

Explosion på en anläggning för behandling av specialavfall.

960419 MARS 1996_02

Olyckan inträffade på en anläggning för behandling av specialavfall, och för återvinning av lösningsmedel från specialavfallet. Explosionen inträffade i destillationsanläggningen på återvinningsavdelningen. Sannolikt inträffade en oförutsedd reaktion i destillationskärlet som exploderade. Övre delen av kärlet skickades som en missil 14 m rakt upp i taket på byggnaden. Splitter av metall och glas kastades vida omkring. Fönster krossades upp till 100 m bort. En träbyggnad 70 m bort skadades också.

Inblandade ämnen och mängder

	CAS Nr.	Mängd
Diklormetan	75-09-2	
andra lösningsmedel, däribland metanol, aceton, och etylacetat		

Skador:

Människor:	En av cheferna fick frakturer på vänster arm och splitter i höger arm. Han fördes till sjukhus.
Materiella:	Skadorna på utrustningen var så omfattande att produktion inte kunde återupptas. Byggnaderna fick också många skador.
Miljö/ekologi:	Inga effekter rapporterade.
Infrastruktur:	Inga.

Erfarenheter redovisade (Ja/Nej): Ja

Kortfattat anges erfarenheter.

Report Profile

Identification of Report:

country: FA ident key: 1996_002_01

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

Date of Major Occurrence: Time of Major Occurrence

start: 1996-04-19 start: 10:45:00

finish: 1996-04-19 finish: 10:50:00

Establishment:

name:

address:

industry: - not applicable -

Plant for solvents recovery and provisional storage of special toxic and dangerous

waste (2002, 2007

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:** 1996_002_01

Accident Types:

release: No **explosion:** Yes

water contamination: No **other:** No

fire: No

description:

The plant has been commissioned by the "Regione Lombardia" for two activities: 1) Storage of special toxic and dangerous waste. 2) Recovering solvents contained in the above waste. The storage plant has 5 metallic vessels, cylindric, horizo... see Appendix Short Report / description of accident types

Substance(s) Directly Involved:

toxic: Yes **explosive:** Yes

ecotoxic: No **other:** Yes

flammable: Yes

description:

On the base of what was told by the people of the company, the substances surely present in the process at the moment of the accident were the following:... see Appendix Short Report / description of substances involved

Immediate Sources of Accident:

storage: No **transfer:** No

process: Yes **other:** No

description:

Probably rapid increase of pressure and temperature due to a non foreseen reaction in the process (runaway reaction), up to a complete rupture and fragmentation of the reboiler.

Suspected Causes:

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

human: Yes **other:** Yes

description:

Loss of process control, probably due to a missing precise knowledge of all the substances involved in the process (including impurities), with resulting missing possibility of forecast of possible uncontrollable exothermic reactions.

Immediate Effects:

material loss: Yes

human deaths: No

human injuries: Yes **community disruption:** Yes

other: No

ecological harm: No

national heritage loss: No

description:

PERSON-RELATED:... see Appendix Short Report / description of immediate effects

Emergency Measures taken:

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

external services: No **restoration:** No

sheltering: No **other:** No

evacuation: Yes

description:

Close to the establishment (within a radius of about 200 m) there were 2 industrial plants (one of them treating chemical substances), an industrial storage facility for marble works and a one-family house on two floors. The competent aut... see Appendix Short Report / description of emergency measures taken

Immediate Lessons Learned:

prevention: Yes **other:** Yes

mitigation: No

description:

As known on the basis of an on-spot-investigation, the company had not presented the declaration foreseen by the Italian legislation corresponding to the Seveso Directive 82/501/EEC. The reason of the missed submission was in the discrepan... see Appendix Short Report / description of immediate lessons learned

A Occurrence Full Report

country: FA **ident key:** 1996_002_01

1 Type of Accident

remarks: Probably an uncontrolled reaction in the reboiler of the solvent recovery plant with following explosion of the reboiler and projection of splinters and fragments.

2 Dangerous Substances

remarks: It was impossible to know the exact composition of the reboiler content at the moment of the accident, for this the starting product has been indicated generally as "highly flammable substances" since these were the main

components of the m... see Appendix Full Report A / dangerous substances

3 Source of Accident

illustration: - not applicable -

remarks: - not applicable -

4 Meteorological Conditions

precipitation none: fog: rain: hail: snow:

Yes No No No No

wind speed (m/s): 0

direction (from):

stability (Pasquill):

ambient temperature (°C): 10

remarks: As declared by the authorities and by the responsible of the company at the moment of the on-the-spot investigation, the weather conditions were good with no wind and normal temperature in that time.

5 Causes of Major Occurrence

main causes

technical / physical 5103 operation: loss of process control

5106 operation: runaway reaction

5107 operation: unexpected reaction/phase-transition

5307 organization: process analysis (inadequate, incorrect)

- not applicable -

human / organizational 5103 operation: loss of process control

5106 operation: runaway reaction

5307 organization: process analysis (inadequate, incorrect)

- not applicable -

- not applicable -

remarks: - not applicable -

6 Discussion about the Occurrence

- not applicable -

Type of Accident country: FA ident key: 1996_002_01

event:

major occurrence 1304 explosion: runaway reaction explosion (usually exothermic)

initiating event 1304 explosion: runaway reaction explosion (usually exothermic)

associated event - not applicable -

Dangerous substances

country: FA ident key: 1996_002_01

a) total establishment inventory

CAS number: 75-09-2 **identity:** Methyl 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): 22

use of substance as: NORMAL FINISHED PRODUCT

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 22 **potential quantity:** 27

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:** Methyl Alcohol

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: No

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: 75-09-2 **identity:** High Flammable Liquids

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): 240

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: No

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: 141-78-6 identity: Ethyl Acetate

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: No

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: 67-64-1 identity: Acetone

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: No

actual quantity: -1 potential quantity: -1

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

B Consequences Full Report

country: FA ident key: 1996_002_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 damage evaluation was possible only up to the level of the existing building... see Appendix

Full Report B / area concerned - remarks

2 People

establishment popul. emergency personnel off-site population

total at risk 4 0

immediate fatalities 0 0 0

subsequent fatalities 0 0 0

hospitalizing injuries 1 0 0

other serious injuries 0 0 0

health monitoring 3 0 0

remarks The quantification of the persons at risk outside the establishment was not poss... 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 - not applicable -

4 National Heritage Loss

effects on:

- historical sites not applicable - historic monuments not applicable
- historic buildings not applicable - art treasures not applicable

remarks - not applicable -

5 Material Loss

establishment losses off site losses

costs (direct costs to operator) (social costs)

in ECU IL ECU IL

material losses 7E+08 3E+08

response, clean up, restoration

remarks The company was insured for damages against third parties.... see Appendix Full Report B /

material loss

6 Disruption of Community Life

establishment/plant evacuated disabled/unoccupiable destroyed

- nearby residences/hotels Yes No No

- nearby factories/offices/small shops Yes 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 Yes No

- political interest No No No

remarks see short report

7 Discussion of Consequences

C Response Full Report

country: FA ident key: 1996_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

see short report

measures to mitigate consequences:

- not applicable -

useful references:

- not applicable -

5 Discussion about Response

- not applicable -

Appendices for the FA / 1996_002_01 report

Appendix Short Report / description of accident types:

The plant has been commissioned by the "Regione Lombardia" for two activities: 1) Storage of special toxic and dangerous waste. 2) Recovering solvents contained in the above waste. The storage plant has 5 metallic vessels, cylindric, horizontal and in underground location with a total capacity of 243 m3. The recovery plant consists of a cylindric horizontal reboiler with a capacity of 20 m3 and of a vertical column with perforated plates (diameter 800 mm, 17m high). Fluid heating for the reboiler is done in the secondary side of the surface-side heat exchanger whose primary circulator's diathermic oil is heated in a boiler. The recovery solvent comes out from the high side of the column and is sent in the collection vessels for the final phases of purification. The process, according to the company, occurred at atmospherical pressure, for which the vessels were not tested as it is requested for pressure equipments. The accident occurred in the recovery plant during the distillation phase. In absence of clear signs of fire and, as stated by the firemen, probably an uncontrolled reaction occurred in the reboiler which caused its explosion and the damage of other part of the plant and of near buildings.

Appendix Short Report / description of substances involved:

On the base of what was told by the people of the company, the substances surely present in the process at the moment of the accident were the following:

- methylene chloride (about 70%)

- Solvents of not identified nature, but essentially methyl alcohol, acetone, ethyl acetate

Appendix Short Report / description of immediate effects:

PERSON-RELATED:

At the moment of the accident there were 4 employees: a secretary, the distillation plant chief, a technician of other works, a general maintenance worker charged to move recipients containing recovered substances and to be treated. The plant's chief received fractures on left elbow and injuries from splinters in the right arm and was sent to hospital for recovery. The other 3, apparently unhurt, were checked in the hospital following their shock state.

MATERIAL-RELATED:

Various equipment received unrecoverable damages (column, receiving vessels and various accessories), so that the plant is no longer operable. Due to the explosion the roof was demolished, also due to 14 m upwards missile impact of a large part of the reboiler (after crossing two layers of strengthened concrete), composed by a part of the mantle and of the welded bottom (2m diameter, 2.5 m length, 6 mm thickness). A metallic fragment, having the weight of 40 kg, was hurled 10 m away after it had perforated a plate of 0,8 mm of the inlet gate of an adjacent establishment 25 m away from the point of explosion. Glasses broke and there were damages to the walls and metallic structures of surrounding buildings up to 100 m. Further, damages to the wooden and metallic structures of a house being 70 m away from the explosion point.

Appendix Short Report / description of emergency measures taken:

Close to the establishment (within a radius of about 200 m) there were 2 industrial plants (one of them treating chemical substances), an industrial storage facility for marble works and a one-family house on two floors. The competent authorities ordered evacuation for 24 hours of the establishments and of the private house as a preventive measure because of the uncertainty related to the still dangerous situation following the accident (uncertainties because of missing knowledge of type and number of substances stored in the plant and due to difficult assessment of the possibility of a further evolution of the accident on behalf of the emergency team). The competent authority (Procura della Repubblica di Crema) has put the plant under sequestration and started an official investigation.

Appendix Short Report / description of immediate lessons learned:

As known on the basis of an on-spot-investigation, the company had not presented the declaration foreseen by the Italian legislation corresponding to the Seveso Directive 82/501/EEC. The reason of the missed submission was in the discrepancy between the amount of the substances present in the establishment and the amount foreseen by the declaration obligation. The consequences of the accident should have been more serious if the splinters had hit places frequented by more persons or if they had reached the tank trucks or other equipments in the nearby establishment which treats chemical products. Considering the fact that the distillation products present in the warehouse were highly flammable, the actual consequences have been less serious than those principally possible. In the light of the above considerations it is useful to study again the problems which could be present in the case of runaway reactions and the limits that are foreseen by the Directive for flammable substances should be studied, particularly in cases in which establishments are not isolated.

Appendix Full Report A / dangerous substances:

It was impossible to know the exact composition of the reboiler content at the moment of the accident, for this the starting product has been indicated generally as "highly flammable substances" since these were the main components of the mixture. The total amount present in the establishment has been indicated equivalent to that indicated at the moment of the on-the-spot investigation by the responsible for the establishment which correspond to the maximum capacity of the storage vessels.

Appendix Full Report B / area concerned - remarks:

The damage evaluation was possible only up to the level of the existing buildings around the establishment (maximum of 200 m from the point of explosion); also at this maximum distance the windows' and doors' glasses were broken. It was not possible to verify if the explosion's power would have had the same destructive power beyond this distance since there is a piece of open field before the nearest village (Sergnano).

Appendix Full Report B / people:

The quantification of the persons at risk outside the establishment was not possible (persons in the neighborhood and inhabitants in the village close to the plant).

Appendix Full Report B / material loss:

The company was insured for damages against third parties.