

Kemikalieutsläpp i en organisk kemisk fabrik.

870424 MARS 1987_09

Olyckan inträffade på en kemikaliefabrik i en värmeväxlare för uppvärmning av en fosgenlösning. Klockan 05:10 brast en ventil vid utflödet på värmeväxlaren, varvid en flytande 70%-ig lösning av fosgen i monoklorbensen släpptes ut. Efter ett oljud lokaliserades läckan av en skiftarbetare. Skiftarbetaren och en operatör tog genast på sig andningsutrustning. De stoppade tillflödet uppströms och stängde en ventil nedströms värmeväxlaren. Anläggningen stängdes ned och katastrofplanen sattes i verket. Angränsande fabriker, räddningstjänsten och närmaste sjukhus informerades. Läckan stoppades inom fem minuter. Ventilen brast på grund av korrosion.

Inblandade ämnen och mängder

	CAS Nr.	Mängd
fosgen	75-44-5	300 kg
monoklorbensen	108-90-7	130 kg

Skador:

Människor: Inga.
Materiella: Inga.
Miljö/ekologi: Inga effekter rapporterade.
Infrastruktur: Inga.

Erfarenheter redovisade (Ja/Nej): Ja

Mycket kortfattat anges förebyggande åtgärder.

Report Profile

Identification of Report:

country: FA ident key: 1987_009_01

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

Date of Major Occurrence: Time of Major Occurrence

start: 1987-04-24 start: 05:00:00

finish: finish:

Establishment:

name:

address:

industry: 2001 general chemicals manufacture

Organic Chemical (Polymeric Isocyanates 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:** 1987_009_01

Accident Types:

release: Yes **explosion:** No

water contamination: No **other:** No

fire: No

description:

SAFETY SYSTEMS OR OPERATORS INTERVENTION:... see Appendix Short Report / description of accident types

Substance(s) Directly Involved:

toxic: Yes **explosive:** No

ecotoxic: No **other:** No

flammable: No

description:

- 70% Phosgene (C.A.S. CODE: 75-44-5, C.E.E. CODE: 006-002-00-8) solution in Monochlorobenzene: amount

involved = maximum 300 kg of phosgene.... see Appendix Short Report / description of substances involved

Immediate Sources of Accident:

storage: No **transfer:** No

process: Yes **other:** No

description:

The accident occurred in the feeding circuit of the 70% phosgene solution in monochlorobenzene of a polymeric

isocyanate production plant in an organic chemical industry. The polymeric isocyanate production used as

starting materials: anyli... see Appendix Short Report / description of immediate sources

Suspected Causes:

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

human: No **other:** No

description:

INITIATING EVENT AND CONSEQUENCES:... see Appendix Short Report / description of suspected causes

Immediate Effects:

material loss: No

human deaths: No

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

other: Yes

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: No **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:... see Appendix Short Report / description of

immediate lessons learned

A Occurrence Full Report

country: FA **ident key:** 1987_009_01

1 Type of Accident

remarks: The rupture of a purge valve, installed at the outlet of a heat exchanger for heating the phosgene solution, caused the release of a 70% phosgene solution in monochlorobenzene (code 1102). Phosgene gas developed from the released solution (... see Appendix Full Report A / type of accident

2 Dangerous Substances

remarks: During the accident a 70% phosgene solution in monochlorobenzene was released. The total establishment and the potential directly involved of phosgene and monochlorobenzene refer to the amount (to be considered as a maximum value) released ... see Appendix Full Report A / dangerous substances

3 Source of Accident

illustration: - not applicable -

remarks: The accident occurred in the feeding circuit of the 70% phosgene solution in

monochlorobenzene of a polymeric isocyanate production plant (codes 3102)
in an organic chemical industry (code 2001). The release occurred from a
purge valve (cod... 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): 0

direction (from):

stability (Pasquill):

ambient temperature (°C):

remarks: Light wind of about 0,3 m/s. 98% relative humidity.

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

- not applicable -

- not applicable -

- not applicable -

- not applicable -

remarks: The four bolts fractured (code 5102) due to chloride stress cracking corrosion (code
5104). There is a possibility (not fully clear) that there was hydrogen embrittlement
also. The cracking corrosion was caused by an inadequate component ... see Appendix Full
Report A / causes of major occurrence

6 Discussion about the Occurrence

- not applicable -

Type of Accident country: FA ident key: 1987_009_01

event:

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

initiating event 1102 release: fluid release to ground

associated event - not applicable -

Dangerous substances

country: FA ident key: 1987_009_01

a) total establishment inventory

CAS number: 75-44-5 **identity:** Phosgene

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): 0,3

use of substance as: NORMAL FINISHED PRODUCT

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 0,3 potential quantity: 0,3

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: 108-90-7 identity: Monochlorobenzene

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): 0,13

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 0,13 potential quantity: 0,13

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

Source of Accident - Situation country: FA ident key: 1987_009_01

situation

industry

initiating event - not applicable -

associated event - not applicable -

activity/unit

major occurrence - not applicable -

initiating event - not applicable -

associated event - not applicable -

component

major occurrence 4010 valves/controls/monitoring devices/drain cocks

initiating event 4010 valves/controls/monitoring devices/drain cocks

associated event - not applicable -

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 4009 heat exchanger (boiler, refrigerator, heating coils, etc.)

initiating event 4009 heat exchanger (boiler, refrigerator, heating coils, etc.)

associated event - not applicable -

B Consequences Full Report

country: FA **ident key:** 1987_009_01

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 Internal, intercompanies and fire department emergency plans were put into actio... see Appendix

Full Report B / area concerned - remarks

2 People

establishment popul. emergency personnel off-site population

total at risk 22

immediate fatalities

subsequent fatalities

hospitalizing injuries

other serious injuries

health monitoring

remarks Inside the establishment some operators experienced minor irritation owing to ex... 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 No material losses occurred except the released phosgene solution and the broken... 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** Yes No No

- **media interest** No No No

- **political interest** No No No

remarks In the Original Report there is no evidence of significant effects outside the e... see Appendix

7 Discussion of Consequences

C Response Full Report

country: FA **ident key:** 1987_009_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, the follow... 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 / 1987_009_01 report

Appendix Short Report / description of accident types:

SAFETY SYSTEMS OR OPERATORS INTERVENTION:

The section of the circuit containing the leaking valve was isolated with subsequent shut-down of the unit.

OTHER SYSTEMS INVOLVED AND OPERATING CONDITIONS:

No other systems were involved in the accident.

ENVIRONMENTAL AND ATMOSPHERIC CONDITIONS:

Light wind of about 0.3 m/s. 98% Relative humidity.

ACCIDENT CASE HISTORY DESCRIPTION:

At 05:10 the rupture of a purge valve, installed at the outlet of a heat exchanger for heating the phosgene solution, caused the release of a 70% phosgene solution in monochlorobenzene. A noise was heard by the shift personnel who then located the leak. The shift supervisor and an operator immediately put on personal air breathing apparatuses and went where the leakage occurred. The section of the circuit containing the leaking valve was isolated on the upstream by stopping the feeding pump and closing the block valve at the exchanger inlet and on the downstream by closing the first block valve after the exchanger outlet. The valve to the vacuum system was immediately opened to evacuate the product contained in the isolated section to the scrubber system. The plant was shut-down. Internal, intercompanies and fire department emergency plans were put into action. Neighbouring plants, fire department and hospital of Salreu were alerted. At 05:14 the leak was stopped.

Appendix Short Report / description of substances involved:

- 70% Phosgene (C.A.S. CODE: 75-44-5, C.E.E. CODE: 006-002-00-8) solution in Monochlorobenzene: amount involved = maximum 300 kg of phosgene.

- Monochlorobenzene (C.A.S. CODE: 108-90-7, C.E.E. CODE: 602-033-00-1): amount involved = about 130 Kg.

Appendix Short Report / description of immediate sources:

The accident occurred in the feeding circuit of the 70% phosgene solution in monochlorobenzene of a polymeric isocyanate production plant in an organic chemical industry. The polymeric isocyanate production used as starting materials: aniline, formaldehyde, hydrogen chloride, sodium hydroxide and carbonium chloride. The operating conditions in the feeding section of the 70% phosgene solution in monochlorobenzene were: pressure= 40 bar and temperature= 135 °C. The plant is part of a chemical industry complex (4 factories) located in a plane forest area, 1 km away from some houses and 3 km away from the nearest village.

Appendix Short Report / description of suspected causes:

INITIATING EVENT AND CONSEQUENCES:

The four bolts of a purge valve fastening the top to the body broke. This purge valve was installed at the outlet of a heat exchanger for heating the phosgene solution. The valve characteristics were:

- Manufacturer=Tuflin,

- Internal diameter= 1/2",

- Pressure design= 600 lb,

- Material= 316 SS,

- Bolts= B6-ANSI 410.

CAUSES:

The four bolts fractured due to chloride stress cracking corrosion. There is a possibility (not fully clear) that there was hydrogen embrittlement also. The cracking corrosion occurred due to an inadequate component design.

Appendix Short Report / description of immediate effects:

EFFECTS ON PEOPLE:

Inside the establishment some operators experienced minor irritation owing to exposure to phosgene. Nobody was injured outside the establishment.

OTHER:

No material losses occurred except the released phosgene solution and the broken valve.

MAP OF THE ACCIDENT AREA AND MAX. DENSITY OF POPULATION:

The plant is part of a chemical industry complex (4 factories) sited in a plane forest area, 1 km away from some houses and 3 km away from the nearest village.

Appendix Short Report / description of emergency measures taken:

INTERNAL TO THE ESTABLISHMENT:

Personal air breathing apparatuses were used by the shift supervisor and one operator. The section of the circuit containing the leaking valve was isolated with consequent shut-down of the unit. The product remained in the isolated section was evacuated to the scrubber system.

EXTERNAL TO THE ESTABLISHMENT:

Internal, intercompanies and fire department emergency plans were put into action. Neighbouring plants, fire department and hospital of Salreu were alerted. The alarm was given through the proper internal telecommunication system but fire brigade intervention was not necessary.

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- the material of which the bolts of the valve are made had been changed from B6-ANSI 410 to B7-ANSI 410;
- 2- for this and similar services, valves will be replaced by new globe valves bellow-sealed with a leak detector or ball valves with double-stem sealing.

Appendix Full Report A / type of accident:

The rupture of a purge valve, installed at the outlet of a heat exchanger for heating the phosgene solution, caused the release of a 70% phosgene solution in monochlorobenzene (code 1102). Phosgene gas developed from the released solution (code 1101) into the environment.

Appendix Full Report A / dangerous substances:

During the accident a 70% phosgene solution in monochlorobenzene was released. The total establishment and the potential directly involved of phosgene and monochlorobenzene refer to the amount (to be considered as a maximum value) released during the accident.

Appendix Full Report A / source of accident - remarks:

The accident occurred in the feeding circuit of the 70% phosgene solution in monochlorobenzene of a polymeric isocyanate production plant (codes 3102) in an organic chemical industry (code 2001). The release occurred from a purge valve (code 4010) at the outlet of a heat exchanger (code 4009). The plant is part of a chemical industry complex (4 factories) sited in a plane forest area, 1 km away from some houses and 3 km away from the nearest village.

Appendix Full Report A / causes of major occurrence:

The four bolts fractured (code 5102) due to chloride stress cracking corrosion (code 5104). There is a possibility (not fully clear) that there was hydrogen embrittlement also. The cracking corrosion was caused by an inadequate component design (code 5308).

Appendix Full Report B / area concerned - remarks:

Internal, intercompanies and fire department emergency plans were put into action. Neighbouring plants, fire department and hospital of Salreu were alerted but in the Original Report there is no evidence of significant effects outside the establishment. Even if some operators experienced minor irritation owing to exposure to phosgene nobody was injured outside the establishment.

Appendix Full Report B / people:

Inside the establishment some operators experienced minor irritation owing to exposure to phosgene. Nobody was injured outside the establishment.

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 phosgene solution and the broken valve.

Appendix Full Report B / disruption of community life:

In the Original Report there is no evidence of significant effects outside the establishment.

Appendix Full Report C / lesson learned - prevent:

After the accident, the following measures were established:

- 1- the material of which the bolts of the valve are made had been changed from B6-ANSI 410 to B7-ANSI 410;
- 2- for this and similar services, valves will be replaced by new globe valves bellow-sealed with a leak detector or ball valves with double-stem sealing.