

Explosion och brand på en krackningsanläggning på ett raffinaderi.

850619 MARS 1800_043_01

Vid uppstart av acetylenhydrogeneringsreaktorerna efter ett instrumentfel uppstod kraftiga vibrationer. Dessa vibrationer lossade ett antal flänskruvar så att gas läckte ut och antändes. En jetlåga slog ut 16 meter och orsakade en 600 mm rörledning att sprängas, varvid tre tankar innehållande etylen, propylen och LPG exploderade. Under en kort inledande period utvecklades svaveldioxid, men snart var förbränningen så fullständig att endast koldioxid utvecklades. Tillkallad expertis bedömde risken för lokalbefolkning vara såpass liten att man undlär evakuering. Man beslöt även att låta kvarvarande brännbara ämnen brinna ut eftersom branden ganska snart kom under kontroll. Branden pågick i flera dagar med fortlöpande användning av vattengardiner för att begränsa spridning av elden.

Inblandade ämnen och mängder

	CAS Nr.	Mängd
etylen	74-85-1	okänt
propylen	115-07-1	okänt
LPG		
svaveldioxid	7446-09-5	okänt, små mängder
koldioxid	124-38-9	okänt

Skador:

Människor:	Fyra människor på anläggningsområdet skadades av explosionen. En kvinna utanför området avled till följd av en hjärtattack.
Materiella:	Stora skador på anläggningen.
Miljö/ekologi:	Inga effekter rapporterade.
Infrastruktur:	Närliggande väg och järnväg stängdes av. Även närliggande hamn stängdes.

Erfarenheter redovisade (Ja/Nej): Ja

Kortfattat anges förebyggande åtgärder.

Report Profile

Identification of Report:

country: FA ident key: 1800_043_01

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

Date of Major Occurrence: Time of Major Occurrence

start: 19/05/1985 start: 23:00:00

finish: 19/05/1985 finish:

Establishment:

name:

address:

industry: 2002 petrochemical, refining, processing

Petrochemical (Cracking and Refrigerating Plant - Storage for Naphtha, Gasoil, Methane)

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: 1800_043_01

Accident Types:

release: Yes explosion: Yes

water contamination: No other: No

fire: Yes

description:

ACCIDENT CASE HISTORY DESCRIPTION:... see Appendix Short Report / description of accident types

Substance(s) Directly Involved:

toxic: Yes explosive: Yes

ecotoxic: No other: No

flammable: Yes

description:

- Ethylene (C.A.S. CODE:74-85-1, E.E.C. CODE: 601-010-00-3): amount involved = not known.... see Appendix

Short Report / description of substances involved

Immediate Sources of Accident:

storage: Yes transfer: No

process: Yes other: No

description:

The accident occurred during normal operation in the cracking plant of a petrochemical industry. The areas

involved were:... see Appendix Short Report / description of immediate sources

Suspected Causes:

plant or equipment: Yes environmental: No

human: No **other:** No

description:

INITIATING EVENT AND CONSEQUENCES:... see Appendix Short Report / description of suspected causes

Immediate Effects:

material loss: Yes

human deaths: Yes

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:

INTERNAL TO THE ESTABLISHMENT:... see Appendix Short Report / description of emergency measures taken

Immediate Lessons Learned:

prevention: No **other:** Yes

mitigation: No

description:

not given

A Occurrence Full Report

country: FA **ident key:** 1800_043_01

1 Type of Accident

remarks: The jet-fire (code 1203) produced by the ignition of the gas leaking from a flange (code 1101) caused the blast of a 600mm pipe of the fractionating column (code 1301) and the explosion of 3 tanks containing, respectively, propylene, LPG an... see Appendix Full Report A / type of accident

2 Dangerous Substances

remarks: No data are available about the amounts of ethylene, propylene and liquified petroleum gas (LPG) involved in the accident. Also, no data are available about the amounts of sulphur dioxide and carbon dioxide developed during the fire. It mu... see Appendix Full Report A / dangerous substances

3 Source of Accident

illustration: - not applicable -

remarks: The accident occurred during normal operation in the cracking plant (code 3102) of a petrochemical industry (code 2002). The areas involved were: ethylene and propylene storage facilities (8 vertical cylinders each with a volumetric capacit... 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 - not applicable -

- not applicable -

- not applicable -

- not applicable -

- not applicable -

remarks: During the restarting of the Acetylene hydrogenation reactors (after a shut-down caused by

instrumentation malfunction) strong vibrations interested the drain valve in the boiler's

candle. These vibrations caused the unscrewing of many flan... see Appendix Full Report A

/ causes of major occurrence

6 Discussion about the Occurrence

- not applicable -

Type of Accident country: FA ident key: 1800_043_01

event:

major occurrence - not applicable -

initiating event - not applicable -

associated event - not applicable -

event:

major occurrence 1301 explosion: pressure burst (rupture of pressure system)

initiating event 1203 fire: jet flame (burning jet of fluid from orifice)

associated event - not applicable -

event:

major occurrence 1201 fire: conflagration (a general engulfment fire)

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

associated event 1401 other: combustion products into air

Dangerous substances

country: FA **ident key:** 1800_043_01

a) total establishment inventory

CAS number: 7446-09-5 **identity:** Sulphur Dioxide

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: ABNORMAL PRODUCT

b) substance belongs to relevant inventory directly involved: No

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

c) substance belongs to relevant inventory indirectly involved: Yes

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

a) total establishment inventory

CAS number: 75-56-9 **identity:** Propylene

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: **identity:** Liquefied Petroleum Gas

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: 74-85-1 identity: Ethylene

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: 124-38-9 identity: Carbon Dioxide

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: ABNORMAL PRODUCT

b) substance belongs to relevant inventory directly involved: No

actual quantity: -1 potential quantity: -1

c) substance belongs to relevant inventory indirectly involved: Yes

actual quantity: -1 indir_pot_quant: -1

Source of Accident - Situation country: FA ident key: 1800_043_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 4007 machinery/equipment (pump, filter, column separator, mixer, etc.)

initiating event 4007 machinery/equipment (pump, filter, column separator, mixer, etc.)

associated event 4007 machinery/equipment (pump, filter, column separator, mixer, etc.)

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

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

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

situation

industry

initiating event 2002 petrochemical, refining, processing

associated event 2002 petrochemical, refining, processing

activity/unit

major occurrence 3102 process: chemical continuous reaction

initiating event 3102 process: chemical continuous reaction

associated event 3102 process: chemical continuous reaction

component

major occurrence 4003 container; non-pressurised (hopper, tank, drum, bag, etc.)

initiating event 4003 container; non-pressurised (hopper, tank, drum, bag, etc.)

associated event 4003 container; non-pressurised (hopper, tank, drum, bag, etc.)

B Consequences Full Report

country: FA ident key: 1800_043_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 On-site arrived a group of experts for a technical survey. They established that... see Appendix

Full Report B / area concerned - remarks

2 People

establishment popul. emergency personnel off-site population

total at risk -1 -1 -1

immediate fatalities 0 0 1

subsequent fatalities 0 0 0

hospitalizing injuries 4 0 0

other serious injuries 0 0 0

health monitoring 0 0 0

remarks 4 people inside the establishment were injured by the explosion (from the Origin... 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 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 None - historic monuments None

- historic buildings None - art treasures None

remarks No data available.

5 Material Loss

establishment losses off site losses

costs (direct costs to operator) (social costs)

in ECU IL ECU IL

material losses 260000 5E+08 0 0

response, clean up, restoration -1 -1 0 0

remarks The cost of the material losses caused by the explosion and the following fire h... 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 No Yes No

- media interest No Yes No

- political interest No No No

remarks The road traffic N° 114 Catania-Siracusa was diverted. The rail traffic was disr... see Appendix

7 Discussion of Consequences

C Response Full Report

country: FA ident key: 1800_043_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 given

measures to mitigate consequences:

not given

useful references:

not given

5 Discussion about Response

- not applicable -

Appendices for the FA / 1800_043_01 report

Appendix Short Report / description of accident types:

ACCIDENT CASE HISTORY DESCRIPTION:

The jet-fire produced by the ignition of gas leaking from a flange caused the blast of a 600 mm pipe of the fractionating column 16 metres away and the explosion of 3 tanks containing, respectively, propylene, LPG and ethylene. The subsequent explosion and fire frightened the population. Sulphur dioxide was released by fire only for a initial (short) period of time. After this period, only carbon dioxide was released. On-site arrived a group of experts for a technical survey. They established that:

- there was no immediate danger for the population to justify the immediate evacuation of the area because the released gases were immediately burned by the various small fires still existing;
- to maintain the 3 controlled fires on the existing openings of the plant and create a safety zone with a water curtain for cooling the nearby plants and tanks. In this way the escaping gases were completely burned thus avoiding the risk of creating an explosive mixture and the presence of asphyxiating gases;
- it was decided to left open the steam column existing in the lowest part of the storage tanks area, to cool the metallic supports of the tanks;
- not convenient to restore neither the railway nor the highway nearby, due to the existing risk of fire in the tanks yard and in the cracking columns. This because it was not possible to exclude that a collapse of the column splitter Ethylene (80 m high) could involve the adjacent cracking columns, still full of highly flammable substances;
- it was decided by ICAM, and approved by the experts, to set up a flare connected with the various points of the plant for burning the propylene coming from the refrigerating plant, and the other substances already in the plant, thus accelerating the exhaustion of the fire on the base of the cracking columns.

Appendix Short Report / description of substances involved:

- Ethylene (C.A.S. CODE:74-85-1, E.E.C. CODE: 601-010-00-3): amount involved = not known.
- Propylene (C.A.S. CODE: 115-07-1): amount involved = not known.
- Liquefied Petroleum Gas [LPG]: amount involved = not known.
- Sulphur Dioxide (C.A.S. CODE: 7446-09-5, E.E.C. CODE: 016-011-00-9): amount involved = not known (sulphur dioxide was released by fire only for a initial [short] period of time. After this period, only carbon dioxide was released).
- Carbon Dioxide (C.A.S. CODE: 124-38-9): amount involved = not known.

Appendix Short Report / description of immediate sources:

The accident occurred during normal operation in the cracking plant of a petrochemical industry. The areas involved were:

- ethylene and propylene storage facilities (8 vertical cylinders each with a volumetric capacity of 500 m³ [whole capacity = 4,000 m³]);
- process area of cracking plant including the ethylene refrigerating plant (whole contents = 3,000 m³) and storage tanks for naphtha, gasoil, methanol, caustic soda, ecc.

Appendix Short Report / description of suspected causes:

INITIATING EVENT AND CONSEQUENCES:

A jet-fire due to the ignition of gases released from a flange, caused the blast of a 600 mm pipe of the Fractionating Column 16m away and the explosion of a propylene vessel and the collapse of three vessels containing propylene, LPG and ethylene.

CAUSES:

During the restarting of the Acetylene hydrogenation reactors (after a shut-down caused by instrumentation malfunction) strong vibrations interested the drain valve in the boiler's candle. These vibrations caused the unscrewing of many flanges bolts of the structure allowing gas leakage.

Appendix Short Report / description of immediate effects:

EFFECTS ON PEOPLE:

4 people inside the establishment were injured by the explosion. Outside the establishment a woman died from a heart attack.

MATERIAL LOSS:

The cost of the material losses caused by the explosion and the following fire has been estimated in about 500,000,000 Lires (about 332 MECU).

COMMUNITY DISRUPTION:

The road traffic N° 114 Catania-Siracusa was diverted. The rail traffic was disrupted. The adjacent harbour of Augusta was closed. Fires had been estinguished in a radius of 60 metres from the plant.

Appendix Short Report / description of emergency measures taken:

INTERNAL TO THE ESTABLISHMENT:

Although the fire was under control, it continued for many days. On-site arrived a group of experts for a technical survey. They established that:

- there was no immediate danger for the population to justify the immediate evacuation of the area because the released gases were immediately burned by the various small fires still existing;
- to maintain the 3 controlled fires on the existing openings of the plant and create a safety zone with a water curtain for cooling the nearby plants and tanks. In this way the escaping gases were completely burned thus avoiding the risk of creating an explosive mixture and the presence of asphyxiating gases;
- it was decided to left open the steam column existing in the lowest part of the storage tanks zone, to cool the metallic supports of the tanks;
- it was decided by ICAM, and approved by the experts, to set up a flare connected with the various points of the plant for burning the propylene coming from the refrigerating plant, and the other substances already in the plant, thus accelerating the exhaustion of the fire on the base of the cracking columns.

EXTERNAL TO THE ESTABLISHMENT:

The road traffic N° 114 Catania-Siracusa was diverted and the rail traffic was disrupted due to the existing risk of fire in the tanks yard and in the cracking columns. This because it was not possible to exclude that a collapse of the column splitter Ethylene (80 m high) could involve the adjacent cracking columns, still full of highly flammable substances. The adjacent harbour of Augusta was closed. Fires had been extinguished in a radius of 60 metres from the plant.

Appendix Full Report A / type of accident:

The jet-fire (code 1203) produced by the ignition of the gas leaking from a flange (code 1101) caused the blast of a 600mm pipe of the fractionating column (code 1301) and the explosion of 3 tanks containing, respectively, propylene, LPG and ethylene (code 1302). The subsequent explosion (code 1307) and fire (code 1201) frightened the population. Sulphur dioxide was released by fire only for a initial (short) period of time (code 1401). After this period, only carbon dioxide was released.

Appendix Full Report A / dangerous substances:

No data are available about the amounts of ethylene, propylene and liquified petroleum gas (LPG) involved in the accident. Also, no data are available about the amounts of sulphur dioxide and carbon dioxide developed during the fire. It must be underlined that sulphur dioxide was released by fire only for a initial (short) period of time. After this period, only carbon dioxide was released.

Appendix Full Report A / source of accident - remarks:

The accident occurred during normal operation in the cracking plant (code 3102) of a petrochemical industry (code 2002). The areas involved were: ethylene and propylene storage facilities (8 vertical cylinders each with a volumetric capacity of 500 m³ [whole capacity = 4000 m³]; process area of cracking plant including the ethylene refrigerating plant (whole contents = 3000 m³) and storage tanks for naphtha, gasoil, methanol, caustic soda, ecc (codes 4003, 4004 and 4007).

Appendix Full Report A / causes of major occurrence:

During the restarting of the Acetylene hydrogenation reactors (after a shut-down caused by instrumentation malfunction) strong vibrations interested the drain valve in the boiler's candle. These vibrations caused the unscrewing of many flanges bolts of the structure allowing gas leakage (code 5102).

Appendix Full Report B / area concerned - remarks:

On-site arrived a group of experts for a technical survey. They established that there was no immediate danger for the population to justify the immediate evacuation of the area because the released gases were immediately burned by the various small fires still existing. The road traffic N° 114 Catania-Siracusa was diverted. The rail traffic was disrupted. The adjacent harbour of Augusta was closed. Fires had been extinguished in a radius of 60 metres from the plant.

Appendix Full Report B / people:

4 people inside the establishment were injured by the explosion (from the Original Report it is not fully clear if they were hospitalized or not). Outside the establishment a woman died from a heart attack.

Appendix Full Report B / ecological harm:

In the Original Report there is no evidence of significant ecological harms.

Appendix Full Report B / material loss:

The cost of the material losses caused by the explosion and the following fire has been estimated in about 500,000,000 Lires.

Appendix Full Report B / disruption of community life:

The road traffic N° 114 Catania-Siracusa was diverted. The rail traffic was disrupted. The adjacent harbour of Augusta was closed. Fires had been extinguished in a radius of 60 metres from the plant.