Explosion på en fabrik för produktion av faramaceutika.

850212 MARS 1985_05

En explosion inträffade vid fyllning av en satsvis reaktor. Arbetsmomentet bestod i att fylla pulver i en tank med aceton och metanol. En utredning visade att lösningsmedelsångor antänts vilket resulterat i en dammexplosion. Den mest sannolika orsaken ansågs vara en elektrostatisk urladdning vid hantering av pulversäckarna, gjorda av polyetylen. De två operatörer som befann sig närmast manluckan på tanken kastades tillbaka av explosionen och täcktes av ett lager vått pulver. Även två andra operatörer något längre bort kastades tillbaka av explosionen ocgh täcktes av pulver.

Inblandade ämnen och mängder

	CAS Nr.	Mängd
aceton	67-64-1	10 kg
metanol	67-56-1	10 kg
penicillin pulver	1406-05-9	30 kg

Skador:

Människor:	4 operatörer kastades tillbaka av explosionen och täcktes av ett lager vått pulver. Alla 4 sköljdes under nödduschar men fick ytliga kemiska brännskador på på händer och i ansikte och fick tillbringa natten på sjukhus.
Materiella:	Skador på anläggningen.
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_005_01

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

Date of Major Occurrence: Time of Major Occurrence

start: 1985-02-12 **start:**

finish: finish:

Establishment:

name:

address:

industry: 2004 pesticides, pharmaceuticals, other fine chemicals

Pharmaceutical

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_005_01

Accident Types:

release: Yes **explosion:** Yes

water contamination: No **other:** No

fire: No

description:

ACCIDENT CASE HISTORY DESCRIPTION:... see Appendix Short Report / description of accident types

Substance(s) Directly Involved:

toxic: No **explosive:** Yes

ecotoxic: No **other:** No

flammable: Yes

description:

- Acetone (C.A.S. CODE: 67-64-1, E.E.C. CODE: 606-001-02-8): amount involved = 10 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 a pharmaceutical industry during the charging of a reactor, containing a mixture of acetone and methanol, with a penicillin material.

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: Yes **decontamination:** No

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: 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_005_01

1 Type of Accident

remarks: While two operators were charging fibre drums of a penicillin material into a reactor containing a mixture of acetone and methanol, an explosion occurred at the reactor man-hole. The accident was caused by the ignition of solvent vapours, w... see Appendix Full Report A / type of accident

2 Dangerous Substances

remarks: The total establishment inventory and the potential inventory directly involved refer to the amounts of the substances involved in the accident.

3 Source of Accident

illustration: - not applicable -

remarks: The accident occurred in a pharmaceutical industry (code 2004) during the charging (code 3101) of a penicillin material into a reactor containing a mixture of acetone and methanol (code 4001). The penicillin material was

contained in polyet... 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 5302 organization: management attitude problem

5307 organization: process analysis (inadequate, incorrect)

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

inappropriate)

- not applicable -

- not applicable -

remarks: The accident was caused by the ignition of the solvent vapours which resulted in a dust

explosion of the dry powder. The most probable cause of the ignition was an electrostatic

discharge from the polyethylene bags during the reactor chargi... see Appendix Full Report

A / causes of major occurrence

6 Discussion about the Occurrence

- not applicable -

Type of Accident **country:** FA **ident key:** 1985_005_01

event:

major occurrence 1305 explosion: dust explosion

initiating event - not applicable -

associated event - not applicable -

event:

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

initiating event 1305 explosion: dust explosion

associated event - not applicable -

Dangerous substances

country: FA **ident key:** 1985_005_01

a) total establishment inventory

CAS number: 1406-05-9 **identity:** Penicillin Powder

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): 0,03

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 0,03 **potential quantity:** 0,03

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 **indir_pot_quant:** -1

a) total establishment inventory

CAS number: 67-56-1 **identity:** Methanol

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): 0,01

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 0,01 **potential quantity:** 0,01

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 **indir_pot_quant:** -1

a) total establishment inventory

CAS number: 67-64-1 **identity:** Acetone

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): 0,01

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 0,01 **potential quantity:** 0,01

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_005_01

situation

industry

inititating event 2004 pesticides, pharmaceuticals, other fine chemicals

associated event - not applicable -

activity/unit

major occurrence 3101 process: chemical batch reaction

inititating event 3101 process: chemical batch reaction

associated event - not applicable -

component

major occurrence 4001 reaction vessel; non-pressurised

inititating event 4001 reaction vessel; non-pressurised

associated event - not applicable -

B Consequences Full Report

country: FA **ident key:** 1985_005_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 effects outside the installation.... see Appendix

Full Report B / area concerned - remarks

2 People

establishment popul. emergency personnel off-site population

total at risk 4

immediate fatalities

subsequent fatalities

hospitalizing injuries 4

other serious injuries

health monitoring

remarks 4 operators were blown back by the explosion and were covered with a wet burnt p... 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 Irish Pounds ECU Irish Pounds

material losses 50000

response, clean up, restoration

remarks The total cost of the material losses has been evaluated in about 50,000 Irish P... 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 effects outside the installation.... see Appendix

7 Discussion of Consequences

C Response Full Report

country: FA **ident key:** 1985_005_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_005_01 report

Appendix Short Report / description of accident types:

ACCIDENT CASE HISTORY DESCRIPTION:

While two operators were charging fibre drums of a penicillin material into a reactor containing a mixture of acetone and methanol, an explosion occurred at the reactor man-hole. The two operators were blown back by the force of the explosion. They were covered with a wet burnt powder. Two other operators, who were opening the drums 2 metres away, were also blown back and covered with wet powder. Subsequently, all four operators were drenched under emergency showers. They suffered superficial burns to the hands and face and spent one night in a local hospital. They suffered no side-effects.

Appendix Short Report / description of substances involved:

- Acetone (C.A.S. CODE: 67-64-1, E.E.C. CODE: 606-001-02-8): amount involved = 10 kg.

- Methanol (C.A.S. CODE: 67-56-1, E.E.C. CODE: 603-001-00-X): amount involved = 10 kg.

- Penicillin powder (C.A.S. CODE: 1406-05-9): amount involved = 30 kg.

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Appendix Short Report / description of suspected causes:

CAUSES:

Investigations showed that the incident was initiated by the ignition of solvent vapours, which resulted in a dust explosion of the dry powder. The solvent mixture in the reactor did not ignite. Tests carried out on the polyethylene liners inside the fibre drums showed they were earthed to the reactor at the time of the explosion but they were of the non-conducting type. The most probable cause of the ignition was an electrostatic discharge from the polyethylene bags during the reactor charging. The underlying causes were inadequate process analysis and design plant, together with a lack of safety culture, that allowed to operate with the risk of a dust explosion.

Appendix Short Report / description of immediate effects:

EFFECTS ON PEOPLE:

4 people were injured by the explosion. All were covered with a wet burnt powder and were drenched under emergency showers. They suffered superficial burns to the hands and face and spent one night in a local hospital. They suffered no side-effects.

MATERIAL LOSS:

The total cost of the material losses has been evaluated in about 50,000 Irish Pounds (about 0.0064 MECU). The extents of the material losses were: both front and side pressure relief windows in the process area blown out; one roof vent just above the reactor slightly lifted; the flexible extractor hose above the reactor burnt.

Appendix Short Report / description of emergency measures taken:

INTERNAL TO THE ESTABLISHMENT:

Company personnel put out the fire with fire extinguishers.

EXTERNAL TO THE ESTABLISHMENT:

No off-site emergency measures were necessary. The local fire brigade with 10 firemen arrived on-site within minutes after the explosion but no intervention was required since the fire was already put out by the company personnel using fire extinguishers.

Appendix Short Report / description of immediate lessons learned:

MEASURES TO PREVENT ANY RECURRENCE OF SIMILAR ACCIDENTS:

After the accident, the company was requested to:

1- use nitrogen inerting when pouring dry powders into flammable solvents;

2- where possible, use properly earthed metal scoops instead of polyethylene bags to transfer dry powders;

3- use conductive polyethylene bags only;

4- avoid pouring dry powders into flammable solvents;

5- carry out an electrostatic review on the whole plant and all the processes.

Appendix Full Report A / type of accident:

While two operators were charging fibre drums of a penicillin material into a reactor containing a mixture of acetone and methanol, an explosion occurred at the reactor man-hole. The accident was caused by the ignition of solvent vapours, which resulted in a dust explosion of the dry powder (code 1305). The operators were covered with a wet burnt powder (code 1101).

Appendix Full Report A / source of accident - remarks:

The accident occurred in a pharmaceutical industry (code 2004) during the charging (code 3101) of a penicillin material into a reactor containing a mixture of acetone and methanol (code 4001). The penicillin material was contained in polyethylene bags (code 4003). From the Original Report is not fully clear if the batch reactor was pressurized or not.

Appendix Full Report A / causes of major occurrence:

The accident was caused by the ignition of the solvent vapours which resulted in a dust explosion of the dry powder. The most probable cause of the ignition was an electrostatic discharge from the polyethylene bags during the reactor charging (code 5109). The underlying causes were inadequate process analysis and plant design (codes 5307 and 5308), together with a lack of safety culture (code 5302), which allowed to operate with the risk of a dust explosion.

Appendix Full Report B / area concerned - remarks:

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

Appendix Full Report B / people:

4 operators were blown back by the explosion and were covered with a wet burnt powder. All were drenched under emergency showers. They suffered superficial burns to the hands and face and spent one night in a local hospital. They suffered no-side effects.

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 total cost of the material losses has been evaluated in about 50,000 Irish Pounds (about 0.0064 MECU). The extent of the material losses was: both front and side pressure relief windows in the process area blown out; one roof vent just above the reactor slightly lifted; the flexible extractor hose above the reactor burnt.

Appendix Full Report B / disruption of community life:

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

Appendix Full Report C / lesson learned - prevent:

After the accident, the company was requested to:

1- use nitrogen inerting when pouring dry powders into flammable solvents;

2- where possible, use properly earthed metal scoops instead of polyethylene bags to transfer dry powders;

3- use conductive polyethylene bags only;

4- avoid pouring dry powders into flammable solvents;

5- carry out an electrostatic review on the whole plant and all the processes.