

Brand i en destillationskolonn för framställning av kolväten på en petrokemisk anläggning.

940604 MARS 1800_38

Vid underhållsarbete på en destillationskolonn för framställning av etylen, propylen och butadien inträffade en plötslig självantändning av pyrofora järnsulfider. Två av operatörerna som befann sig inne i kolonnen (1m diameter) avled; ytterligare fem skadades. Avlagringar av pyrofora järnsulfider kan inträffa i destillationskolonner där svavelförorenade kolväten hanteras. Företagets interna brandkår fick snabbt branden under kontroll och kunde släcka den.

Inblandade ämnen och mängder

	CAS Nr.	Mängd
Järnsulfider (FeS, Fe2S3)		okänt

Skador:

Människor:	Två operatörer omkom i samband med branden. Ytterligare fem skadades, varav två fördes till sjukhus.
Materiella:	Begränsade skador på anläggningen.
Miljö/ekologi:	Inga effekter rapporterade.
Infrastruktur:	Inga.

Erfarenheter redovisade (Ja/Nej): Nej

Report Profile

Identification of Report:

country: FA ident key: 1800_038_01

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

Date of Major Occurrence: Time of Major Occurrence

start: 1994-06-04 start: 10:00:00

finish: finish:

Establishment:

name:

address:

industry: 2002 petrochemical, refining, processing

Oil Refinery and Petrochemical Complex (Ethylene, Propylene and Butadiene Production)

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_038_01

Accident Types:

release: No **explosion:** No

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:** No

ecotoxic: No **other:** No

flammable: Yes

description:

- Iron Sulphides [FeS, Fe2S3]: amount involved = not known.

Immediate Sources of Accident:

storage: No **transfer:** No

process: Yes **other:** No

description:

The accident occurred during the maintenance of the main column of the distillation unit in an oil refinery and petrochemical complex for ethylene, propylene and butadiene production. The distillation column (66 metres high) had an internal... see Appendix Short Report / description of immediate sources

Suspected Causes:

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

human: No **other:** No

description:

CAUSES:... see Appendix Short Report / description of suspected causes

Immediate Effects:

material loss: Yes

human deaths: Yes

human injuries: Yes **community disruption:** No

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: No **restoration:** No

sheltering: No **other:** Yes

evacuation: No

description:

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

Immediate Lessons Learned:

prevention: Yes **other:** No

mitigation: Yes

description:

The measures to prevent any recurrence or to mitigate the effects of similar accidents will depend on the results of the various inquiries that are carrying out. In any case, the procedures for the preparation of the unit to maintenance ope... see Appendix Short Report / description of immediate lessons learned

A Occurrence Full Report

country: FA **ident key:** 1800_038_01

1 Type of Accident

remarks: The distillation unit was stopped 1 week before the accident occurred for preparing it to a maintenance operations programme (scheduled every 3*5 years). During the major maintenance programme, the operators were inspecting plates inside th... see Appendix Full Report A / type of accident

2 Dangerous Substances

remarks: No data are available about the amount of iron sulphides (FeS and Fe₂S₃) involved in the accident. Iron sulphides deposits may appear in equipment made in ferrous alloys shells where hydrocarbons contaminated with sulphur are handled.

3 Source of Accident

illustration: - not applicable -

remarks: The accident occurred during the maintenance of the main column (code 4007) of the distillation unit (code 3102) in an oil refinery and petrochemical complex for ethylene, propylene and butadiene production (code 2002). The distillation col... 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 5107 operation: unexpected reaction/phase-transition

- not applicable -

- not applicable -

- not applicable -

- not applicable -

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

5307 organization: process analysis (inadequate, incorrect)

- not applicable -

- not applicable -

- not applicable -

remarks: The accident was probably caused by the spontaneous burning of pyrophoric iron sulphides

deposits in the column (code 5107). Such deposits may appear in equipment made in ferrous

alloys shells where hydrocarbons contaminated with sulphur ar... see Appendix Full Report

A / causes of major occurrence

6 Discussion about the Occurrence

- not applicable -

Type of Accident country: FA ident key: 1800_038_01

event:

major occurrence 1204 fire: flash fire (burning vapour cloud, subsonic flame front)

initiating event 1204 fire: flash fire (burning vapour cloud, subsonic flame front)

associated event - not applicable -

Dangerous substances

country: FA ident key: 1800_038_01

a) total establishment inventory

CAS number: identity: Iron Sulphides [Fe S, Fe2 S3]

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: 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_038_01

situation

industry

initiating event 2002 petrochemical, refining, processing

associated event - not applicable -

activity/unit

major occurrence 3102 process: chemical continuous reaction

initiating event 3102 process: chemical continuous reaction

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 -

B Consequences Full Report

country: FA ident key: 1800_038_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 In the Original Report there is no evidence of significant effects outside the e... see Appendix

Full Report B / area concerned - remarks

2 People

establishment popul. emergency personnel off-site population

total at risk 50

immediate fatalities 2

subsequent fatalities

hospitalizing injuries 2

other serious injuries 3

health monitoring

remarks 2 operators were killed inside the column by the flash fire. 5 operators were in... 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** 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 The flash fire caused very small material damages within the distillation unit. ... 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 e... see Appendix

7 Discussion of Consequences

C Response Full Report

country: FA **ident key:** 1800_038_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 measures to prevent any re... see Appendix Full Report C / lesson learned - prevent

measures to mitigate consequences:

The measures to mitigate the e... see Appendix Full Report C / lesson learned - mitigate

useful references:

- not applicable -

5 Discussion about Response

- not applicable -

Appendices for the FA / 1800_038_01 report

Appendix Short Report / description of accident types:

ACCIDENT CASE HISTORY DESCRIPTION:

The distillation unit was stopped 1 week before the accident occurred for preparing it to a maintenance operations programme (scheduled every 3-5 years). The column was vented, then followed by a vapour clean-up (on May 28-29) and finally flushed with water. The actual major maintenance programme was started on May 30. The operators were inspecting plates inside the column and welding on the main "hard" pipe (1 m diameter) when an internal flash fire burst suddenly, killing two operators inside the column and injuring 5 others workers. In the Original Report there is no evidence of sulphur dioxides release during the accident.

Appendix Short Report / description of immediate sources:

The accident occurred during the maintenance of the main column of the distillation unit in an oil refinery and petrochemical complex for ethylene, propylene and butadiene production. The distillation column (66 metres high) had an internal volume of about 2,750 m³ and operated at 2 bar. The whole treatment capacity was 26,000 tonnes/day.

Appendix Short Report / description of suspected causes:

CAUSES:

The accident was probably caused by the spontaneous burning of pyrophoric iron sulphides deposits in the column. Such deposits may appear in equipment made in ferrous alloys shells where hydrocarbons contaminated with sulphur are handled. They get incandescent at air contact and emit sulphur oxides.

Appendix Short Report / description of immediate effects:

EFFECTS ON PEOPLE:

2 operators were killed inside the column by the flash fire. 5 operators were injured in and outside the column (2 of them were brought to hospital).

MATERIAL LOSS:

The flash fire caused very small material damages within the distillation unit. No data are available about the cost of the damages. In the Original Report there is no evidence of significant effects outside the establishment.

Appendix Short Report / description of emergency measures taken:

INTERNAL TO THE ESTABLISHMENT:

The necessary emergency measures were limited because the fire was easily put under control by the fire fighting teams (about 50 firemen were mobilized). 1 chemical emergency specific rescue team (CMC) was mobilized.

EXTERNAL TO THE ESTABLISHMENT:

The competent Authorities were informed about the accident.

Appendix Short Report / description of immediate lessons learned:

The measures to prevent any recurrence or to mitigate the effects of similar accidents will depend on the results of the various inquiries that are carrying out. In any case, the procedures for the preparation of the unit to maintenance operation will be carefully overviewed.

Appendix Full Report A / type of accident:

The distillation unit was stopped 1 week before the accident occurred for preparing it to a maintenance operations programme (scheduled every 3⁵ years). During the major maintenance programme, the operators were inspecting plates inside the column and welding on the main "hard" pipe (1 m diameter) when an internal flash fire (code 1204) burst suddenly. In the Original Report there is no evidence of sulphur dioxides release during the accident.

Appendix Full Report A / source of accident - remarks:

The accident occurred during the maintenance of the main column (code 4007) of the distillation unit (code 3102) in an oil refinery and petrochemical complex for ethylene, propylene and butadiene production (code 2002). The distillation column (66 metres high) had an internal volume of about 2,750 m³ and operated at 2 bar. The whole treatment capacity was 26,000 tonnes/day.

Appendix Full Report A / causes of major occurrence:

The accident was probably caused by the spontaneous burning of pyrophoric iron sulphides deposits in the column (code 5107). Such deposits may appear in equipment made in ferrous alloys shells where hydrocarbons contaminated with sulphur are handled. The procedures for the preparation of the units to maintenance operations were inadequate (codes 5303 and 5307) because did not take into account the possible formation of the iron sulphides deposits.

Appendix Full Report B / area concerned - remarks:

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

Appendix Full Report B / people:

2 operators were killed inside the column by the flash fire. 5 operators were injured in and outside the column (2 of them were brought to hospital). No injuries occurred outside the establishment. About 50 firemen were mobilized to fight the fire.

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 flash fire caused very small material damages within the distillation unit. No data are available about the cost of the damages. In the Original Report there is no evidence of significant effects outside the establishment.

Appendix Full Report B / disruption of community life:

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

Appendix Full Report C / lesson learned - prevent:

The measures to prevent any recurrence of similar accidents will depend on the results of the various inquiries that are carrying out. In any case, the procedures for the preparation of the unit to maintenance operation will be carefully overviewed.

Appendix Full Report C / lesson learned - mitigate:

The measures to mitigate the effects of similar accidents will depend on the results of the various inquiries that are carrying out. In any case, the procedures for the preparation of the unit to maintenance operation will be carefully overviewed.