

Gasutsläpp på en PVC-fabrik till följd av ett operatörsmisslag.

880222 MARS 1988_02

Olyckan inträffade på en fabrik för produktion av polyvinylklorid. Den orsakades av ett operatörsmisslag vid rengöring av en polymeriseringsreaktor. Vid rengöring öppnas manluckan och reaktorn rengörs. Operatören öppnade manluckan till en reaktor under drift vid 8 bars tryck. Luckan kunde inte enkelt stängas och reaktorns innehåll läckte ut i fabriksbyggnaden under en dryg halvtimmes tid. Larm gick och byggnaden utrymdes. Efter trycksänkning och omtappning av reaktionsblandningen kunde luckan stängas. Halten av vinylklorid mättes kontinuerligt för att säkerställa att ett explosivt gasmoln inte bildades.

Inblandade ämnen och mängder

	CAS Nr.	Mängd
vinylklorid	75-01-4	5000 kg
polyvinylklorid	9002-86-2	okänt
vatten	7732-18-5	okänt

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: 1988_002_01

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

Date of Major Occurrence: Time of Major Occurrence

start: 1988-02-22 start:

finish: finish:

Establishment:

name:

address:

industry: 2001 general chemicals manufacture

Organic Chemical (Polyvinylchloride 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:** 1988_002_01

Accident Types:

release: Yes **explosion:** No

water contamination: No **other:** No

fire: No

description:

SYSTEM ORIGINATING AND OPERATING CONDITIONS:... see Appendix Short Report / description of accident types

Substance(s) Directly Involved:

toxic: Yes **explosive:** Yes

ecotoxic: No **other:** No

flammable: Yes

description:

When the reactor was opened, the contents (about 5.5 tonnes), that is vinylchloride, polyvinylchloride and water, was released over a period of about 35 minutes. No data are available about the single amounts of water and polyvinylchloride ... 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 the opening of the man-hole for an intermittent cleaning operation of a polymerization reactor of an organic chemical industry for the polyvinylchloride production. The man-hole of the reactor, that was operatin... see Appendix Short Report / description of immediate sources

Suspected Causes:

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

human: Yes **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:

OTHER:

No material losses occurred except the substances released during the accident.

Emergency Measures taken:

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

external services: No **restoration:** No

sheltering: No **other:** No

evacuation: Yes

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:** 1988_002_01

1 Type of Accident

remarks: The man-hole of the polymerization reactor had to be removed in order to

allow the internal cleaning of the vessel. By mistake, the man-hole of a

polymerization reactor in operation was opened for cleaning. This resulted

in a leakage (codes... see Appendix Full Report A / type of accident

2 Dangerous Substances

remarks: When the reactor was opened, the contents (about 5.5 tonnes), that is

vinylchloride, polyvinylchloride and water, was released over a period of

about 35 minutes. The total establishment and the potential directly

involved inventories of vin... see Appendix Full Report A / dangerous

substances

3 Source of Accident

illustration: - not applicable -

remarks: The accident occurred during the opening of the man-hole for an intermittent cleaning operation of a polymerization reactor (codes 3101 and 4002) of an organic chemical industry for the polyvinylchloride production (code 2001).
The man-hole... 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 5102 operation: component/machinery failure/malfunction

- not applicable -

- not applicable -

- not applicable -

- not applicable -

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

5314 organization: testing/inspecting/recording (none, inadequate, inappropriate)

5401 person: operator error

- not applicable -

- not applicable -

remarks: The accident was caused by an operator error (code 5401) during cleaning operations of the polymerization reactor but, however, the sealing of the reactor was not possible because the gasket was damaged (code 5102). The underlying causes th... see Appendix Full Report A / causes of major occurrence

6 Discussion about the Occurrence

- not applicable -

Type of Accident country: FA ident key: 1988_002_01

event:

major occurrence 1102 release: fluid release to ground

initiating event 1102 release: fluid release to ground

associated event - not applicable -

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:** 1988_002_01

a) total establishment inventory

CAS number: 7732-18-5 **identity:** Water

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: NORMAL FINISHED 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: 75-01-4 **identity:** Vinylchloride

name from Seveso I Directive: - not applicable -

name from Seveso II Directive: - not applicable -

category from Seveso II: - not applicable -

other hazards (1): - not applicable -

other hazards (2): - not applicable -

maximum quantity (tonnes): 5

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 5 **potential quantity:** 5

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 **indir_pot_quant:** -1

a) total establishment inventory

CAS number: 9002-86-2 **identity:** Polyvinylchloride

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: NORMAL FINISHED 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: 1988_002_01

situation

industry

initiating event 2001 general chemicals manufacture

associated event - not applicable -

activity/unit

major occurrence 3101 process: chemical batch reaction

initiating event 3101 process: chemical batch reaction

associated event - not applicable -

component

major occurrence 4002 reaction vessel; pressurised

initiating event 4002 reaction vessel; pressurised

associated event - not applicable -

B Consequences Full Report

country: FA ident key: 1988_002_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 measurements of the vinylchloride concentrations in the nearby residenti... 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

other serious injuries

health monitoring

remarks No people were injured during the accident.

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 preventing human access or activities) Suspected

- 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 substances released during 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 Yes No No

- media interest No No No

- political interest No No No

remarks Even if measurements of the vinylchloride concentrations in the nearby residenti... see Appendix

7 Discussion of Consequences

C Response Full Report

country: FA ident key: 1988_002_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, a procedur... see Appendix Full Report C / lesson learned - prevent

measures to mitigate consequences:

After the accident, it was dec... see Appendix Full Report C / lesson learned - mitigate

useful references:

- not applicable -

5 Discussion about Response

- not applicable -

Appendices for the FA / 1988_002_01 report

Appendix Short Report / description of accident types:

SYSTEM ORIGINATING AND OPERATING CONDITIONS:

Polymerization reactor vessel operating at about 8 bar.

SAFETY SYSTEMS OR OPERATORS INTERVENTION:

Since the sealing of the man-hole was not possible being the gasket damaged, the alarm was sounded in the plant and it was evacuated. The reactor was depressurized and its contents transferred to another (empty) vessel and pressurized again.

ACCIDENT CASE HISTORY DESCRIPTION:

After every reaction cycle, the man-hole of the polymerizayion reactor had to be removed in order to allow the internal cleaning of the vessel. By mistake, the man-hole of a polymerization reactor in operation was opened for cleaning. This resulted in a leakage within the process building of the contents of the reactor (vinylchloride, water and polyvinylchloride) over a period of about 35 minutes because the gasket was damaged and therefore the sealing of the vessel was not possible. Since the sealing of the man-hole was not possible being the gasket damaged, the alarm was sounded in the plant and it was evacuated. The reactor was depressurized and its contents transferred to another (empty) vessel and pressurized again. Vinylchloride concentrations within the building were measured by the company to exclude the formation of an explosive cloud.

Appendix Short Report / description of substances involved:

When the reactor was opened, the contents (about 5.5 tonnes), that is vinylchloride, polyvinylchloride and water, was released over a period of about 35 minutes. No data are available about the single amounts of water and polyvinylchloride released.

- Vinylchloride (C.A.S. CODE: 75-01-4): amount involved = about 5,000 kg.

- Polyvinylchloride (C.A.S. CODE: 9002-86-2): amount involved = not known.

- Water (C.A.S. CODE: 7732-18-5): amount involved = not known.

Appendix Short Report / description of immediate sources:

The accident occurred during the opening of the man-hole for an intermittent cleaning operation of a polymerization reactor of an organic chemical industry for the polyvinylchloride production. The man-hole of the reactor, that was operating at about 8 bar, after every reaction cycle had to be removed in order to allow the internal cleaning of the vessel.

Appendix Short Report / description of suspected causes:

INITIATING EVENT AND CONSEQUENCES:

The opening of the man-hole of a reactor was attempted while the reactor was in operation (at about 8 bar), resulting in the release of the vessel contents. As the sealing of the man-hole was not possible (being the gasket damaged), the reactor's contents was released within the process building until transfer to another (empty) vessel was carried out.

CAUSES:

The accident was caused by an operator error during cleaning operations of the polymerization reactor but, however, the sealing of the reactor was not possible because the gasket was damaged. The underlying causes that led to the accident were inadequate operation procedures (with particular reference to the reactor's cleaning) and insufficient inspection of the gasket of the vessel.

Appendix Short Report / description of emergency measures taken:

INTERNAL TO THE ESTABLISHMENT:

Since the sealing of the man-hole was not possible being the gasket damaged, the alarm was sounded in the plant and it was evacuated. The reactor was depressurized and its contents transferred to another (empty) vessel and pressurized again. Vinylchloride concentrations within the building were measured by the company to exclude the formation of an explosive cloud.

EXTERNAL TO THE ESTABLISHMENT:

Vinylchloride concentrations in the nearby residential area were measured by the company (values measured up to 1.9 mg/m³).

Appendix Short Report / description of immediate lessons learned:

MEASURES TO PREVENT ANY RECURRENCE OF SIMILAR ACCIDENTS:

After the accident, a procedure requiring signature for opening the man-hole of the polymerization reactors was adopted (up to the accident, clearance to open a reactor was given independently by two operators using a magnet labelling system).

MEASURES TO MITIGATE THE EFFECTS OF THE ACCIDENT:

After the accident, it was decided that the control room had to be able to withstand explosions so that control room operators can take proper action in case such accidents could happen.

Appendix Full Report A / type of accident:

The man-hole of the polymerization reactor had to be removed in order to allow the internal cleaning of the vessel. By mistake, the man-hole of a polymerization reactor in operation was opened for cleaning. This resulted in a leakage (codes 1101 and 1102) within the process building of the contents of the reactor (vinylchloride, water and polyvinylchloride) over a period of about 35 minutes because the gasket was damaged and therefore the sealing of the vessel was not possible.

Appendix Full Report A / dangerous substances:

When the reactor was opened, the contents (about 5.5 tonnes), that is vinylchloride, polyvinylchloride and water, was released over a period of about 35 minutes. The total establishment and the potential directly involved inventories of vinylchloride refer to the amount involved in the accident. No data are available about the single amounts of water and polyvinylchloride released during the accident.

Appendix Full Report A / source of accident - remarks:

The accident occurred during the opening of the man-hole for an intermittent cleaning operation of a polymerization reactor (codes 3101 and 4002) of an organic chemical industry for the polyvinylchloride production (code 2001). The man-hole of the reactor, that was operating at about 8 bar, after every reaction cycle had to be removed in order to allow the internal cleaning of the vessel.

Appendix Full Report A / causes of major occurrence:

The accident was caused by an operator error (code 5401) during cleaning operations of the polymerization reactor but, however, the sealing of the reactor was not possible because the gasket was damaged (code 5102). The underlying causes that led to the accident were inadequate operation procedures [code 5303] (with particular reference to the reactor's cleaning) and insufficient inspection of the gasket of the vessel (code 5314).

Appendix Full Report B / area concerned - remarks:

Even if measurements of the vinylchloride concentrations in the nearby residential area were measured by the company (values measured up to 1.9 mg/m³), in the Original Report there is no evidence of significant effects 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 substances released during the accident.

Appendix Full Report B / disruption of community life:

Even if measurements of the vinylchloride concentrations in the nearby residential area were carried out by the company (values measured up to 1.9 mg/m³), in the Original Report there is no evidence of significant effects outside the establishment.

Appendix Full Report C / lesson learned - prevent:

After the accident, a procedure requiring signature for opening the man-hole of the polymerization reactors was adopted (up to the accident, clearance to open a reactor

was given independently by two operators using a magnet labelling system).

Appendix Full Report C / lesson learned - mitigate:

After the accident, it was decided that the control room had to be able to withstand explosions so that control room operators can take proper action in case such accidents could happen.