

Missöde i förbränningen på ett oljeraffinaderi.

960427 MARS 1996_03

Olyckan på raffinaderiet inbegrep en ugn för termisk krackning av destillationsrester för produktion av lättare kolväten. Den första indikationen på att något var fel kom då temperaturgivarna visade en något för hög temperatur. En tydlig rök syntes också. Ofullständig förbränning hade uppstått till följd av ett hål på ett rör i förbränningskammaren. Operatören satte igång ett begränsat produktionsstopp för att försiktigt undvika problem. Ytterligare två rör i förbränningskammaren sprack och en jetflamma slog upp. Anläggningen stoppades genast och branden i förbränningskammaren dog ut i brist på bränsle. Kvarvarande brand släcktes enkelt med skum. Anläggningen kylades med vatten av räddningstjänsten.

Inblandade ämnen och mängder

	CAS Nr.	Mängd
bränsleolja		okänt

Skador:

Människor:	Inga.
Materiella:	Ugnen skadades en aning.
Miljö/ekologi:	Ett utsläpp av ofullständigt förbrända kolväten syntes som grå, och senare även svart rök. Inga effekter rapporterades.
Infrastruktur:	Inga.

Erfarenheter redovisade (Ja/Nej): Ja

Kortfattat anges förebyggande åtgärder.

Report Profile

Identification of Report:

country: FA ident key: 1996_003_01

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

Date of Major Occurrence: Time of Major Occurrence

start: 1996-04-27 start: 07:45:00

finish: 1996-04-27 finish: 09:30:00

Establishment:

name:

address:

industry: - not applicable -

Petrochemical, refinery and process (2002)

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_003_01**Accident Types:****release:** Yes **explosion:** No**water contamination:** No **other:** No**fire:** Yes**description:**

The accident in the refinery involved the oven F1801 of the Visbreaking process in the Residues Section used in the thermal cracking of the distillation residue in order to obtain medium to light distillates. The oven has two radiant chambe... see Appendix Short Report / description of accident types

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

Fuel oil

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

The supply flow at the moment of the accident was about 80 t/h (max. design value =140 t/h). Initially a break of the tube of a serpentine containing products to be processed occurred, which evolved into a hole of some cm diameter in the zo... see Appendix Short Report / description of immediate sources

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

The accident originated from the rupture of a tube, located about 3/4 of the height in the first pass in the

combustion chamber (side "Ancona"), and later involved other two tubes, one in the same chamber and another down in the convection ... see Appendix Short Report / description of suspected causes

Immediate Effects:

material loss: Yes

human deaths: No

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

other: No

ecological harm: No

national heritage loss: No

description:

RELATED TO PERSONS:... 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:

Inside the establishment... see Appendix Short Report / description of emergency measures taken

Immediate Lessons Learned:

prevention: Yes **other:** No

mitigation: No

description:

The company in its technical note suggests:... see Appendix Short Report / description of immediate lessons learned

A Occurrence Full Report

country: FA **ident key:** 1996_003_01

1 Type of Accident

remarks: The product escaping from the initially formed hole, determined the fuel oversupply in the combustion chamber and then the production of black smoke at the exit of the chimney. Probably the product jet then hit two other tubes situated away... see Appendix Full Report A / type of accident

2 Dangerous Substances

remarks: - not applicable -

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): 3

direction (from): N-W

stability (Pasquill):

ambient temperature (°C): 15

remarks: The chimney involved in the first cases is about 300 m from the first houses in north-west direction; it is 51 m above the ground and 54 m above sea level. The smoke plume was noted up to a distance in that direction of 500 m and except f... see Appendix Full Report

A / meteorological conditions

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 -

- not applicable -

- not applicable -

- not applicable -

- not applicable -

remarks: The exact cause was not ascertained, however the technical service of the refinery indicated as the most probable cause an existing defect in the tube material, which presented itself during the course of the incident.

6 Discussion about the Occurrence

- not applicable -

Type of Accident country: FA ident key: 1996_003_01

event:

major occurrence 1401 other: combustion products into air

initiating event 1401 other: combustion products into air

associated event - not applicable -

event:

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

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

associated event - not applicable -

event:

major occurrence 1101 release: gas/vapour/mist/etc release to air

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

associated event - not applicable -

Dangerous substances

country: FA ident key: 1996_003_01

a) total establishment inventory

CAS number: identity: Tetramethyl Lead

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): 80

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: identity: Tetraethyl Lead

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): 80

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: 7783-06-4 identity: Sulphydic Acid

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): 16000

use of substance as: ON-SITE INTERMEDIATE

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: identity: Nickel

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: identity: Liquefied Gases

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): 2700

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: 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): 8800

use of substance as: ON-SITE INTERMEDIATE

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: identity: Highly 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): 14800

use of substance as: NORMAL FINISHED PRODUCT

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 80 potential quantity: 140

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: identity: 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): 3200

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: identity: Cobalt

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: identity: Ammonia

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): 2500

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

B Consequences Full Report

country: FA ident key: 1996_003_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 fire involved only the area close to the oven. The smoke release in the atmo... see Appendix

Full Report B / area concerned - remarks

2 People

establishment popul. emergency personnel off-site population

total at risk 0 0 0

immediate fatalities 0 0 0

subsequent fatalities 0 0 0

hospitalizing injuries 0 0 0

other serious injuries 0 0 0

health monitoring 0 0 0

remarks No person involved

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 It seems that the release did not cause relevant damages to the environment in t... 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 relevant damages to places and buildings of particular historical interest al... see

Appendix Full Report B / national heritage loss

5 Material Loss

establishment losses off site losses

costs (direct costs to operator) (social costs)

in ECU IL ECU IL

material losses 1E+09 0

response, clean up, restoration

remarks The costs concern the reconstruction of the damaged structures but not the produ... 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 - not applicable -

7 Discussion of Consequences

C Response Full Report

country: FA ident key: 1996_003_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_003_01 report

Appendix Short Report / description of accident types:

The accident in the refinery involved the oven F1801 of the Visbreaking process in the Residues Section used in the thermal cracking of the distillation residue in order to obtain medium to light distillates. The oven has two radiant chambers and a convection zone. In the two chambers the combustion of the fuel oil for the heating of the input distillates circulating in the tubes surrounding the chamber occurs. The

convection zone also has various series of tubes. The first indication of a malfunction was an anomalous temperature increase (+6 degrees Celsius) observed on the thermal element in the oven output. The operator noticed a light smoke in a combustion chamber and after verification of the correct lighting of the burners, initiated the alarm for low percentage of oxygen in the smoke of the combustion. At a second inspection he also discovered a small hole in a tube of the serpentine. It was then decided to shut down the plant in a controlled way following the procedures described in the operating manual for losses of small scale, which required the shut-down of the burner in the near chamber (the involved chamber was kept running in order to burn the product escaping from the hole) and reducing the income flow to the minimum value. The situation in the combustion chamber worsened when two other tubes began to leak and the flame propagated externally up to a few meters outside the chamber. The plant was then rapidly shut-down and the emergency ended quickly with the burn-out of the flame in the internal of the chamber due to the consumption of the fuel, the use of a vapour jet, and the extinguishment of the external flame with the use of foam by the emergency intervention forces internal to the refinery. The incomplete

combustion caused the release of a dense cloud composed by the combustion products from the chimney to about 500m in the west direction towards the first houses of the village of Rocca Priora.

Appendix Short Report / description of immediate sources:

The supply flow at the moment of the accident was about 80 t/h (max. design value =140 t/h). Initially a break of the tube of a serpentine containing products to be processed occurred, which evolved into a hole of some cm diameter in the zone of maximum opening of the flame in one of the 2 burners. The product escaping from the hole supplied the combustion which, being poor in air, was incomplete causing the observed smoke in the combustion chamber and the release of grey smoke from the chimney. Successively two more tubes broke, and swelling caused them to open longitudinally for about 20 cm. From the position of the two tubes, one in a high corner opposite to the initial broken tube, and the other in the upper convection chamber, it was deduced that they were reached by a jet of product which overheated them

locally. The consequent and massive product release worsened the situation of the combustion with emission of a black smoke cloud from the chimney. Part of the product also exited the oven propagating the fire to the outside.

Appendix Short Report / description of suspected causes:

The accident originated from the rupture of a tube, located about 3/4 of the height in the first pass in the combustion chamber (side "Ancona"), and later involved other two tubes, one in the same chamber and another down in the convection chamber. In a first internal report of the company two hypothesis were put forward: either partial obstruction of the tube passage due to an anomalous detaching of the coke, which

normally forms a layer inside the tube, or a defect of the material of the tube at the point of the rupture. From the successive analysis of temperature of the tube passages and the product flows, the technical note supports as the most plausible hypothesis the material defect of the tube which was the origin of the first loss, and which would not have been evident during the normal operation of the plant.

Appendix Short Report / description of immediate effects:

RELATED TO PERSONS:

The personnel present at the plant were a head of shift, 2 workers and 4 operators, of which none were injured as results from the internal report.

RELATED TO MATERIAL:

The oven has been damaged in its interior due to the high temperature reached in the combustion chamber (about 1000 degrees Celsius and thus much higher than the design temperature of 495 degrees Celsius). About 100 tubes had to be replaced and it was necessary to revise the external control devices.

Appendix Short Report / description of emergency measures taken:

Inside the establishment

Initial controlled shut down controlled by the emergency intervention team.

Successive rapid shut down and the following operations:

- fuels interception at the limit of the battery,
- interception of feed line at the limit of the battery and deviation of the residue to another line,
- vacuum 3 to storage,
- opening of the vapour screen with Soaker inlet,
- opening water screen between the oven and the plant near the catalytic desulphurisation plant,
- circulation interruption of overheated oil, and feed of the accumulation to flare
- control of columns pressure by motorised drainage valve to flare.

Extinguishing of external fire by foam, extinguishing of internal fire (by the consumption of the fuel, closing of the incoming air and the action of suffocating vapour) and cooling of the external structure of the oven with the support of the Ancona fire brigade.

Appendix Short Report / description of immediate lessons learned:

The company in its technical note suggests:

- in order to guarantee a complete monitoring of the temperature profile across the tube metal in the various zones of the oven to install a number of the skin points (thermocouples) along the oven,
- verification with the licensing society of the process of the operating conditions and of the emergency procedures adopted in order to verify their efficiency,
- re-design of the dimensions of the combustion system to fit the actual operating capacity of the oven.

Appendix Full Report A / type of accident:

The product escaping from the initially formed hole, determined the fuel oversupply in the combustion chamber and then the production of black smoke at the exit of the chimney. Probably the product jet then hit two other tubes situated away from the flame, causing a local overheating and their rupture resulting in worsening of the combustion conditions with black smoke release external to the establishment up to 500 m.

Appendix Full Report A / meteorological conditions:

The chimney involved in the first cases is about 300 m from the first houses in north-west direction; it is 51 m above the ground and 54 m above sea level. The smoke plume was noted up to a distance in that direction of 500 m and except from personnel of the installation did not cause damages.

Appendix Full Report B / area concerned - remarks:

The fire involved only the area close to the oven. The smoke release in the atmosphere without ascertained damages, reached an area up to 500 m in the N-W direction.

Appendix Full Report B / ecological harm:

It seems that the release did not cause relevant damages to the environment in that the products were dispersed in a wide area.

Appendix Full Report B / national heritage loss:

No relevant damages to places and buildings of particular historical interest also because the release was of short duration and occurred in an area of relative recent development.

Appendix Full Report B / material loss:

The costs concern the reconstruction of the damaged structures but not the production loss.