

# Explosion på kemikaliefabrik.

850604 MARS 1985\_07

Explosionen inträffade vid tillsats av ftalanhydrid till ett reaktionskärl med soyaolja, glycerol och natriumhydroxid. Den operatör som befann sig närmast skadades vid explosionen då han kastades till marken och bröt armen. Den mest sannolika orsaken till explosionen ansågs vara en statisk elektrisk urladdning.

## Inblandade ämnen och mängder

	CAS Nr.	Mängd
ftalanhydrid	85-44-9	110 kg

## Skador:

Människor: En person skadades vid explosionen då han kastades till marken och bröt armen.

Materiella: Anläggningen skadades.

Miljö/ekologi: Inga effekter rapporterade.

Infrastruktur: Inga.

## Erfarenheter redovisade (Ja/Nej): Ja

Kortfattat anges förebyggande åtgärder.

## Report Profile

### Identification of Report:

country: FA ident key: 1985\_007\_01

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

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

start: 1985-06-04 start:

finish: finish:

### Establishment:

name:

address:

industry: 2001 general chemicals manufacture

Organic Chemical (Process Plant)

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: 1985\_007\_01

**Accident Types:**

release: No explosion: Yes

water contamination: No other: No

fire: No

**description:**

During the addition of phthalic anhydride to a varnish kettle which contained a mixture of soya-bean oil, glycerol and caustic soda at 200°C, an explosion occurred at the charging hatch. The operator was blown back by the overpressure and b... see Appendix Short Report / description of accident types

**Substance(s) Directly Involved:**

toxic: No explosive: Yes

ecotoxic: No other: No

flammable: Yes

**description:**

- Phthalic anhydride (C.A.S. CODE: 85-44-9): amount involved = 110 kg... 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 organic chemical industry during the addition of phthalic anhydride to a varnish kettle containing a mixture of soya-bean oil, glycerol and caustic soda at 200°C.

**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:** No

**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:** No **decontamination:** No

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

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

**evacuation:** No

**description:**

No emergency measures were necessary, neither on-site nor off-site.... 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:** 1985\_007\_01

### **1 Type of Accident**

**remarks:** During the addition of phthalic anhydride dust to a varnish kettle which contained a mixture of soya-bean oil, glycerol and caustic soda at 200°C, an explosion occurred at the charging hatch (code 1305). The most likely cause of the explosi... see Appendix Full Report A / type of accident

### **2 Dangerous Substances**

**remarks:** The total establishment and the potential directly involved inventories of phthalic anhydride refer to the amount involved in the accident.

### **3 Source of Accident**

**illustration:** - not applicable -

**remarks:** The accident occurred in an organic chemical industry (code 2001) during the addition (code 3101) of phthalic anhydride dust to a varnish kettle (code 4001) containing a mixture of soya-bean, glycerol and caustic soda at 200°C. From the Ori... 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** 5109 operation: electrostatic accumulation

- not applicable -

- not applicable -

- not applicable -

- not applicable -

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

- not applicable -

- not applicable -

- not applicable -

- not applicable -

**remarks:** Investigations carried out after the accident showed that the steel charging chute was not

bonded to the reactor because of the presence of a non-conducting gasket in between them

(code 5308). The most likely cause of the explosion was the ... see Appendix Full Report A

/ causes of major occurrence

## 6 Discussion about the Occurrence

- not applicable -

**Type of Accident** country: FA ident key: 1985\_007\_01

**event:**

**major occurrence** 1305 explosion: dust explosion

**initiating event** 1305 explosion: dust explosion

**associated event** - not applicable -

## Dangerous substances

country: FA ident key: 1985\_007\_01

### a) total establishment inventory

**CAS number:** 88-44-9 **identity:** Phthalic Anhydride

**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):** 0,11

**use of substance as:** STARTING MATERIAL

**b) substance belongs to relevant inventory directly involved:** Yes

**actual quantity:** 0,11 **potential quantity:** 0,11

**c) substance belongs to relevant inventory indirectly involved:** No

**actual quantity:** -1 **indir\_pot\_quant:** -1

**Source of Accident - Situation** country: FA ident key: 1985\_007\_01

## **situation**

**industry**

**initiating event** 2001 general chemicals manufacture

**associated event** - not applicable -

**activity/unit**

**major occurrence** 3101 process: chemical batch reaction

**initiating event** 3101 process: chemical batch reaction

**associated event** - not applicable -

**component**

**major occurrence** 4001 reaction vessel; non-pressurised

**initiating event** 4001 reaction vessel; non-pressurised

**associated event** - not applicable -

## **B Consequences Full Report**

country: FA ident key: 1985\_007\_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** In the Original Report there is no evidence of significant effects outside the i... see Appendix

Full Report B / area concerned - remarks

### **2 People**

**establishment popul. emergency personnel off-site population**

**total at risk** 3

**immediate fatalities**

**subsequent fatalities**

**hospitalizing injuries** 1

**other serious injuries**

**health monitoring**

**remarks** The operator charging the phthalic anhydride was blown back by the overpressure ... 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... 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 Irish Pounds ECU Irish Pounds**

**material losses 1000**

**response, clean up, restoration**

**remarks** The charging chute was propelled upwards by the explosion and damaged the kettle... 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:** 1985\_007\_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 compan... see Appendix Full Report C / lesson learned - prevent

**measures to mitigate consequences:**

- not applicable -

**useful references:**

- not applicable -

### **5 Discussion about Response**

- not applicable -

## **Appendices for the FA / 1985\_007\_01 report**

### **Appendix Short Report / description of accident types:**

During the addition of phthalic anhydride to a varnish kettle which contained a mixture of soya-bean oil, glycerol and caustic soda at 200°C, an explosion occurred at the charging hatch. The operator was blown back by the overpressure and broke his arm as he fell to the ground. Two other operators standing nearby were not injured. The charging chute was also propelled upwards and damaged the kettle's agitator motor. The contents of the vessel was unaffected. The bursting disc in the kettle's pressure relief line did not rupture.

### **Appendix Short Report / description of substances involved:**

- Phthalic anhydride (C.A.S. CODE: 85-44-9): amount involved = 110 kg.

### **Appendix Short Report / description of suspected causes:**

CAUSES:

Investigations carried out after the accident showed that the steel charging chute was not bonded to the reactor because of the presence of a non-conducting gasket in between them. The most likely cause of the explosion was the ignition of phthalic anhydride dust by a static discharge from the unbonded chute. The bursting disc in the kettle pressure relief line did not rupture. The underlying causes were a lack of safety culture together with a design plant inadequate.

### **Appendix Short Report / description of immediate effects:**

EFFECTS ON PEOPLE:

1 person was injured by the explosion (he was blown back by the overpressure and broke his arm as he fell to the ground). Two other operators standing nearby were not injured.

MATERIAL LOSS:

The charging chute was propelled upwards by the explosion and damaged the kettle's agitator motor. The cost of the damaged motor has been evaluated in about 1,000 Irish Pounds (about 0.0013 MECU).

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

No emergency measures were necessary, neither on-site nor off-site.

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

MEASURES TO PREVENT ANY RECURRENCE OF SIMILAR ACCIDENTS:

After the accident, the company was required to check that all the equipment used to transfer phthalic anhydride powder was bonded to earth and to amend the operating procedures to ensure that the risks associated with phthalic anhydride were highlighted.

**Appendix Full Report A / type of accident:**

During the addition of phthalic anhydride dust to a varnish kettle which contained a mixture of soya-bean oil, glycerol and caustic soda at 200°C, an explosion occurred at the charging hatch (code 1305). The most likely cause of the explosion was the ignition of the phthalic anhydride dust by a static discharge from the unbonded chute.

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

The accident occurred in an organic chemical industry (code 2001) during the addition (code 3101) of phthalic anhydride dust to a varnish kettle (code 4001) containing a mixture of soya-bean, glycerol and caustic soda at 200°C. From the Original Report is not fully clear if the batch reactor was pressurized or not.

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

Investigations carried out after the accident showed that the steel charging chute was not bonded to the reactor because of the presence of a non-conducting gasket in between them (code 5308). The most likely cause of the explosion was the ignition of the phthalic anhydride dust by a static discharge from the unbonded chute (code 5109).

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

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

**Appendix Full Report B / people:**

The operator charging the phthalic anhydride was blown back by the overpressure and broke his arm as he fell to the ground. Two other operators standing nearby were not injured.

**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 charging chute was propelled upwards by the explosion and damaged the kettle's agitator motor. The cost of this damaged motor has been evaluated in about 1,000 Irish Pounds (about 0.0013 MECU).

**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 company was required to check that all the equipment used to transfer phthalic anhydride powder was bonded to earth and to amend the operating procedures to ensure that the risks associated with phthalic anhydride were highlighted.