

Utsläpp av klor till följd av ett operatörsmisslag på en kemikaliefabrik.

870224 MARS 1987_08

En ung och oerfaren operatör skulle för första gången blanda två kemikalier i ett blandningskärl. Utan övervakning kom han att använda svavelsyra istället för natriumsulfat. Detta resulterade i en värmeutvecklande kemisk reaktion som inte gick att stoppa. I reaktionen utvecklades klorgas och väteklorid. Operatören slog larm och stoppade blandaren. Räddningstjänsten kylde ner blandningskärlet så fort de anlät. Kylningen fortsatte till dess att reaktionen stannat av. Koncentrationen av gas i luften mättes kontinuerligt. Gaserna som lämnade byggnaden sögs olyckligt in i ventilationssystemet till en närliggande fabrik. 30 anställda fick söka sjukhus för förgiftningssymptom. 12 fick stanna för observation.

Inblandade ämnen och mängder

	CAS Nr.	Mängd
svavelsyra	7664-93-9	240 kg
Sodiumdichlorisocyanuratedihydrate 56% lösning		160 kg
klor	7782-50-5	okänt
väteklorid	7647-01-0	okänt

Skador:

Människor: 30 människor fördes till sjukhus efter att ha utsatts för giftångorna (huvudsakligen klor). 12 av dem behölls för observation.

Materiella: Inga.

Miljö/ekologi: Inga effekter rapporterade.

Infrastruktur: Inga.

Erfarenheter redovisade (Ja/Nej): Ja

Kortfattat anges förebyggande åtgärder.

Report Profile

Identification of Report:

country: FA ident key: 1987_008_01

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

Date of Major Occurrence: Time of Major Occurrence

start: 1987-02-24 start: 12:00:00

finish: finish:

Establishment:

name:

address:

industry: 2001 general chemicals manufacture

General Chemical (Chemicals to Reduce Grease)

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_008_01

Accident Types:

release: Yes **explosion:** No

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:** No

ecotoxic: No **other:** No

flammable: No

description:

- Sulphuric acid (C.A.S. CODE: 7664-93-9): amount involved = 240 kg... 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 a general chemical industry for the production of chemicals to reduce grease. The

component involved was a mixer, operating at ambient temperature, located in a plant building during the

mixing of sodium sulphate an... see Appendix Short Report / description of immediate sources

Suspected Causes:

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

human: Yes **other:** No

description:

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

Immediate Effects:

material loss: Yes

human deaths: No

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

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: 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_008_01

1 Type of Accident

remarks: During the mixing of two chemicals an inexperienced operator, by mistake, took sulphuric acid instead of sodium sulphate. It resulted in an exothermic reaction between sulphuric acid and sodiumdichlorisocyanuratedihydrate that led to the re... see Appendix Full Report A / type of accident

2 Dangerous Substances

remarks: The total establishment and the potential directly involved inventories of sodiumdichlorisocyanuratedihydrate 56% and sulphuric acid refer to the amounts involved in the accident. No data are available about the amount of chlorine and hydro... see Appendix Full Report A / dangerous substances

3 Source of Accident

illustration: - not applicable -

remarks: The accident occurred in a general chemical industry for the production of chemicals to reduce grease (code 2201). The component involved was a mixer, operating at ambient temperature, located in a plant building (code 4007) during the mixi... 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 5304 organization: training/instruction (none, inadequate, inappropriate)

5305 organization: supervision (none, inadequate, inappropriate)

5307 organization: process analysis (inadequate, incorrect)

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

5401 person: operator error

remarks: An inexperienced operator (code 5304) had to mix two chemicals for the first time. During

the mixing operation the operator was not under supervision (code 5305) and he took, by

mistake, sulphuric acid instead of sodium sulphate (code 5401)... see Appendix Full Report

A / causes of major occurrence

6 Discussion about the Occurrence

- not applicable -

Type of Accident country: FA ident key: 1987_008_01

event:

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

initiating event 1101 release: gas/vapour/mist/etc release to air

associated event - not applicable -

Dangerous substances

country: FA ident key: 1987_008_01

a) total establishment inventory

CAS number: 7664-93-9 identity: Sulphuric Acid

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): 0,24

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 0,24 potential quantity: 0,24

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: identity: Nadichlorisocyanuratedihydrate

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): 0,16

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 0,16 potential quantity: 0,16

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: 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: 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): -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

Source of Accident - Situation country: FA ident key: 1987_008_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 3104 process: physical operations (mixing, melting crystallizing, etc.)

associated event - not applicable -

component

major occurrence 4007 machinery/equipment (pump, filter, column separator, mixer, etc.)

initiating event 4007 machinery/equipment (pump, filter, column separator, mixer, etc.)

associated event - not applicable -

B Consequences Full Report

country: FA ident key: 1987_008_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 dimensions of the cloud outside the building are not known. The local fire b... see Appendix

Full Report B / area concerned - remarks

2 People

establishment popul. emergency personnel off-site population

total at risk 1 29

immediate fatalities

subsequent fatalities

hospitalizing injuries 1 11

other serious injuries 18

health monitoring

remarks 30 people were referred to a hospital: 1 operator of the Biesterfeld & Co and 29... see Appendix

Full Report B / people

3 Ecological Harm

pollution/contamination/damage of:

- residential area (covered by toxic cloud) not applicable
- common wild flora/fauna (death or elimination) not applicable
- rare or protected flora/fauna (death or elimination) not applicable
- water catchment areas and supplies for consumption or recreation not applicable
- land (with known potential for long term ecological harm or not applicable

preventing human access or activities)

- marine or fresh water habitat not applicable
- areas of high conservation value or given special protection not applicable

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 data are available about the pollution in the mixing room where the accident ... 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 local fire brigade measured the gas concentration inside the building but no... see Appendix

7 Discussion of Consequences

C Response Full Report

country: FA ident key: 1987_008_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_008_01 report

Appendix Short Report / description of accident types:

ACCIDENT CASE HISTORY DESCRIPTION:

An inexperienced new operator (17 years old) had to mix 2 chemicals for the first time. He got a prescription of the proceedings but he was not under supervision. By unacquaintance of chemicals and their names, he took by mistake sulphuric acid instead of sodium sulphate. An exothermic chemical reaction, which could not be stopped, occurred resulting in the release of chlorine and hydrogen chloride into the building and, then, into the environment (the building was well vented). The operator, as soon as he detected an abnormal amount of smoke that was developing from the mixer, stopped it and beat the alarm. The local fire brigade started to cool the mixer until the unwanted reaction stopped. The local fire-brigade also measured the concentrations of chlorine and hydrogen chloride inside the building. No action to alert the population was carried out because the measured concentrations inside the building did not exceed several times the MAC-values of chlorine (1.5 mg/m³) and hydrogen chloride (7 mg/m³). The dimensions of the cloud outside the building are not known. Toxic effects (irritation) in the neighbourhood were limited within a distance of 100 metres. Unlucky, the toxic fumes were sucked in by the ventilation system of a nearby factory. As a consequence, 29 employees of this neighbouring company were intoxicated. 30 people were referred to a hospital: 1 operator from Biesterfeld & Co and 29 employees of this neighbouring company. After examination, 12 people were taken in for observation whilst 18 people were sent home.

Appendix Short Report / description of substances involved:

- Sulphuric acid (C.A.S. CODE: 7664-93-9): amount involved = 240 kg.
- Sodiumdichlorisocyanuratedihydrate 56%: amount involved = 160 Kg.
- Chlorine (C.A.S. CODE: 7782-50-5, E.E.C. CODE: 017-001-00-7): 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.

Appendix Short Report / description of immediate sources:

The accident occurred in a general chemical industry for the production of chemicals to reduce grease. The component involved was a mixer, operating at ambient temperature, located in a plant building during the mixing of sodium sulphate and sodiumdichlorisocyanuratedihydrate 56%. The industry was located in the industrial site within the municipality of Zoetermeer.

Appendix Short Report / description of suspected causes:

INITIATING EVENTS AND CONSEQUENCES:

An inexperienced operator had to mix two chemicals. By mistake he took sulphuric acid instead of sodium sulphate. An exothermic reaction occurred resulting in the release of chlorine and hydrogen chloride into the environment.

CAUSES:

The accident occurred because:

- 1- an inexperienced new operator (17 years old) had to mix two chemicals for the first time but no supervision on process safety was carried out;
- 2- by mistake he took sulphuric acid instead of sodium sulphate and an unexpected chemical reaction occurred;
- 3- no emergency measures for exothermic reactions in the mixing room were available.

Appendix Short Report / description of immediate effects:

EFFECTS ON PEOPLE:

1 operator of Biesterfeld & Co was hospitalized due to intoxication caused by the toxic cloud of chlorine and hydrogen chloride.

Since the concentrations of toxic substances measured inside the building did not exceeded several times the MAC-values for chlorine and hydrogen chloride (toxic effects [irritation] were limited within a distance of 100 metres), no action to alert the population was carried out. Unlucky, the released toxic fumes were sucked in by the ventilation system of a nearby factory and, as a consequence, 29 employees of this neighbouring company were referred to a hospital together with the intoxicated operator of Biesterfeld & Co. After examination, 12 people were taken in for observation and 18 were sent home.

MATERIAL LOSS:

No data are available about the cost of the pollution in the mixing room where the accident occurred.

Appendix Short Report / description of emergency measures taken:

INTERNAL TO THE ESTABLISHMENT:

When the operator detected the abnormal amount of smoke that was developing from the mixer, he stopped it, beat the alarm and called the local fire brigade. The local fire brigade started to cool the mixer until the unwanted reaction stopped. The fire brigade measured the concentration of chlorine and hydrogen chloride inside the building. No action to alert the population was carried out because the measured concentrations inside the building did not exceeded several times the MAC-values of chlorine (1.5 mg/m³) and hydrogen chloride (7 mg/m³).

EXTERNAL TO THE ESTABLISHMENT:

Local fire brigade was activated and started to cool the mixer and measure gas concentrations inside the building. The dimensions of the cloud are not known but toxic effects (irritation) in the neighbourhood were limited within 100 metres. Unlucky, the toxic fumes were sucked in by the ventilation system of a nearby factory and 29 employees of this company were referred to the hospital due to intoxication.

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- cooling the mixer with water to stop the reactions;
- 2- supervision on mixing activities;
- 3- interdiction to young and inexperienced operators to execute mixing activities. This was already regulated in articles of the law.

Appendix Full Report A / type of accident:

During the mixing of two chemicals an inexperienced operator, by mistake, took sulphuric acid instead of sodium sulphate. It resulted in an exothermic reaction between sulphuric acid and sodiumdichlorisocyanuratedihydrate that led to the release of chlorine and hydrogen chloride into the mixing building and, then, into the environment (code 1101).

Appendix Full Report A / dangerous substances:

The total establishment and the potential directly involved inventories of sodiumdichlorisocyanuratedihydrate 56% and sulphuric acid refer to the amounts involved in the accident. No data are available about the amount of chlorine and hydrogen chloride developed by the exothermic reaction of sulphuric acid with sodiumdichlorisocyanuratedihydrate 56%.

Appendix Full Report A / source of accident - remarks:

The accident occurred in a general chemical industry for the production of chemicals to reduce grease (code 2201). The component involved was a mixer, operating at ambient temperature, located in a plant building (code 4007) during the mixing (code 3104) of sodium sulphate and sodiumdichlorisocyanuratedihydrate 56%. The factory was located in the industrial site within the municipality of Zoetermeer.

Appendix Full Report A / causes of major occurrence:

An inexperienced operator (code 5304) had to mix two chemicals for the first time. During the mixing operation the operator was not under supervision (code 5305) and he took, by mistake, sulphuric acid instead of sodium sulphate (code 5401). It resulted in an exothermic reaction with sodiumdichlorisocyanuratedihydrate (code 5107) which could not be stopped because no emergency measures for exothermic reactions in the mixing room were available (codes 5307 and 5308).

Appendix Full Report B / area concerned - remarks:

The dimensions of the cloud outside the building are not known. The local fire brigade measured the gas concentration inside the building but no action to alert the population were carried out because it was not judged critical. In effect, toxic concentrations (irritation) in the neighbourhood were limited within a distance of 100 metres but, unlucky, gas were sucked in by the ventilation system of a nearby building. As a consequence, 29 employees of this neighbouring company were intoxicated.

Appendix Full Report B / people:

30 people were referred to a hospital: 1 operator of the Biesterfeld & Co and 29 employees of a nearby company. All of them were intoxicated by toxic fumes of chlorine and hydrogen chloride. After examination, 12 people were taken in for observation and 18 were sent home.

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 data are available about the pollution in the mixing room where the accident occurred.

Appendix Full Report B / disruption of community life:

The local fire brigade measured the gas concentration inside the building but no action was carried out to alert the population because it did not exceeded several times the MAC-values of chlorine (1.5 mg/m³) and hydrogen chloride (7 mg/m³). The toxic effects were limited within 100 metres but, unlucky, the toxic fumes were sucked in by the ventilation system of a nearby factory and 29 employees of this company were referred to the hospital due to intoxication.

Appendix Full Report C / lesson learned - prevent:

After the accident, the following measures were established:

- 1- cooling the mixer with water to stop reactions;
- 2- supervision on mixing activities;
- 3- interdiction to young and inexperienced operators to execute mixing activities. This was already regulated in articles of the law.