

Gasläcka och kraftig explosion på oljeraffinaderi.

921109

MARS 1800_37

Inblandade ämnen och mängder

	CAS Nr.	Mängd
gasformiga kolväten		okänt
flytande kolväten		okänt
natriumhydroxid löst i lättare kolväten		2000 m3

Skador:

Människor:	Sex arbetare omkom och en skadades allvarligt vid den första explosionen. Lindrigare skador förekom bland de tillkallade brandmännen.
Materiella:	Byggnader och anläggning skadades svårt inom ett område på 2 hektar. Fönsterrutor krossades 1 km i alla riktningar kring raffinaderiet. I somliga riktningar krossades fönsterrutor 8 km bort. Försäkringsbolag uppskattade den totala kostnaden för förödelsen till en miljard franska Francs.
Miljö/ekologi:	Den allra största delen av släcknings- och kylvattnet kunde samlas upp och tas om hand. Inga effekter rapporterade.
Infrastruktur:	Inget angivet förutom effekten på fönsterrutor.

Erfarenheter redovisade (Ja/Nej): Nej

Report Profile

Identification of Report:

country: FA ident key: 1800_037_01

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

Date of Major Occurrence: Time of Major Occurrence

start: 1992-11-09 start: 05:00:00

finish: finish:

Establishment:

name:

address:

industry: 2002 petrochemical, refining, processing

Oil Refinery

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_037_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: No **explosive:** Yes

ecotoxic: No **other:** Yes

flammable: Yes

description:

- Gaseous Hydrocarbons: amount involved in the first explosion = not known.... see Appendix Short Report / description of substances involved

Immediate Sources of Accident:

storage: No **transfer:** No

process: Yes **other:** No

description:

The accident occurred in an oil refinery within the FCC N⁻3 (Fluidized Catalytic Cracking Unit), either in the "gas plant" section started in 1953 (where gases are fractionated and processed at 290°C and 20 bar) or in the "cryogenic" secti... see Appendix Short Report / description of immediate sources

Suspected Causes:

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

human: No **other:** Yes

description:

CAUSES:

The causes of the initial massive gas leakage have not been still identified.

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:** Yes

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:

The accident was subjected to legal and administrative in-depth technical investigations, both at regional and national levels.

A Occurrence Full Report

country: FA **ident key:** 1800_037_01

1 Type of Accident

remarks: Due to unknown causes, a massive gas leakage occurred (code 1101). Gas was quickly ignited and the explosion that occurred was heard about 15`30 Km away (code 1307). A large fire then developed (codes 1202 and 1203).

Failure of a 2,000 m3 ... see Appendix Full Report A / type of accident

2 Dangerous Substances

remarks: No data are available about the amount of hydrocarbon gases that caused the first explosion. Also, no data are available about the amount of liquid/gas hydrocarbons involved in the fires (interesting the FCC unit itself, a close 5,000 m3 re... see Appendix Full Report A / dangerous substances

3 Source of Accident

illustration: - not applicable -

remarks: The accident occurred in an oil refinery (code 2002) within the FCC N⁻3 (Fluidized Catalytic Cracking Unit), either in the "gas plant" section started in 1953 (operating at 290°C and 20 bar) or in the "cryogenic" section started in 1986 (o... 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 5501 other: not identified

- not applicable -

- not applicable -

- not applicable -

- not applicable -

human / organizational - not applicable -

remarks: The causes of the initial massive gas leakage have not been still identified (code 5501).

6 Discussion about the Occurrence

- not applicable -

Type of Accident country: FA **ident key:** 1800_037_01

event:

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

initiating event - not applicable -

associated event - not applicable -

event:

major occurrence 1203 fire: jet flame (burning jet of fluid from orifice)

initiating event - not applicable -

associated event 1307 explosion: VCE (vapour cloud explosion; supersonic wave front)

event:

major occurrence 1202 fire: pool fire (burning pool of liquid, contained or uncontained)

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

associated event 1103 release: fluid release to water

Dangerous substances

country: FA ident key: 1800_037_01

a) total establishment inventory

CAS number: MIXTURE identity: Naoh / Light Hydrocarbons

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: Liquid Hydrocarbons

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: Gaseous Hydrocarbons

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

Source of Accident - Situation country: FA ident key: 1800_037_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 - 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 - not applicable -

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

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

associated event - not applicable -

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 4002 reaction vessel; pressurised

initiating event 4002 reaction vessel; pressurised

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

B Consequences Full Report

country: FA **ident key:** 1800_037_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 Many window panes were broken off-site in a 1,000 m area around the refinery. In... see Appendix

Full Report B / area concerned - remarks

2 People

establishment popul. emergency personnel off-site population

total at risk 400 250

immediate fatalities 6

subsequent fatalities

hospitalizing injuries 1

other serious injuries

health monitoring

remarks 6 operators were killed and 1 operator severely injured in the FCC control room ... 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 Most part of the water used for extinction and cooling was collected in 30,000 s... 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 FF ECU FF

material losses 1E+09

response, clean up, restoration

remarks Facilities were destroyed or severely damaged within a 2 hectares area around th... 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 No No

- political interest No No No

remarks Many window panes were broken off-site in a 1,000 m area around the refinery. In... see Appendix

7 Discussion of Consequences

C Response Full Report

country: FA ident key: 1800_037_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

The accident was subjected to ... see Appendix Full Report C / lesson learned - prevent

measures to mitigate consequences:

The accident was subjected to ... see Appendix Full Report C / lesson learned - mitigate

useful references:

- not applicable -

5 Discussion about Response

- not applicable -

Appendices for the FA / 1800_037_01 report

Appendix Short Report / description of accident types:

ACCIDENT CASE HISTORY DESCRIPTION:

04:00 - Workers getting out of the establishment did not notice anything unusual.

05:20 - A massive gas leakage occurred. Gas was quickly ignited and the explosion that occurred was heard about 15^30 Km away. A large fire then developed. On-site emergency plan was immediately activated by the Director of the refinery.

05:30^06:00 - Arrival of first emergency teams. 3 fires followed the first explosion: the catalytic cracking unit itself, a close 5,000 m3 reservoir containing heavy distillates and a group of pipings transferring liquid and gaseous hydrocarbons. The off-site emergency plan was activated by the Prefect. Set-up of an official emergency management and coordination post by Prefect services, fully operational at 07:00.

09:45 - Failure of a 2,000 m3 reservoir containing a mixture of sodium hydroxide and light hydrocarbons, due to thermal radiation. Last minor explosion due to quick lighting of flooding mixture occurred.

13:00 - All fires were put under control. Due to partly damaged flare system, fire brigades decide to let small jet-fires continue to burn in order to ensure the safe depressurization of involved installations.

6 operators were killed and 1 operator severely injured in the FCC control room by the first explosion. Minor injuries among fire brigades. Facilities were destroyed or severely damaged within a 2 hectares area around the FCC unit, including the control room common to FCC and associated facilities. Many window panes were broken off-site in a 1,000 m area around the refinery. In some particular directions, window panes were broken at 8 Km and damages to house tile-roofs at some hundred metres occurred.

About 250 firemen called from TOTAL site, 3 neighbouring industrial establishments and 4 local districts were mobilized. Most part of the water used for extinction and cooling was collected in 30,000 storm water capacity and treated within the site water treatment plant. Floating barriers were immediately set up in order to protect the Etang de Berre. Consequently, no significant surface water pollution occurred.

Appendix Short Report / description of substances involved:

- Gaseous Hydrocarbons: amount involved in the first explosion = not known.

- Liquid/Gas Hydrocarbons: amount involved in the fires (interesting the catalytic cracking unit itself, a close 5,000 m3 reservoir containing heavy distillates and a group of pipings transferring liquid and gaseous hydrocarbons) which followed the first explosion = not known.

- Sodium Hydroxide and Light Hydrocarbons mixture: amount involved = about 2,000 m3.

Appendix Short Report / description of immediate sources:

The accident occurred in an oil refinery within the FCC N° 3 (Fluidized Catalytic Cracking Unit), either in the "gas plant" section started in 1953 (where gases are fractionated and processed at 290°C and 20 bar) or in the "cryogenic" section started in 1986 (operating at -90°C and 23 bar). The oil refinery had been operated since

1935 at 40 Km west of Marseille, near the Etang de Berre. About 400 people were on the site when the accident occurred. The refining capacity was 6.6 millions tonnes/year.

Appendix Short Report / description of immediate effects:

EFFECTS ON PEOPLE:

6 operators were killed and 1 operator severely injured in the FCC control room by the first explosion. Minor injuries among fire brigades (about 250 firemen called from TOTAL site, 3 neighbouring industrial establishments and 4 local districts were mobilized).

MATERIAL LOSS:

Facilities were destroyed or severely damaged within a 2 hectares area around the FCC unit, including the control room common to FCC and associated facilities. Many window panes were broken off-site in a 1,000 m area around the refinery. In some particular directions, window panes were broken at 8 Km and damages to house tile-roofs at some hundred metres occurred. On the basis of rough preliminary investigation, involved insurance companies concluded that on-site and off-site material damages could probably be estimated beyond 1 billion of French Francs.

ECOLOGICAL HARM:

Most part of the water used for extinction and cooling was collected in 30,000 storm water capacity and treated within the site water treatment plant. Floating barriers were immediately set up in order to protect the Etang de Berre. Consequently, no significant surface water pollution occurred.

COMMUNITY DISRUPTION:

Many window panes were broken off-site in a 1,000 m area around the refinery. In some particular directions, window panes were broken at 8 Km and damages to house tile-roofs at some hundred metres occurred. The off-site emergency plan was activated by the Prefect.

Appendix Short Report / description of emergency measures taken:

INTERNAL TO THE ESTABLISHMENT:

On-site emergency plan was immediately activated by the Director of the refinery. About 250 firemen called from TOTAL site, 3 neighbouring industrial establishments and 4 local districts were mobilized. Most part of the water used for extinction and cooling was collected in 30,000 storm water capacity and treated within the site water treatment plant. Floating barriers were immediately set up in order to protect the Etang de Berre. Consequently, no significant surface water pollution occurred. Even when the fire were put under control, due to partly damaged flare system, the fire brigades decide to let small jet-fires continue to burn in order to ensure the safe depressurization of involved installations.

EXTERNAL TO THE ESTABLISHMENT:

The off-site emergency plan was activated by the Prefect. Set-up of an official emergency management and coordination post by Prefect services, fully operational at 07:00.

Appendix Full Report A / type of accident:

Due to unknown causes, a massive gas leakage occurred (code 1101). Gas was quickly ignited and the explosion that occurred was heard about 15`30 Km away (code 1307). A large fire then developed (codes 1202 and 1203). Failure of a 2,000 m³ reservoir containing a mixture of sodium hydroxide and light hydrocarbons (code 1103), due to thermal radiation. Last minor explosion due to quick lightning of flooding mixture occurred (code 1307). No significant surface water pollution occurred.

Appendix Full Report A / dangerous substances:

No data are available about the amount of hydrocarbon gases that caused the first explosion. Also, no data are available about the amount of liquid/gas hydrocarbons involved in the fires (interesting the FCC unit itself, a close 5,000 m³ reservoir containing heavy distillates and a group of pipings transferring liquid and gaseous hydrocarbons) which followed the first explosion. The NaOH/Light Hydrocarbons mixture's amount released refers to the capacity of the reservoir (about 2,000 m³).

Appendix Full Report A / source of accident - remarks:

The accident occurred in an oil refinery (code 2002) within the FCC N° 3 (Fluidized Catalytic Cracking Unit), either in the "gas plant" section started in 1953 (operating at 290 °C and 20 bar) or in the "cryogenic" section started in 1986 (operating at -90 °C and 23 bar) [codes 3102, 4002, 4003, 4007 and 4001). The oil refinery had been operated since 1935 at 40 Km west of Marseille, near the Etang de Berre. The refining capacity was 6.6 millions tonnes/year.

Appendix Full Report B / area concerned - remarks:

Many window panes were broken off-site in a 1,000 m area around the refinery. In some particular directions, window panes were broken at 8 Km and damages to house tile-roofs at some hundred metres occurred. The off-site emergency plan was activated by the Prefect.

Appendix Full Report B / people:

6 operators were killed and 1 operator severely injured in the FCC control room by the first explosion. Minor injuries among fire brigades (about 250 firemen called from TOTAL site, 3 neighbouring industrial establishments and 4 local districts were mobilized).

Appendix Full Report B / ecological harm:

Most part of the water used for extinction and cooling was collected in 30,000 storm water capacity and treated within the site water treatment plant. Floating barriers were immediately set up in order to protect the Etang de Berre. Consequently, no significant surface water pollution occurred.

Appendix Full Report B / material loss:

Facilities were destroyed or severely damaged within a 2 hectares area around the FCC unit, including the control room common to FCC and associated facilities. Many window panes were broken off-site in a 1,000 m area around the refinery. In some particular directions, window panes breakage at 8 Km and damages to house tile-roofs at some hundred metres occurred. Involved insurance companies concluded that on-site and off-site material damages could be estimated beyond 1 billion of French Francs.

Appendix Full Report B / disruption of community life:

Many window panes were broken off-site in a 1,000 m area around the refinery. In some particular directions, window panes were broken at 8 Km and damages to house

tile-roofs at some hundred metres occurred. The off-site emergency plan was activated by the Prefect.

Appendix Full Report C / lesson learned - prevent:

The accident was subjected to legal and administrative in-depth technical investigations, both at regional and national levels.

Appendix Full Report C / lesson learned - mitigate:

The accident was subjected to legal and administrative in-depth technical investigations, both at regional and national levels.