

## Mindre utsläpp och brand på ett oljeraffinaderi.

901129 MARS 1800\_109\_01

Vid ett rörledningsarbete som inte företogs enligt föreskrifter kom LPG att läcka ut vid hög temperatur och högt tryck genom en blockerad ventil. Tryckutjämningsventiler öppnades och en operatör iklädd skyddskläder stängde den blockerade ventilen. Den utsläppta mängden LPG skingrades utan att antändas. Den resterande mängden omdirigerades via tryckutjämningsventilerna till facklan. I rörledningarna mot facklan passerar gasen en sump där vätska ofta ansamlas. I normala fall pumpas vätskan automatiskt bort, men i detta fall blockerades sumpen av skräp varvid en ansenlig mängd vätska fanns i rörledningen. I rörledningen (762 mm diameter) fanns uppskattningsvis 30 m<sup>3</sup> vätska, vilket drevs med stor kraft av den omdirigerade gasen mot facklan. Detta resulterade i att ungefär 100 m rörledning rubbades ur sitt fäste och föll 10 m till marken, dock utan att rörledningen brast. Ingen LPG släpptes ut på väg mot facklan. Såväl interna brandbekämpningsstyrkor som räddningsverk alarmerades.

### Inblandade ämnen och mängder

	CAS Nr.	Mängd
LPG (blandning av propan, propylen, butan och butylen)		
Propan	74-98-6	okänt
Propylen	115-07-1	okänt
Butan	106-97-8	okänt
butylen	25167-67-3	okänt

### Skador:

Människor:	Inga personer skadades.
Materiella:	Avsevärda materiella skador på anläggningen.
Miljö/ekologi:	Inga effekter rapporterade.
Infrastruktur:	Alla närliggande områden på anläggningen evakuerades. Vägar i anläggningens närhet spärrades av.

### Erfarenheter redovisade (Ja/Nej): Ja

Kortfattat anges förebyggande åtgärder.

## Report Profile

### Identification of Report:

country: FA ident key: 1800\_109\_01

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

### Date of Major Occurrence: Time of Major Occurrence

start: 29/11/1990 start: 15:15:00

finish: 29/11/1990 finish:

### Establishment:

name:

address:

industry: 2002 petrochemical, refining, processing

Petroleum 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\_109\_01

### **Accident Types:**

release: Yes explosion: No

water contamination: No other: No

fire: No

#### **description:**

An operator disconnected a drain assembly connected to the depropaniser reboiler until it was remained only a partially opened but blocked 50mm valve (from the Original Report it is not fully clear if it was a 50mm or a 15mm valve). The blo... see Appendix Short Report / description of accident types

### **Substance(s) Directly Involved:**

toxic: No explosive: Yes

ecotoxic: No other: No

flammable: Yes

#### **description:**

- Propane (C.A.S. CODE: 74-98-6): amount involved = 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 a process plant of a petroleum refinery. The plant included the depropaniser column

(to separate C3 and C4), the polypropylene/propane splitter columns and the flare system. The LPG release occurred during the maint... see Appendix Short Report / description of immediate sources

### **Suspected Causes:**

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

**human:** Yes **other:** No

**description:**

INITIATING EVENT AND CONSEQUENCES:... 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:**

MATERIAL LOSS:

The cost of reinstating the collapsed flareline was about ú 980,000.

### **Emergency Measures taken:**

**on-site systems:** Yes **decontamination:** No

**external services:** Yes **restoration:** No

**sheltering:** No **other:** No

**evacuation:** Yes

**description:**

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

### **Immediate Lessons Learned:**

**prevention:** Yes **other:** No

**mitigation:** No

**description:**

MEASURES TO PREVENT ANY RECURRENCE OF SIMILAR ACCIDENTS:... see Appendix Short Report / description of immediate lessons learned

## **A Occurrence Full Report**

**country:** FA **ident key:** 1800\_109\_01

### **1 Type of Accident**

**remarks:** The initiating event was the release of LPG through a 50 mm valve connected to a depropaniser reboiler (code 1101). The LPG released dispersed without igniting. In order to reduce the amount of LPG escaping, the interconnecting depropaniser... see Appendix Full Report A / type of accident

### **2 Dangerous Substances**

**remarks:** The LPG (propane, propylene, butane, butylene) was released only through the drain valve on the depropaniser reboiler. No LPG was released the displaced flareline, although the potential was present. No data are available about the amounts ... see Appendix Full Report A / dangerous substances

### 3 Source of Accident

**illustration:** - not applicable -

**remarks:** The accident occurred in a process plant of a petroleum refinery (code 2002). The plant included a depropaniser column, polypropylene/propane splitter columns and a flareline. The accident occurred during the maintenance of a blocked drain ... 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** 5108 operation: blockage

- not applicable -

- not applicable -

- not applicable -

- not applicable -

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

5308 organization: design of plant/equipment/system (inadequate, inappropriate)

5401 person: operator error

- not applicable -

- not applicable -

**remarks:** The drain valve on the depropaniser reboiler was blocked by caustic soda (code 5108). The disconnection of the drain assembly was not done in accordance with the (however inadequate) procedures (codes 5303 and 5401). Besides, the flareline ... see Appendix Full Report A / causes of major occurrence

### 6 Discussion about the Occurrence

- not applicable -

**Type of Accident** country: FA ident key: 1800\_109\_01

**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:** 1800\_109\_01

### **a) total establishment inventory**

**CAS number:** 115-07-1 **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:** 74-98-6 **identity:** Propane

**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:** 25167-67-3 **identity:** Butylene

**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: 106-97-8 identity: Butane

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\_109\_01

**situation**

**industry**

**initiating event** 2002 petrochemical, refining, processing

**associated event** - not applicable -

**activity/unit**

**major occurrence** 3104 process: physical operations (mixing, melting crystallizing, etc.)

**initiating event** 3104 process: physical operations (mixing, melting crystallizing, etc.)

**associated event** - not applicable -

**component**

**major occurrence** 4010 valves/controls/monitoring devices/drain cocks

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

**associated event** - not applicable -

## **B Consequences Full Report**

country: FA ident key: 1800\_109\_01

**1 Area concerned**

**affected**

**extent of effects installation:** Yes

**establishment:** No

**off-site; local:** No

**off-site; regional:** No

**off-site; transboundary:** No

**illustration of effects** - not applicable -

**remarks** Though all the areas in the vicinity of the plant were evacuated, in the Origina... 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 0

**subsequent fatalities** 0 0 0

**hospitalizing injuries** 0 0 0

**other serious injuries** 0 0 0

**health monitoring** 0 0 0

**remarks** No data are available about the number of people involved in the accident.... see Appendix Full

Report B / people

## 3 Ecological Harm

**pollution/contamination/damage of:**

- residential area (covered by toxic cloud) Suspected

- common wild flora/fauna (death or elimination) Suspected

- rare or protected flora/fauna (death or elimination) Suspected

- water catchment areas and supplies for consumption or recreation Suspected

- land (with known potential for long term ecological harm or Suspected

preventing human access or activities)

- marine or fresh water habitat Suspected

- areas of high conservation value or given special protection Suspected

**remarks** In the Original Report there is no evidence of significant ecological harms. Thi... 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 British Pounds ECU British Pounds

material losses 1450000 980000 0 0

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

remarks The cost of reinstating the flareline was about 980,000 pounds.... 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 i... see Appendix

## 7 Discussion of Consequences

# C Response Full Report

country: FA ident key: 1800\_109\_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

After the accident, the follow... see Appendix Full Report C / lesson learned - prevent

measures to mitigate consequences:

not given

useful references:

Some calculations were carried... see Appendix Full Report C / lesson learned - references

### **5 Discussion about Response**

- not applicable -

# Appendices for the FA / 1800\_109\_01 report

## Appendix Short Report / description of accident types:

An operator disconnected a drain assembly connected to the depropaniser reboiler until it was remained only a partially opened but blocked 50mm valve (from the Original Report it is not fully clear if it was a 50mm or a 15mm valve). The blockage was caused by caustic soda and the operator played steam over the valve to clear the blockage. The blockage was cleared but the operator was unable to close the gate valve due to caustic soda and LPG released at high temperature and pressure (the disconnection of the pipework was not done in accordance with the sites standing instructions). In order to reduce the pressure in the depropaniser to minimise the amount of LPG escaping from the 50mm valve, a 406mm pneumatically operated depressurizing valve was opened. This valve, with a rated capacity of 13.375 tons per minute, was designed to depressurize the interconnected depropaniser and polypropylene splitter columns in 15 minutes via a 762mm line into the main 910mm flareheader. After the depressurizing valve was opened, the 50mm gate valve connected to the depropaniser was closed by an operator wearing breathing apparatus. The LPG released was safely dispersed. The emergency depressurising valve was open for 2'19". At a low point in the 762mm line to the main flareheader described above there was located a small (254mm diameter, 600mm high) sump. At the bottom of this sump there was a 38mm diameter pipe to drain accumulated liquid into a nearby vessel. The liquid accumulated in this vessel was automatically pumped away. The sump was however blocked with debris and this allowed a large amount of liquid (about 30 m<sup>3</sup>) to accumulate in the 762mm line. The escaping gas from the depressurizing valve caused this liquid to be dispersed down the flareline and the forces generated caused about 100m of 762mm line to be displaced, falling approximately 10 metres to the ground. The pipeline buckled and in a few points there were some crackings. In one point a crack was found to have propagated through the 77% of the 10mm nominal thickness of the pipeline wall. The pipeline did not however failed and no LPG was released from this source.

## Appendix Short Report / description of substances involved:

- Propane (C.A.S. CODE: 74-98-6): amount involved = not known.
- Propylene (C.A.S. CODE: 115-07-1): amount involved = not known.
- Butane (C.A.S. CODE: 106-97-8): amount involved = not known.
- Butylene (C.A.S. CODE: 25167-67-3): amount involved = not known.

N.B. The LPG (propane, propylene, butane, butylene) was released only through the drain valve on the depropaniser reboiler. No LPG was released the displaced flareline, although the potential was present.

## Appendix Short Report / description of immediate sources:

The accident occurred in a process plant of a petroleum refinery. The plant included the depropaniser column (to separate C3 and C4), the polypropylene/propane splitter columns and the flare system. The LPG release occurred during the maintenance of a blocked drain valve on the depropaniser reboiler. The depropaniser reboiler was operating at about 104°C and 18.1 barg.

## Appendix Short Report / description of suspected causes:

INITIATING EVENT AND CONSEQUENCES:

The initiating event was the release of LPG through 15mm drain valve (initially blocked by caustic soda) connected to the depropaniser reboiler. The operator was unable to close the valve after its blockage was cleared out by means of steam. In order to reduce the amount of released LPG, the depropaniser and polypropylene splitter columns were depressurised via an emergency depressurising valve to a flareline. A blockage in the flareline resulted in its displacement.

CAUSES:

The initiating event was caused by the blockage of a drain valve by caustic soda. The disconnection of the pipework was not done in accordance with the sites standing procedures that, however, were inadequate for clearing a pipe blockage. The flareline displacement was caused by the failure to maintain the line free of blockages (no written procedures were instituted to avoid it and, besides, the design of the flareline drainage arrangements made its maintenance difficult).

## Appendix Short Report / description of emergency measures taken:

INTERNAL TO THE ESTABLISHMENT:

The emergency depressurization of the interconnected depropaniser and polypropylene splitter columns was activated in order to minimize the amount of LPG released from the drain valve. After the activation of the emergency depressurization, the drain valve was closed by an operator wearing breathing apparatus. Besides, as precautionary measures:

- all the areas in the vicinity of the plant were evacuated;
- the internal fire brigade was alerted and attended incident;
- mobile and fixed fire monitors were set-up downwind of the damaged sections of flareline;
- roads in the area were closed;
- the county fire brigades were called.

## Appendix Short Report / description of immediate lessons learned:

MEASURES TO PREVENT ANY RECURRENCE OF SIMILAR ACCIDENTS:

After the accident, the following measures were established:

- 1- procedures with regard to the drainage of caustic soda etc, from LPG containing installations have been reinforced;
- 2- the flareline was reconstructed and the design for the liquid removal from the line has been improved such that its blockage is no longer foreseeable;
- 3- written maintenance procedures have been instituted.

## Appendix Full Report A / type of accident:

The initiating event was the release of LPG through a 50 mm valve connected to a depropaniser reboiler (code 1101). The LPG released dispersed without igniting. In order

to reduce the amount of LPG escaping, the interconnecting depropaniser and polypropylene splitter columns were depressurized to a flareheader. Due to a line blockage, the flareline displacement occurred. The flareline did not however fail and no LPG was released from this source.

#### **Appendix Full Report A / dangerous substances:**

The LPG (propane, propylene, butane, butylene) was released only through the drain valve on the depropaniser reboiler. No LPG was released the displaced flareline, although the potential was present. No data are available about the amounts of the substances released during the accident.

#### **Appendix Full Report A / source of accident - remarks:**

The accident occurred in a process plant of a petroleum refinery (code 2002). The plant included a depropaniser column, polypropylene/propane splitter columns and a flareline. The accident occurred during the maintenance of a blocked drain valve on the depropanizer reboiler (code 4010). The depropaniser was operating at 104 °C and 18.1 barg.

#### **Appendix Full Report A / causes of major occurrence:**

The drain valve on the depropaniser reboiler was blocked by caustic soda (code 5108). The disconnection of the drain assembly was not done in accordance with the (however inadequate) procedures (codes 5303 and 5401). Besides, the flareline displacement occurred due to the failure to maintain the line free of blockages (code 5108), due to the lack of written procedures (code 5303) and to the inadequate design of the flareline drainage arrangements that had made maintenance difficult (code 5308).

#### **Appendix Full Report B / area concerned - remarks:**

Though all the areas in the vicinity of the plant were evacuated, in the Original Report there is no evidence of significant effects outside the installation.

#### **Appendix Full Report B / people:**

No data are available about the number of people involved in the accident.

#### **Appendix Full Report B / ecological harm:**

In the Original Report there is no evidence of significant ecological harms. This is due to the low ecotoxic risks of the substances involved in the accident.

#### **Appendix Full Report B / material loss:**

The cost of reinstating the flareline was about 980,000 pounds.

#### **Appendix Full Report B / disruption of community life:**

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

#### **Appendix Full Report C / lesson learned - prevent:**

After the accident, the following measures were established:

- 1- the operating procedures with regard to the drainage of caustic soda, etc. from LPG containing installations have been reinforced;
- 2- the flareline has been reconstructed and the design for the liquid removal from the line has been improved such that its blockage is no longer foreseeable;
- 3- written maintenance procedures have been instituted.

#### **Appendix Full Report C / lesson learned - references:**

Some calculations were carried out in order to evaluate the overpressure and consequential effects in case the flareline had really failed. These calculations, however, involved some speculations in evaluate the rate of gas release, the gas dispersion, the extent of the confinement, etc.