

Gasexplosion och brand på en keramikfabrik.

911005 MARS 1991_22

En läcka uppstod vid en ventil på en en tank som innehöll 370 kg väte. Sprickan hade troligen uppstått till följd av materialtrötthet. Den utsläppta gasen antändes och exploderade. Tryckvågen orsakade skador på byggnader utanför anläggningen, framför allt i form av krossade fönster. Splitter från tanken upptäcktes flera hundra meter bort. Explosionen följdes av en brand som hotade att antända två tankar som innehöll acetylen och vätefluorid. Mycket litet anges om hur konsekvenserna hanterades

Inblandade ämnen och mängder

	CAS Nr.	Mängd
väte	1333-74-0	370 kg

Skador:

Människor:	23 personer skadades lindrigt vid explosionen.
Materiella:	Utanför anläggningen registrerades 850 fall av förstörelse som bränder och krossade fönster, mm.
Miljö/ekologi:	Inga effekter rapporterade.
Infrastruktur:	Ett ålderdomshem fattade eld och fick utrymmas. All befolkning ino 500 m från anläggningen evakuerades.

Erfarenheter redovisade (Ja/Nej): Nej

Kortfattat anges förebyggande åtgärder.

Report Profile

Identification of Report:

country: FA ident key: 1991_022_01

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

Date of Major Occurrence: Time of Major Occurrence

start: 1991-10-05 start:

finish: finish:

Establishment:

name:

address:

industry: 2010 ceramics (bricks, pottery, glass, cement, plaster, etc.)

Ceramics (Glass)

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:** 1991_022_01**Accident Types:****release:** Yes **explosion:** Yes**water contamination:** No **other:** No**fire:** Yes**description:**

On October, 5 (Sunday) at 5:12 a.m. a valve on a hydrogen tank (100 m3 volumetric capacity) containing about 370 kg hydrogen leaked and the released gas exploded. The pressure wave caused damages to buildings outside the plant area (in part... see Appendix Short Report / description of accident types

Substance(s) Directly Involved:**toxic:** No **explosive:** Yes**ecotoxic:** No **other:** No**flammable:** Yes**description:**

- Hydrogen (C.A.S. CODE: 1333-74-0, E.E.C. CODE: 001-001-00-9); amount involved = 370 kg.... see Appendix Short Report / description of substances involved

Immediate Sources of Accident:**storage:** Yes **transfer:** No**process:** Yes **other:** No**description:**

The accident occurred in a ceramics industry and the component involved was a valve on the hydrogen storage tank. The hydrogen storage tank was modified and enlarged and the "new" tank was put in operation on December 1982. The first obliga... see Appendix Short Report / description of immediate sources

Suspected Causes:**plant or equipment:** Yes **environmental:** No**human:** No **other:** No**description:**

CAUSES:

The leakage of hydrogen was caused by a tank material defect.

Immediate Effects:

material loss: Yes

human deaths: No

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

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:

EXTERNAL TO THE ESTABLISHMENT:

The police delimited an area (500 metres large) around the plant. The rail traffic was stopped and the road traffic deviated.

Immediate Lessons Learned:

prevention: No **other:** No

mitigation: No

description:

- not applicable -

A Occurrence Full Report

country: FA **ident key:** 1991_022_01

1 Type of Accident

remarks: On October, 5 (Sunday) at 5:12 a.m. a valve on a hydrogen tank (100 m3 volumetric capacity) containing about 370 kg hydrogen leaked (code 1101) and the released gas exploded (code 1307). The pressure wave caused damages to buildings outside... see Appendix Full Report A / type of accident

2 Dangerous Substances

remarks: The total establishment and the potential directly involved inventories of hydrogen refer to the amount contained in the storage tank (100 m3 volumetric capacity). No data are available about the amounts of hydrogen fluoride and acetylene t... see Appendix Full Report A / dangerous substances

3 Source of Accident

illustration: - not applicable -

remarks: The accident occurred in a ceramics industry (code 2010) and the component involved was a valve (code 40101) on the hydrogen storage tank (codes 3201 and 4004). The hydrogen storage tank was modified and enlarged and the "new" tank was put ... 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: The existing meteorological conditions when the accident occurred allowed the formation of a gas cloud with an ignitable concentration.

5 Causes of Major Occurrence

main causes

technical / physical 5104 operation: corrosion/fatigue

- not applicable -

- not applicable -

- not applicable -

- not applicable -

human / organizational 5310 organization: manufacture/construction (inadequate, inappropriate)

- not applicable -

- not applicable -

- not applicable -

- not applicable -

remarks: The rebuilt tank suffered material fatigue. In particular, the removal of the roof of the "old" along the welding ??? affected the roundness of the tank and induced material tension. The more than weekly firing accelerated the process resu... see Appendix Full Report A / causes of major occurrence

6 Discussion about the Occurrence

- not applicable -

Type of Accident country: FA ident key: 1991_022_01

event:

major occurrence 1307 explosion: VCE (vapour cloud explosion; supersonic wave front)

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

associated event 1201 fire: conflagration (a general engulfment fire)

Dangerous substances

country: FA ident key: 1991_022_01

a) total establishment inventory

CAS number: 7664-39-3 identity: Hydrogen Fluoride

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: 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: 1333-74-0 identity: Hydrogen

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): 0,37

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 0,37 potential quantity: 0,37

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: 74-86-2 identity: Acetylene

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: 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

Source of Accident - Situation country: FA ident key: 1991_022_01

situation

industry

initiating event 2010 ceramics (bricks, pottery, glass, cement, plaster, etc.)

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

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

associated event - not applicable -

B Consequences Full Report

country: FA ident key: 1991_022_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 - not applicable -

2 People

establishment popul. emergency personnel off-site population

total at risk 12

immediate fatalities

subsequent fatalities

hospitalizing injuries

other serious injuries 23

health monitoring

remarks The accident took place early sunday morning, thus limiting the consequences. ... 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) 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 The explosion affected only urban area, windows were broken by the explosion and... see Appendix

Full Report B / ecological harm

4 National Heritage Loss

effects on:

- historical sites Suspected - historic monuments Suspected
- historic buildings Suspected - art treasures Suspected

remarks - not applicable -

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 Not given

6 Disruption of Community Life

establishment/plant evacuated disabled/unoccupiable destroyed

- nearby residences/hotels Yes No No
- nearby factories/offices/small shops No No No
- schools, hospitals, institutions Yes No No
- other places of public assembly Yes 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 Yes

- **political interest** No No Yes

remarks The explosion caused broken windows and an old peoples home caught fire and had ... see Appendix

7 Discussion of Consequences

- not applicable -

Ecological Components involved

country: FA **ident key:** 1991_022_01

type: 6301 shore: salt-marsh/mud-flats

threatened: not applicable **affected:** not applicable

type: 6101 inland: metropolitan development

threatened: not applicable **affected:** not applicable

C Response Full Report

country: FA **ident key:** 1991_022_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

- not applicable -

measures to mitigate consequences:

- not applicable -

useful references:

- not applicable -

5 Discussion about Response

- not applicable -

Appendices for the FA / 1991_022_01 report

Appendix Short Report / description of accident types:

On October, 5 (Sunday) at 5:12 a.m. a valve on a hydrogen tank (100 m3 volumetric capacity) containing about 370 kg hydrogen leaked and the released gas exploded. The pressure wave caused damages to buildings outside the plant area (in particular windows were broken). The explosion was followed by a fire that threatened acetylene and hydrogen fluoride containers. A debris from tank was found several hundreds metres away.

Appendix Short Report / description of substances involved:

- Hydrogen (C.A.S. CODE: 1333-74-0, E.E.C. CODE: 001-001-00-9): amount involved = 370 kg.

No data are available about the amounts of Hydrogen Fluoride (C.A.S. CODE: 7664-39-3) and Acetylene (C.A.S. CODE: 74-86-2) in the containers threatened by the fire.

Appendix Short Report / description of immediate sources:

The accident occurred in a ceramics industry and the component involved was a valve on the hydrogen storage tank. The hydrogen storage tank was modified and enlarged and the "new" tank was put in operation on December 1982. The first obligatory pressure test was after 5 years (1987) and no anomalies were found. The next obligatory test had to be carried out in 1992 (after 10 years). The tank had a working maximum pressure of 44.1 bar and, when the pressure fell below about 15 bar, it was refilled (usually several times a week) by an external company. Last refill occurred from 03:25 a.m. to 03:45 a.m. on October 5, 1991.

Appendix Short Report / description of immediate effects:

EFFECTS ON PEOPLE:

Outside the establishment 23 people were slightly injured by the explosion.

MATERIAL LOSS:

Outside the establishment the explosion caused about 850 cases of material damages (fires, broken windows, etc).

COMMUNITY DISRUPTION:

The police delimited an area (500 metres large) around the plant. The rail traffic was stopped and the road traffic deviated.

Appendix Full Report A / type of accident:

On October, 5 (Sunday) at 5:12 a.m. a valve on a hydrogen tank (100 m³ volumetric capacity) containing about 370 kg hydrogen leaked (code 1101) and the released gas exploded (code 1307). The pressure wave caused damages to buildings outside the plant area (in particular windows were broken). The explosion was followed by a fire (code 1201) that threatened acetylene and hydrogen fluoride containers.

Appendix Full Report A / dangerous substances:

The total establishment and the potential directly involved inventories of hydrogen refer to the amount contained in the storage tank (100 m³ volumetric capacity). No data are available about the amounts of hydrogen fluoride and acetylene threatened by fire. From the Original Report it is not fully clear if substances are starting materials or not.

Appendix Full Report A / source of accident - remarks:

The accident occurred in a ceramics industry (code 2010) and the component involved was a valve (code 40101) on the hydrogen storage tank (codes 3201 and 4004). The hydrogen storage tank was modified and enlarged and the "new" tank was put in operation on December 1982.

Appendix Full Report A / causes of major occurrence:

The rebuilt tank suffered material fatigue. In particular, the removal of the roof of the "old" along the welding ??? affected the roundness of the tank and induced material tension. The more than weekly firing accelerated the process resulting in cracks in the wall.

Appendix Full Report B / people:

The accident took place early Sunday morning, thus limiting the consequences. It is estimated that if the explosion had occurred during normal working hours the consequences would have been much more severe.

Appendix Full Report B / ecological harm:

The explosion affected only urban area, windows were broken by the explosion and further damage was feared. Some buildings caught fire.

Appendix Full Report B / disruption of community life:

The explosion caused broken windows and an old people's home caught fire and had to be evacuated. For safety reasons residences in a 500 m safety zone were evacuated.