Kemikalieutsläpp från en depå på en kemikaliefabrik.

870924 MARS 1987_13

Propylenoxiddepån opererades helt manuellt. Vid en omtappning mellan två tankar kom ett reglage att ställas fel av operatören. Detta resulterade i att den ena tanken svämmade över. Då operatören insåg sitt misstag reagerade han snabbt och stängde de korrekta ventilerna. Den propylenoxid som svämmat över späddes ut med vatten från kranar som operatören öppnade. Den utspädda propyelnoxiden rann ut i avloppsledningarna. Ingen brand uppstod. Orsakerna till olyckan var huvudsakligen organisatoriska. För det första saknades överfyllningsskydd. For det andra skulle operatören övervaka två processer samtidigt. Minsta problem i den ena processen ledde till försummelse av den andra. För det tredje ignorerade den ansvarige förmannen att man denna dag var underbemannad.

Inblandade ämnen och mängder

	CAS Nr.	Mängd
propylenoxid	75-56-9	1500 kg
etylenoxid	75-21-8	25 000 kg

Skador:

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

Erfarenheter redovisade (Ja/Nej): Ja

Förebyggande åtgärder anges.

Report Profile

Identification of Report:

country: FA **ident key:** 1987_013_01

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

Date of Major Occurrence: Time of Major Occurrence

start: 1987-09-24 **start:** 15:00:00

finish: finish:

Establishment:

name:

address:

industry: 2001 general chemicals manufacture

Organic Chemical (Propylene Oxide/Ethylene Oxide Storage Tanks and Road Tanker

Unloading Stands)

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_013_01

Accident Types:

release: Yes **explosion:** No

water contamination: No **other:** No

fire: No

description:

The manufacturing plant was being supplied from one previously-filled twin tank whilst the parallel twin tank was receiving the last of the tanker delivery. The tank in use had been re-pressurised with nitrogen to 2 barg whilst the tank bei... see Appendix Short Report / description of accident types

Substance(s) Directly Involved:

toxic: Yes **explosive:** Yes

ecotoxic: No **other:** No

flammable: Yes

description:

- Propylene Oxide (C.A.S. CODE:75-56-9): amount involved = 1,500 kg.... see Appendix Short Report / description of substances involved

Immediate Sources of Accident:

storage: Yes **transfer:** Yes

process: Yes **other:** No

description:

The accident occurred in a propylene oxide storage installation comprising twin horizontal cylindrical pressure tanks operating/storing at ambient temperature and about 2 barg under nitrogen padding pressure. The storage installation was su... see Appendix Short Report / description of immediate sources

Suspected Causes:

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

human: Yes **other:** No

description:

CAUSES:... 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 escaped propylene oxide.

Emergency Measures taken:

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

external services: No **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:** Yes

mitigation: Yes

description:

No additional measures internal or external to the establishment were necessary. Existing on-site fire

brigade, control room, communications, emergency planning & operation etc. considered adequate to cope with

and alleviate the so far as r... see Appendix Short Report / description of immediate lessons learned

A Occurrence Full Report

country: FA **ident key:** 1987_013_01

1 Type of Accident

remarks: During the loading of a propylene oxide storage tank, an operator error

allowed a direct open connection between a second propylene oxide storage

tank, previously filled and pressurized. It resulted in an overfilling of

the tank that was un... see Appendix Full Report A / type of accident

2 Dangerous Substances

remarks: The propylene oxide (P.O.) storage installation was comprising twin

horizontal cylindrical pressure tanks. The total establishment and the

potential directly involved inventories of P.O. refer to the amount released

during the accident. The... see Appendix Full Report A / dangerous

substances

3 Source of Accident

illustration: - not applicable -

remarks: The accident occurred in a propylene oxide storage installation (code 3201)

supplying a production plant in an organic chemical industry (code 2001)

manufacturing a range of specific chemicals. The manufacturing plant was

being supplied fro... 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 - not applicable -

- not applicable -

- not applicable -

- not applicable -

- not applicable -

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

unclear)

5305 organization: supervision (none, inadequate, inappropriate)

5306 organization: staffing (inadequate, inappropriate)

5307 organization: process analysis (inadequate, incorrect)

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

inappropriate)

remarks: The immediate cause was the error of an operator that omitted to shift off the bottom

outlet valve of the receiving tank (code 5401). However, the following must be underlined:

only one operator was working because the second one was ill (c... see Appendix Full

Report A / causes of major occurrence

6 Discussion about the Occurrence

- not applicable -

Type of Accident **country:** FA **ident key:** 1987_013_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:** 1987_013_01

a) total establishment inventory

CAS number: 75-56-9 **identity:** Propylene 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): 1,5

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 1,5 **potential quantity:** 1,5

c) substance belongs to relevant inventory indirectly involved: No

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

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): 25

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: -1 **potential quantity:** 25

c) substance belongs to relevant inventory indirectly involved: Yes

actual quantity: -1 **indir_pot_quant:** 25

Source of Accident - Situation **country:** FA **ident key:** 1987_013_01

situation

industry

inititating event 2001 general chemicals manufacture

associated event - not applicable -

activity/unit

major occurrence 3201 storage: process-associated (stockholding, etc. on-site of manufacture)

inititating event 3201 storage: process-associated (stockholding, etc. on-site of manufacture)

associated event - not applicable -

component

major occurrence 4004 container; pressurised (bullet, sphere, cylinder, etc.)

inititating event 4004 container; pressurised (bullet, sphere, cylinder, etc.)

associated event - not applicable -

B Consequences Full Report

country: FA **ident key:** 1987_013_01

1 Area concerned

affected

extent of effects installation: Yes

establishment: No

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 s... see Appendix

Full Report B / area concerned - remarks

2 People

establishment popul. emergency personnel off-site population

total at risk 20

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 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 escaped propylene 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 s... see Appendix

7 Discussion of Consequences

C Response Full Report

country: FA **ident key:** 1987_013_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:

No additional measures interna... see Appendix Full Report C / lesson learned - mitigate

useful references:

- not applicable -

5 Discussion about Response

- not applicable -

Appendices for the FA / 1987_013_01 report

Appendix Short Report / description of accident types:

The manufacturing plant was being supplied from one previously-filled twin tank whilst the parallel twin tank was receiving the last of the tanker delivery. The tank in use had been re-pressurised with nitrogen to 2 barg whilst the tank being filled had been re-pressurised as usual to 0.35^0.7 barg and its vent valve set partly open to vent displaced nitrogen to atmosphere. During the change-over between tanks, the operator omitted to shut off the bottom outlet valve of the tank now receiving so that when he opened up the bottom outlet valve of the twin tank now supplying the plant he established in error a direct open connection between the twin tanks via the 1" diameter bottom outlet manifold. Owing to the differential tank pressures, propylene oxide from the full tank flowed into the vented tank in addition to current inflow from the delivery tanker. In consequence the vented tank overfilled until propylene oxide overflowed from the elevated vent. Escape did not stop when the tanker driver in attendance shut off the delivery from the tanker since transfer via the open outlet manifold between tanks continued. Escape was only halted when the returning process operator shut off the tank vent and, on realizing his error, the bottom outlet valve. The escape ran down the elevated vent pipework and structure alongside and partly into the bund of the neighbouring ethylene oxide storage tank installation. The operator sensibly opened the ethylene oxide installation water drenches to dilute and wash the spillage to drain and ethylene oxide bund dilution sump. Fortunately there was no fire and the incident was contained.

Appendix Short Report / description of substances involved:

- Propylene Oxide (C.A.S. CODE:75-56-9): amount involved = 1,500 kg.

- Ethylene Oxide (C.A.S. CODE:75-21-8): amount potentially involved = 25,000 kg. This amount refers to the capacity of the nearby storage tank installation. Fortunately, there was no fire and therefore the ethylene oxide storage tank installation was not damaged.

Appendix Short Report / description of immediate sources:

The accident occurred in a propylene oxide storage installation comprising twin horizontal cylindrical pressure tanks operating/storing at ambient temperature and about 2 barg under nitrogen padding pressure. The storage installation was supplying a production plant of an organic chemical industry manufacturing a range of special chemicals. The accident occurred during the filling operation of the propylene oxide tanks. The propylene oxide system is shown on a map attached to the Original Report.

Appendix Short Report / description of suspected causes:

CAUSES:

1- The propylene oxide storage installation was entirely manually controlled so that incorrect setting (or passing) of a valve could result in mis-direction or mis-transfer of bulk material between the tanks. Though tanks overloading was a routine possibility as 18 tonnes road tankers deliveries have to be split between at least two tanks (capacity only 12 or 14 tonnes), no hardware safeguarded against overfilling was foreseen . This has been recently recognised by the Company during assessment for purposes of the CIMAH regulation: the consequent intention was to fit tank high level alarms.

2) Staffing and supervision of the plant was inadequate. It had become customery to expect or allow plant operators to keep a check on process plant whilst overseeing tanker deliveries. Any delay on either job meant temporary neglect of the other. In view of the total lack of automatic safeguards continous operator presence was essential and there should have been a clear rule that there was continuous attendance throughout all propylene oxide delivery and other transfers. This did not happen in practice and the Standard Operating Procedures though fairly detailed were not clear on this point though requiring the plant operator to 'observe the level rise in the receiving tank ... so as not to exeed 80% maximum ...'. Suspension of transfer if the operator has to leave the installation was not laid down.

3) Line supervisors were insensitive to the obvious staff shortage on the day of the incident. The out-going supervisor should not have allowed unsupervised delivery to continue during shift change and the oncoming supervisor should likewise have suspended delivery operations or given/arranged adequate support for the lone shift operator. Such decision should not have been left to the operator himself who would feel in danger of criticism for causing delay.

Appendix Short Report / description of emergency measures taken:

INTERNAL TO THE ESTABLISHMENT:

The operator, when detected the propylene oxide release, closed the bottom outlet valve and opened the water drenches of the ethylene oxide storage tank installation to dilute and wash the spillage to the drain and ethylene oxide bund dilution sump.

The works fire brigade and other emergency services were not activated as the accident did not escalate.

Appendix Short Report / description of immediate lessons learned:

No additional measures internal or external to the establishment were necessary. Existing on-site fire brigade, control room, communications, emergency planning & operation etc. considered adequate to cope with and alleviate the so far as reasonably practicable the possible worst outcome of this accident. Existing on-site and off-site

emergency plans and also local development plan and consultation arrangements not significantly affected by the possible worst outcome of this accident.

MEASURES TO PREVENT ANY RECURRENCE OF SIMILAR ACCIDENTS:

After the accident, the following measures were established:

1- fitting of high-level alarms and trips to propylene oxide tanks (ethylene oxide tanks were already overflow-protected);

2- modification/interlocking of propylene oxide tank valves to prevent ungoverned propylene oxide transfers between manifold tanks;

3- improvement of staffing, supervision and instruction of plant personnel, including in particular: immediate requirement for continuous presence of an operator during all deliveries and bulk transfers; consideration of staffing particulary if delivery/ transfer is to continue during shift changeovers; revision of existing written Standard Operating Procedures to include the point mentioned above.

MEASURES TO MITIGATE THE CONSEQUENCES OF THE ACCIDENT:

After the accident, the repositioning of propylene oxide and ethylene oxide tank vents to reduce fire risk to tanks in the event of overflow from vent (s) was established.

Appendix Full Report A / type of accident:

During the loading of a propylene oxide storage tank, an operator error allowed a direct open connection between a second propylene oxide storage tank, previously filled and pressurized. It resulted in an overfilling of the tank that was under loading and, consequently, to the release of propylene oxide from a vent (codes 1101 and 1102). The released propylene oxide was not ignited.

Appendix Full Report A / dangerous substances:

The propylene oxide (P.O.) storage installation was comprising twin horizontal cylindrical pressure tanks. The total establishment and the potential directly involved inventories of P.O. refer to the amount released during the accident. The potential inventory indirectly involved of ethylene oxide refers to the capacity of the nearby storage tank installation. Fortunately, there was no fire following the propylene oxide escape and therefore the ethylene oxide tank was not damaged.

Appendix Full Report A / source of accident - remarks:

The accident occurred in a propylene oxide storage installation (code 3201) supplying a production plant in an organic chemical industry (code 2001) manufacturing a range of specific chemicals. The manufacturing plant was being supplied from one previously-filled tank whilst the parallel twin tank was receiving the last of the tanker delivery. The component involved in the accident was the propylene oxide storage stank (code 4004) during filling operation.

Appendix Full Report A / causes of major occurrence:

The immediate cause was the error of an operator that omitted to shift off the bottom outlet valve of the receiving tank (code 5401). However, the following must be underlined: only one operator was working because the second one was ill (code 5306); plant supervisors had not given/arranged adequate support for the lone shift operator (code 5305); procedures were not clear about the delivery operation (code 5303); process analisys and design plant were not adequate (codes 5307 and 5308).

Appendix Full Report B / area concerned - remarks:

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

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 escaped propylene oxide.

Appendix Full Report B / disruption of community life:

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

Appendix Full Report C / lesson learned - prevent:

After the accident, the following measures were established:

1- fitting of high-level alarms and trips to propylene oxide tanks (ethylene oxide tanks were already overflow-protected);

2- modification/interlocking of propylene oxide tank valves to prevent ungoverned propylene oxide transfers between manifold tanks;

3- improvement of staffing, supervision and instruction of plant personnel, including in particular: immediate requirement for continuous presence of an operator during all deliveries and bulk transfers; consideration of staffing particulary if delivery/ transfer is to continue during shift changeovers; revision of existing written Standard Operating Procedures to include the point mentioned above.

Appendix Full Report C / lesson learned - mitigate:

No additional measures internal or external to the establishment were necessary. Existing on-site fire brigade, control room, communications, emergency planning & operation etc. considered adequate to cope with and alleviate the so far as reasonably practicable the possible worst outcome of this accident. Existing on-site and off-site emergency plans and also local development plan and consultation arrangements not significantly affected by the possible worst outcome of this accident.

After the accident, the repositioning of propylene oxide and ethylene oxide tank vents to reduce fire risk to tanks in the event of overflow from vent (s) was established.