

Gasutsläpp på en petrokemisk fabrik.

860515 MARS 1986_10

Olyckan inträffade vid underhållsarbete på en petrokemisk anläggning. En backventil på ledningen till en lagertank med etylenoxid skulle underhållas. Huvudoperatören stängde tankens isolationsventiler och låste dem. Arbetsordern undertecknades. Då reparatörerna avlägsnade backventilen inträffade ett plötsligt utsläpp av etylenoxid. En vertikal plym formades och utvecklades till ett moln. Reparatörerna skyndade att sätta sig i säkerhet. Etylenoxid läckte ut i 9 minuters tid. Gaslarmet gick och vattensprinklers aktiverades. Katastrofplanen sattes i verket och räddningstjänsten tillkallades. Gasmolnet kunde begränsas och skingras utan att det antändes. Den mest troliga orsaken till olyckan var att polymer bildats och blockerat den ena av tankens två isolationsventiler. En arbetare med andningsutrustning lyckades stänga den blockerade ventilen. Han ådrog sig kemiska brännskador på överkroppen och fick tillbringa en vecka på sjukhus.

Inblandade ämnen och mängder

	CAS Nr.	Mängd
etylenoxid	75-21-8	8 ton

Skador:

Människor:	En arbetare skadades allvarligt och fick kemiska brännskador på överkroppen. Han fick tillbringa en vecka på sjukhus. Ytterligare 4 skadades av etylenoxiden.
Materiella:	Inga.
Miljö/ekologi:	Inga effekter rapporterade.
Infrastruktur:	Inga rapporterade.

Erfarenheter redovisade (Ja/Nej): Ja

Kortfattat anges förebyggande åtgärder.

Report Profile

Identification of Report:

country: FA ident key: 1986_010_01

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

Date of Major Occurrence: Time of Major Occurrence

start: 1986-05-15 start: 09:00:00

finish: finish:

Establishment:

name:

address:

industry: 2002 petrochemical, refining, processing

Petrochemical (Ethylene Oxide Storage Plant)

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:** 1986_010_01

Accident Types:

release: Yes **explosion:** No

water contamination: No **other:** No

fire: No

description:

The non-return valve on the delivery line from the road tanker unloading stance to ... see Appendix Short

Report / description of accident types

Substance(s) Directly Involved:

toxic: Yes **explosive:** Yes

ecotoxic: No **other:** No

flammable: Yes

description:

- Ethylene Oxide (C.A.S. CODE: 75-21-8, E.E.C. CODE: 603-023-00-X); amount involved = 8,000 kg.

Immediate Sources of Accident:

storage: Yes **transfer:** No

process: Yes **other:** No

description:

The accident occurred during the maintenance of a non-return valve on the delivery line from the road tanker unloading stance to an ethylene oxide storage tank in a petrochemical industry.

Suspected Causes:

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

human: No **other:** No

description:

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

Immediate Effects:

material loss: No

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: Yes

description:

INTERNAL TO THE ESTABLISHMENT:... see Appendix Short Report / description of immediate lessons learned

A Occurrence Full Report

country: FA **ident key:** 1986_010_01

1 Type of Accident

remarks: During a maintenance operation on the delivery line from the road tanker

unloading stance to an ethylene oxide storage tank, a sudden release of

ethylene oxide took place (code 1101) and a vertical plume formed which

developped into a cloud... see Appendix Full Report A / type of accident

2 Dangerous Substances

remarks: The total establishment and the potential directly involved inventories of

ethylene oxide refer to the amount released during the accident.

3 Source of Accident

illustration: - not applicable -

remarks: The accident occurred during a routine maintenance of a non-return valve

(code 4010) on a pipeline (code 4011) from a road tanker unloading to an

ethylene oxide storage tank (code 3201) of a petrochemical industry (code

2002).

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 5108 operation: blockage

- not applicable -

- 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: Probably, the accident occurred due to the formation of a cold polymer of ethylene oxide in one of the isolation valves, blocking it and preventing its fully closure (code 5108).

When the non-return valve was dismantled, the polymer was rem... see Appendix Full Report

A / causes of major occurrence

6 Discussion about the Occurrence

- not applicable -

Type of Accident country: FA ident key: 1986_010_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: 1986_010_01

a) total establishment inventory

CAS number: 75-21-8 **identity:** Ethylene Oxide

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): 8

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 8 **potential quantity:** 8

c) substance belongs to relevant inventory indirectly involved: No

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

Source of Accident - Situation country: FA ident key: 1986_010_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 4011 general pipework/flanges

initiating event 4011 general pipework/flanges

associated event - not applicable -

situation

industry

initiating event 2002 petrochemical, refining, processing

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 4010 valves/controls/monitoring devices/drain cocks

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

associated event - not applicable -

B Consequences Full Report

country: FA ident key: 1986_010_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 In the Original Report there is no evidence of significant effects outside the e... see Appendix

Full Report B / area concerned - remarks

2 People

establishment popul. emergency personnel off-site population

total at risk 5

immediate fatalities

subsequent fatalities

hospitalizing injuries 1

other serious injuries 2

health monitoring

remarks Inside the establishment 1 person (the worker who closed the isolation valves) o... 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 becau... 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 ethylene oxide.... 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: 1986_010_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:

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

useful references:

- not applicable -

5 Discussion about Response

- not applicable -

Appendices for the FA / 1986_010_01 report

Appendix Short Report / description of accident types:

The non-return valve on the delivery line from the road tanker unloading stance to an ethylene oxide storage tank was due for maintenance. The lead operator closed

the two isolation valves to the tank and locked them. Excess nitrogen was bled from the system. Permit to work on system was signed. A maintenance fitter and his mate then began to remove the non-return valve. As the valve was dismantled a sudden release of ethylene oxide took place. A vertical plume formed which developed into a cloud. The fitter and his mate made a rapid descent from the tank top. Ethylene oxide was released over 9 minutes. Emergency response was put into operation. The gas detector alarm sounded and water sprays were activated. The leak was largely contained within the bund walls and the ethylene oxide was washed to drain. The gas cloud dispersed safely without igniting. A worker wearing breathing apparatus applied further pressure to close isolation valves. He suffered extensive skin burns to upper part of body and was in hospital for 1 week. Two other workers were slightly affected.

Appendix Short Report / description of suspected causes:

Causes:

The most likely explanation is that a cold polymer of ethylene oxide formed in one of the isolation valves preventing complete closure. This polymer was displaced by nitrogen pressure when the non-return valve was dismantled. There had been no previous problems with polymer formation on this line.

Appendix Short Report / description of immediate effects:

EFFECTS ON PEOPLE:

Inside the establishment 1 person (the worker who closed the isolation valves) of 5 exposed was injured during the accident. He suffered extensive skin burns to upper part of body and was in hospital for 1 week. Two other workers were slightly affected.

Appendix Short Report / description of emergency measures taken:

INTERNAL TO THE ESTABLISHMENT:

Gas detector alarm sounded and water sprays were activated. Then fire alarm sounded and the on-site fire brigade was called. One worker wearing breathing apparatus applied further closure to isolation valves.

EXTERNAL TO THE ESTABLISHMENT:

The county fire brigade was called.

Appendix Short Report / description of immediate lessons learned:

INTERNAL TO THE ESTABLISHMENT:

Storage tank was emptied. Valves were inspected and all equipment were found to be in good mechanical order.

MEASURES TO PREVENT ANY RECURRENCE OF SIMILAR ACCIDENTS:

After the accident, the following measures were established:

- 1- better system for isolation of tank to be introduced;
- 2- review of pipework at installation to verify if system can be improved.

MEASURES TO MITIGATE THE EFFECTS OF THE ACCIDENT:

After the accident, it was established that workers should wear appropriate clothing during operations on this tank.

Appendix Full Report A / type of accident:

During a maintenance operation on the delivery line from the road tanker unloading stance to an ethylene oxide storage tank, a sudden release of ethylene oxide took place (code 1101) and a vertical plume formed which developed into a cloud. The gas cloud dispersed safely without igniting.

Appendix Full Report A / causes of major occurrence:

Probably, the accident occurred due to the formation of a cold polymer of ethylene oxide in one of the isolation valves, blocking it and preventing its fully closure (code 5108). When the non-return valve was dismantled, the polymer was removed by nitrogen pressure resulting in a leak of ethylene oxide. There had been no previous problems with polymer formation on this line.

Appendix Full Report B / area concerned - remarks:

In the Original Report there is no evidence of significant effects outside the establishment because, when the release of ethylene oxide occurred, the gas detector alarm sounded and water sprays were activated. Therefore the leak was largely contained within the bund walls and the ethylene oxide was washed to drain.

Appendix Full Report B / people:

Inside the establishment 1 person (the worker who closed the isolation valves) of 5 exposed was injured during the accident. He suffered extensive skin burns to upper part of body and was in hospital for 1 week. Two other workers were slightly affected.

Appendix Full Report B / ecological harm:

In the Original Report there is no evidence of significant ecological harms because the leak was largely contained within the bund walls and the ethylene oxide was washed to drain.

Appendix Full Report B / material loss:

No material losses occurred except the released ethylene oxide.

Appendix Full Report B / disruption of community life:

In the Original Report there is no evidence of significant effects outside the establishment because the leak was largely contained within the bund walls and the ethylene oxide was washed to drain.

Appendix Full Report C / lesson learned - prevent:

After the accident, the following measures were established:

- 1- better system for isolation of tank to be introduced;
- 2- review of pipework at installation to verify if system can be improved.

Appendix Full Report C / lesson learned - mitigate:

After the accident, it was established that workers should wear appropriate clothing during operations on this tank. Workers should wear appropriate clothing during operations.