

Gasutsläpp på en kloralkalifabrik.

810925 MARS 1800_43

Under rutinemässig drift inträffade en oväntad och oönskad bildning av metylnitrat i ett kärl för uppsamling av flytande klorrester. Blandningen i kärlet exploderade och delar av vätskeblandningen förångades med utsläpp av klor och brom som följd. Anläggningen stängdes av och allmänheten varnades. Information om den direkta orsaken till bildningen av metylnitrat saknas, även om en orsak kan ha varit förekomsten av metanolföreningar i väteklorid.

Inblandade ämnen och mängder

	CAS Nr.	Mängd
metylnitrat	598-58-3	okänt
metanol	67-56-1	okänt
väteklorid	7647-01-0	okänt
utsläppta gaser fördelat på		totalt ca 600 kg
klor	7782-50-5	okänt
brom	7726-95-6	okänt

Skador:

Människor: Sex anställda fördes till sjukhus efter att ha utsatts för giftgaserna.

Materiella: Anläggningen skadades. Inga närmare uppgifter.

Miljö/ekologi: Inga effekter rapporterade.

Infrastruktur: Inga.

Erfarenheter redovisade (Ja/Nej): Ja

Förebyggande åtgärder anges kortfattat.

Report Profile

Identification of Report:

country: FA ident key: 1800_043_01

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

Date of Major Occurrence: Time of Major Occurrence

start: 1981-09-25 start:

finish: finish:

Establishment:

name:

address:

industry: 2001 general chemicals manufacture

Chlorine-Alkali Electrolysis (Collecting Residuals of Liquefied Chlorine)

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_043_01

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:

- Methylnitrate (C.A.S. CODE: 598-58-3): amount involved in the explosion = not known.... see Appendix Short

Report / description of substances involved

Immediate Sources of Accident:

storage: No **transfer:** No

process: Yes **other:** No

description:

The accident occurred during normal operation in a collecting vessel of residuals of liquified chlorine from the chlorine condensation plant in a chlorine/alkali electrolysis.

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

immediate lessons learned

A Occurrence Full Report

country: FA **ident key:** 1800_043_01

1 Type of Accident

remarks: A sudden confined explosion occurred in a vessel for liquified chlorine

residuals (code 1306). As a consequence, the pipe connecting it to the chlorine condensation plant broke and hence a partial evaporation of its contents followed and to... see Appendix Full Report A / type of accident

2 Dangerous Substances

remarks: No data are available about the amount of methylnitrate formed in the vessel

due to the introduction of hydrogen chloride contaminated with methanol in the electrolysis system. The whole amount of toxic gases released into the environment d... see Appendix Full Report A / dangerous substances

3 Source of Accident

illustration: - not applicable -

remarks: The explosion occurred during normal operation in a collecting vessel (codes

3201 and 4003) of residuals of liquified chlorine from the chlorine condensation plant in a chlorine/alkali electrolysis (code 2001). The explosion caused a break ... 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 5107 operation: unexpected reaction/phase-transition

- not applicable -

- not applicable -

- not applicable -

- not applicable -

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

5307 organization: process analysis (inadequate, incorrect)

- not applicable -

- not applicable -

- not applicable -

remarks: The explosion was caused by an unexpected (code 5307) and undesired formation of methylnitrate in the vessel for collecting residual chlorine residuals from the condensation plant (code 5107). Presumably this has been caused by the introduc... see Appendix Full Report A / causes of major occurrence

6 Discussion about the Occurrence

- not applicable -

Type of Accident country: FA ident key: 1800_043_01

event:

major occurrence 1306 explosion: explosive decomposition (of unstable material)

initiating event - not applicable -

associated event - not applicable -

event:

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

initiating event 1306 explosion: explosive decomposition (of unstable material)

associated event - not applicable -

Dangerous substances

country: FA ident key: 1800_043_01

a) total establishment inventory

CAS number: 598-58-3 identity: Methylnitrate

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): -1

use of substance as: ABNORMAL PRODUCT

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: -1 potential quantity: -1

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: 67-56-1 identity: Methanol

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): -1

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: -1 potential quantity: -1

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: 7647-01-0 identity: Hydrogen 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): -1

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: -1 potential quantity: -1

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: 7782-50-5 identity: Chlorine

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): 0,6

use of substance as: NORMAL FINISHED PRODUCT

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 0,6 potential quantity: 0,6

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: 7726-95-6 identity: Bromine

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): 0,6

use of substance as: NORMAL FINISHED PRODUCT

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 0,6 potential quantity: 0,6

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_043_01

situation

industry

initiating event 2001 general chemicals manufacture

associated event - not applicable -

activity/unit

major occurrence 3104 process: physical operations (mixing, melting crystallizing, etc.)

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 4003 container; non-pressurised (hopper, tank, drum, bag, etc.)

associated event - not applicable -

B Consequences Full Report

country: FA **ident key:** 1800_043_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 Even if the population outside the establishment was alerted, in the Original Re... 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 6

other serious injuries

health monitoring

remarks Inside the establishment 6 people were hospitalized due to the toxic release.... 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 explosion caused damages to the plant but no data are available about the co... 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 The population outside the establishment was alerted.... see Appendix Full Report B / disruption

7 Discussion of Consequences

C Response Full Report

country: FA ident key: 1800_043_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 / 1800_043_01 report

Appendix Short Report / description of accident types:

ACCIDENT CASE HISTORY DESCRIPTION:

During normal operation there was an unexpected and unwanted formation of methylnitrate in a vessel for collecting chlorine residuals. Probably this has been caused by the introduction of hydrogen chloride contaminated with methanol in the electrolysis system. The explosion in the vessel caused a break in the pipe connecting it to the chlorine condensation plant, and hence a partial evaporation of the contents followed. The plant was shut-down and the population outside the establishment was alerted.

Appendix Short Report / description of substances involved:

- Methylnitrate (C.A.S. CODE: 598-58-3): amount involved in the explosion = not known.

- Methanol (C.A.S. CODE: 67-56-1, E.E.C. CODE: 603-001-00-X): amount involved = not known.

- Hydrogen Chloride (C.A.S. CODE: 7647-01-0, E.E.C. CODE: 017-002-00-2): amount involved = not known.

The whole amount of toxic gases released into the environment due to the partial evaporation of the contents of the chlorine condensation plant was about 600 Kg, but no data are available about the single amounts of Chlorine (C.A.S. CODE: 7782-50-5, E.E.C. CODE: 017-001-00-7) and Bromine (C.A.S. CODE: 7726-95-6, E.E.C. CODE: 035-001-00-5).

Appendix Short Report / description of suspected causes:

INITIATING EVENT AND CONSEQUENCES:

A sudden confined explosion occurred in a vessel for liquified chlorine residuals. As a consequence, the pipe connecting it to the chlorine condensation plant broke and hence a partial evaporation of its contents followed.

CAUSES:

The explosion was caused by an unexpected (due to an inadequate process analysis) and undesired formation of methylnitrate in the vessel for collecting residual chlorine residuals from the condensation plant. Presumably this has been caused by the introduction of hydrogen chloride contaminated with methanol in the electrolysis system. No information are available about the real causes of the contamination of hydrogen chloride with methanol but, in any case, laboratory analysis procedures about the raw materials were insufficient.

Appendix Short Report / description of immediate effects:

EFFECTS ON PEOPLE:

Inside the establishment, 6 people were hospitalized due to the toxic release.

MATERIAL LOSS:

The explosion caused damages to the plant but no data are available about the cost of the material losses.

COMMUNITY DISRUPTION:

The population outside the establishment was alerted.

Appendix Short Report / description of emergency measures taken:

INTERNAL TO THE ESTABLISHMENT:

The plant was shut-down and the internal alarm was sounded.

EXTERNAL TO THE ESTABLISHMENT:

The population outside the establishment was alerted.

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- a review of design and construction rules for new containments;
- 2- to improve the analytical controls of raw materials;
- 3- to improve the operating procedures.

Appendix Full Report A / type of accident:

A sudden confined explosion occurred in a vessel for liquified chlorine residuals (code 1306). As a consequence, the pipe connecting it to the chlorine condensation plant broke and hence a partial evaporation of its contents followed and toxic gases (chlorine and bromine) were released into the environment (code 1101).

Appendix Full Report A / dangerous substances:

No data are available about the amount of methylnitrate formed in the vessel due to the introduction of hydrogen chloride contaminated with methanol in the electrolysis system. The whole amount of toxic gases released into the environment due to the partial evaporation of the contents of the chlorine condensation plant was about 600 Kg, but no data are available about the single amounts of Cl₂ and Br₂. From the Original Report it is not fully clear if substances were starting materials or not.

Appendix Full Report A / source of accident - remarks:

The explosion occurred during normal operation in a collecting vessel (codes 3201 and 4003) of residuals of liquified chlorine from the chlorine condensation plant in a chlorine/alkali electrolysis (code 2001). The explosion caused a break in the pipe (code 4011) connecting the vessel to the chlorine condensation plant (code 3104).

Appendix Full Report A / causes of major occurrence:

The explosion was caused by an unexpected (code 5307) and undesired formation of methylnitrate in the vessel for collecting residual chlorine residuals from the condensation plant (code 5107). Presumably this has been caused by the introduction of hydrogen chloride contaminated with methanol. No information are available about the causes of hydrogen contamination but, in any case, laboratory analysis procedures about the raw materials were insufficient (code 5303).

Appendix Full Report B / area concerned - remarks:

Even if the population outside the establishment was alerted, in the Original Report there is no evidence of significant effects outside the establishment.

Appendix Full Report B / people:

Inside the establishment 6 people were hospitalized due to the toxic release.

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 explosion caused damages to the plant but no data are available about the cost of the material losses.

Appendix Full Report B / disruption of community life:

The population outside the establishment was alerted.

Appendix Full Report C / lesson learned - prevent:

After the accident, the following measures were established:

- 1- a review of design and construction rules for new containments;
- 2- to improve the analytical controls of raw materials;
- 3- to improve the operating procedures.