (Vinyl Chloride Production)

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\_005\_04

**Accident Types:**

**release:** Yes **explosion:** Yes

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

**fire:** No

**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:**

- Vinyl Chloride (C.A.S. CODE: 75-01-4): amount involved = 4,000 kg.

**Immediate Sources of Accident:**

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

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

**description:**

The accident occurred at night in the vinyl chloride storage site of an organic chemical industry for the vinyl chloride production. The component involved was a piping of the degassing collector. The storage area was located on the other s... see Appendix Short Report / description of immediate sources

**Suspected Causes:**

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

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

**description:**

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

**Immediate Effects:**

**material loss:** No

**human deaths:** No

**human injuries:** No **community disruption:** Yes

**other:** Yes

**ecological harm:** No

**national heritage loss:** No

**description:**

OTHER:... see Appendix Short Report / description of immediate effects

**Emergency Measures taken:**

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

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

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

**evacuation:** No

**description:**

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

**Immediate Lessons Learned:**

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

**mitigation:** Yes

**description:**

MEASURES TO PREVENT ANY RECURRENCE OF SIMILAR ACCIDENTS:... see Appendix Short Report / description of immediate lessons learned

## A Occurrence Full Report

**country:** FA **ident key:** 1800\_005\_04

### 1 Type of Accident

**remarks:** A handling error allowed liquid vinyl chloride to be admitted in the degassing collector. The pipe had been filled with liquid vinyl chloride at a pressure of 9ö10 bar and, even if it had a nominal design pressure of 16 bar, it ruptured (co... see Appendix Full Report A / type of accident

### 2 Dangerous Substances

**remarks:** The total establishment and the potential directly involved inventories of vinyl chloride refer to the amount released during the accident.

### 3 Source of Accident

**illustration:** - not applicable -

**remarks:** The accident occurred at night in the vinyl chloride storage site (code 3201) of an organic chemical industry for the vinyl chloride production (code 2001). The component involved was a piping (code 4011) of the degassing collector. The sto... see Appendix Full

#### 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** 5102 operation: component/machinery failure/malfunction

5104 operation: corrosion/fatigue

- not applicable -

- not applicable -

- not applicable -

**human / organizational** 5303 organization: organized procedures (none, inadequate, inappropriate, unclear)

5307 organization: process analysis (inadequate, incorrect)

5308 organization: design of plant/equipment/system inadequate, inappropriate)

5401 person: operator error

- not applicable -

**remarks:** A handling error (code 5401) allowed liquid vinyl chloride to be admitted in the degassing collector. The pipe had been filled with liquid vinyl chloride at a pressure of 9.610 bar and it ruptured (code 5102) at a weak point that has been de... see Appendix Full Report A / causes of major occurrence

#### 6 Discussion about the Occurrence

- not applicable -

**Type of Accident country: FA ident key: 1800\_005\_04**

**event:**

**major occurrence** 1102 release: fluid release to ground

**initiating event** - not applicable -

**associated event** - not applicable -

**event:**

**major occurrence** 1101 release: gas/vapour/mist/etc release to air

**initiating event** 1301 explosion: pressure burst (rupture of pressure system)

**associated event** - not applicable -

#### Dangerous substances

**country: FA ident key: 1800\_005\_04**

**a) total establishment inventory**

**CAS number:** 75-01-4 **identity:** Vinyl Chloride

**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):** 4

**use of substance as:** NORMAL FINISHED PRODUCT

**b) substance belongs to relevant inventory directly involved:** Yes

**actual quantity:** 4 **potential quantity:** 4

**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\_005\_04

**situation**

**industry**

**initiating event** 2001 general chemicals manufacture

**associated event** - not applicable -

**activity/unit**

**major occurrence** 3201 storage: process-associated (stockholding, etc. on-site of manufacture)

**initiating event** 3201 storage: process-associated (stockholding, etc. on-site of manufacture)

**associated event** - not applicable -

**component**

**major occurrence** 4011 general pipework/flanges

**initiating event** 4011 general pipework/flanges

**associated event** - not applicable -

## **B Consequences Full Report**

**country:** FA **ident key:** 1800\_005\_04

**1 Area concerned**

**affected**

**extent of effects installation:** Yes

**establishment:** Yes

**off-site; local:** No

**off-site; regional:** No

**off-site; transboundary:** No

**illustration of effects** - not applicable -

**remarks** Sambreville fire brigade was called and took position around the plant fence on ... see Appendix Full Report B / area concerned - remarks

## 2 People

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

**total at risk** -1 -1 -1

**immediate fatalities** 0 0 0

**subsequent fatalities** 0 0 0

**hospitalizing injuries** 0 0 0

**other serious injuries** 0 0 0

**health monitoring** 0 0 0

**remarks** Nobody was injured by the vinyl chloride release.

## 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 BFr ECU BFr**

**material losses** 0 0 0 0

**response, clean up, restoration** 0 0 0 0

**remarks** No material losses occurred except the released vinyl chloride and the ruptured ... 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 23:32 to 03:08

- **waterways** No

- **air transport** No

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

- **off site populations** No No Yes

- **media interest** No No No

- **political interest** No No No

**remarks** Sambreville fire brigade was called and took position around the plant fence on ... see Appendix

## 7 Discussion of Consequences

### Ecological Components involved

**country:** FA **ident key:** 1800\_005\_04

**type:** - not applicable -

**threatened:** not applicable **affected:** not applicable

## C Response Full Report

**country:** FA **ident key:** 1800\_005\_04

### 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, the follow... see Appendix Full Report C / lesson learned - prevent

measures to mitigate consequences:

After the accident, the follow... see Appendix Full Report C / lesson learned - mitigate

useful references:

More detailed information abou... see Appendix Full Report C / lesson learned - references

### 5 Discussion about Response

- not applicable -

## **Appendices for the FA / 1800\_005\_04 report**

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

#### **ACCIDENT CASE HISTORY DESCRIPTION:**

A corroded pipe in the degassing system ruptured after the wrong admission of liquid vinyl chloride and a leakage of about 4 tonnes of this substance occurred before its isolation. A layer of the escaped gas developed close to the drain ditches of the area where the leakage occurred. The vinyl chloride vapours, being 2.5 times heavier than air, remained close to the ground. The slightly elevated rails of the railway serving the area acted initially as a dike and contained the gas cloud. Atmospheric conditions and water curtains created by the plant fire brigade managed to contain the cloud close to the leakage point until it had been diluted by convection. The evaporation of liquid vinyl chloride had been promoted by the water draining from the water curtains. The source of the release was identified 45 minutes after the leakage was detected; the leaking pipeline was isolated soon after that. The company firemen checked the roads around the factory with explosimeters and the response was negative everywhere. Besides, they irrigated the area where the leakage occurred and made a screen from each side. The Security chief called Service 100 to signal the leak and to ask the firemen to take up position around the factory in case gas layer moved to the outside. Sambreville fire brigade was called and took position around the plant fence on the side opposite the site of the leak but its intervention was not necessary, since repeated gas concentration measurements at the boundary of the factory resulted negative. The railway traffic in the city of Jemeppe was interrupted during the accident, from 23:32 till 03:08 next morning. The goods trains were stopped where they were whilst the international traffic was diverted via Brussels. The leakage had been detected at 23:10, the leaking point had been identified at 23:55 and the piping isolation took place around 00:05. From this moment, the leakage was decreasing until the gas cloud was practically dispersed at 01:30. More detailed information about the accident are available on the document "Accident which occurred on 17th August, 1988 at the SOLVIC monomer Centre at Jemeppe-sure-Sambre. Leak of liquid vinyl chloride. ANALYTICAL INFORMATION" attache to the Original Report.

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

The accident occurred at night in the vinyl chloride storage site of an organic chemical industry for the vinyl chloride production. The component involved was a piping of the degassing collector. The storage area was located on the other side of the rail-way line (line 130 Charleroi-Namur) which passed behind the vinyl chloride/dichlorethane installations.

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

#### **CAUSES:**

A handling error allowed liquid vinyl chloride to be admitted in the degassing collector. The pipe had been filled with liquid vinyl chloride at a pressure of 9ö10 bar and, even if it had a nominal design pressure of 16 bar, it ruptured at a weak point that has been developed due to a corrosion phenomenon. The collector, which was locally corroded in an inaccessible section situated in a piping tunnel, burst under the pressure of fluid and vinyl chloride was released over the soil. The underlying causes that led to the accident were insufficient testing/inspection procedures together with inadequate process analysis and design plant.

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

#### **OTHER:**

No material losses occurred except the released vinyl chloride and the ruptured piping that had to be changed.

#### **COMMUNITY DISRUPTION:**

The railway traffic in the city of Jemeppe was interrupted during the accident, from 23:32 till 03:08 next morning. The goods trains were stopped where they were whilst the international traffic was diverted via Brussels.

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

#### **INTERNAL TO THE ESTABLISHMENT:**

The water spray system went into operation. The source of the release was identified 45 minutes after the leakage was detected; the leaking pipeline was isolated soon after that. The company firemen checked the roads around the factory with explosimeters and the response was negative everywhere. Besides, they irrigated the area where the leakage occurred and made a screen from each side. The Security chief called Service 100 to signal the leak and to ask the firemen to take up position around the factory in case gas layer moved to the outside.

#### **EXTERNAL TO THE ESTABLISHMENT:**

Sambreville fire brigade was called and took position around the plant fence on the side opposite the site of the leak but its intervention was not necessary, since repeated gas concentration measurements at the boundary of the factory resulted negative. The railway traffic in the city of Jemeppe was interrupted during the accident, from 23:32 till 03:08 next morning. The goods trains were stopped where they were whilst the international traffic was diverted via Brussels.

### **Appendix Short Report / description of immediate lessons learned:**

## MEASURES TO PREVENT ANY RECURRENCE OF SIMILAR ACCIDENTS:

After the accident, the following measures were established:

- 1- improved training for operators;
- 2- improved inspections procedures;
- 3- pipes in a gas service and in a degassing system to be equipped with liquid traps and to be installed in such a way to make visible inspection possible.

## MEASURES TO MITIGATE THE EFFECTS OF THE ACCIDENT:

After the accident, the following measures were established:

- 1- the plant drawings to be reviewed to determine the consequences of any maloperation, ensure rapid detection and check the efficiency of emergency measures;
- 2- simple and efficient emergency response procedures to be developed for all operations;
- 3- the number of gas detectors to be increased.

### **Appendix Full Report A / type of accident:**

A handling error allowed liquid vinyl chloride to be admitted in the degassing collector. The pipe had been filled with liquid vinyl chloride at a pressure of 9.610 bar and, even if it had a nominal design pressure of 16 bar, it ruptured (code 1301) at a weak point that has been developed due to a corrosion phenomenon. The collector burst under the pressure of fluid and vinyl chloride was released over the soil (codes 1101 and 1102).

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

The accident occurred at night in the vinyl chloride storage site (code 3201) of an organic chemical industry for the vinyl chloride production (code 2001). The component involved was a piping (code 4011) of the degassing collector. The storage area was located on the other side of the rail-way line (line 130 Charleroi-Namur) which passed behind the vinyl chloride/dichlorethane installations.

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

A handling error (code 5401) allowed liquid vinyl chloride to be admitted in the degassing collector. The pipe had been filled with liquid vinyl chloride at a pressure of 9.610 bar and it ruptured (code 5102) at a weak point that has been developed due to a corrosion phenomenon (code 5104). The underlying causes that led to the accident were insufficient testing/inspection procedures together with inadequate process analysis and design plant (codes 5303, 5307 and 5308).

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

Sambreville fire brigade was called and took position around the plant fence on the side opposite the site of the leak but its intervention was not necessary, since repeated gas concentration measurements at the boundary of the factory resulted negative. The railway traffic in the city of Jemeppe was interrupted during the accident, from 23:32 till 03:08 next morning. The goods trains were stopped where they were whilst the international traffic was diverted via Brussels.

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

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

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

No material losses occurred except the released vinyl chloride and the ruptured piping that had to be changed.

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

Sambreville fire brigade was called and took position around the plant fence on the side opposite the site of the leak but its intervention was not necessary, since repeated gas concentration measurements at the boundary of the factory resulted negative. The railway traffic in the city of Jemeppe was interrupted during the accident, from 23:32 till 03:08 next morning. The goods trains were stopped where they were whilst the international traffic was diverted via Brussels.

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

After the accident, the following measures were established:

- 1- improved training for operators;
- 2- improved inspections procedures;
- 3- pipes in a gas service and in a degassing system to be equipped with liquid traps and to be installed in such a way to make visible

inspection possible.

**Appendix Full Report C / lesson learned - mitigate:**

After the accident, the following measures were established:

- 1- the plant drawings to be reviewed to determine the consequences of any maloperation, ensure rapid detection and check the efficiency of emergency measures;
- 2- simple and efficient emergency response procedures to be developed for all operations;
- 3- the number of gas detectors to be increased.

**Appendix Full Report C / lesson learned - references:**

More detailed information about the accident are available on the document " Accident which occurred on 17th August, 1988 at the SOLVIC monomer Centre at Jemeppe-sure-Sambre. Leak of liquid vinyl chloride. ANALYTICAL INFORMATION" attache to the Original Report.