

Explosion på en fabrik för farmaceutika till följd av ett operatörsfel som ledde till en skenande reaktion.

860404 MARS 1800_21

En omkastning av tillsatsordningen för svavelsyra och salpetersyra under en nitreringsfas av tioanisol ledde till bildning av metylnitrat, vilket isin tur ledde till en oväntad skenande reaktion. Det var sannolikt denna skenande reaktion som orsakade explosionen. Explosionen förstörde syntesanläggningen fullständigt och slungade iväg brottstycken en avsevärd bit: fönster krossades 700 m bort. Räddningstjänsten ingrep snabbt. Olyckan inträffade under rutinmässiga betingelser under syntes av 3-metyltioanilin. Den omedelbara orsaken var ett operatörsfel. De lokala myndigheterna stoppade produktionen till dess att olyckan blivit utredd.

Inblandade ämnen och mängder

	CAS Nr.	Mängd
ämne		

Skador:

Människor: En av de sex personer som befann sig i fabriksbyggnaden skadades vid explosionen.

Materiella: Syntesanläggningen totalförstördes. Inga uppgifter om kostnader anges.

Miljö/ekologi: Inga rapporterade.

Infrastruktur: Inga.

Erfarenheter redovisade (Ja/Nej): Nej

Report Profile

Identification of Report:

country: FA ident key: 1800_021_01

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

Date of Major Occurrence: Time of Major Occurrence

start: 04/04/1986 start: 17:00:00

finish: finish:

Establishment:

name:

address:

industry: 2004 pesticides, pharmaceuticals, other fine chemicals

Pharmaceutical (Synthesis of 3-Methylthioaniline)

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_021_01**Accident Types:****release:** No **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:** Yes **explosive:** Yes**ecotoxic:** No **other:** No**flammable:** No**description:**

- Nitric Acid (C.A.S. CODE: 7697-37-2); 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 during normal operation in the reaction section of a pharmaceutical industry for the

synthesis of 3-methylthioaniline during the nitration phase of thioanisole to thionium (an intermediate

product in the synthesis of 3... see Appendix Short Report / description of immediate sources

Suspected Causes:**plant or equipment:** Yes **environmental:** No**human:** Yes **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: 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_021_01

1 Type of Accident

remarks: An accidental inversion of the order of introducing the sulphuric acid and

nitric acid during the nitration phase of thioanisole to thionium caused the

formation of methyl nitrate which, in turn, initiated an unexpected runaway

reaction lea... see Appendix Full Report A / type of accident

2 Dangerous Substances

remarks: No data are available about the amount of nitric acid and sulphuric acid

involved in the accident.

3 Source of Accident

illustration: - not applicable -

remarks: The accident occurred during normal operation in the reaction section of a

pharmaceutical industry (code 2004) for the synthesis of 3-methylthioaniline

during the nitration phase of thioanisole to thionium which was an

intermediate product ... 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 5106 operation: runaway reaction

- not applicable -

- not applicable -

- not applicable -

- not applicable -

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

5304 organization: training/instruction (none, inadequate, inappropriate)

5307 organization: process analysis (inadequate, incorrect)

5401 person: operator error

- not applicable -

remarks: An accidental inversion (due to a human error [codes 5401, 5303 and 5304]) of the order of

introducing the sulphuric acid and nitric acid during the nitration phase of thioanisole

to thionium caused the formation of methyl nitrate which, in... see Appendix Full Report A

/ causes of major occurrence

6 Discussion about the Occurrence

- not applicable -

Type of Accident country: FA ident key: 1800_021_01

event:

major occurrence 1304 explosion: runaway reaction explosion (usually exothermic)

initiating event 1304 explosion: runaway reaction explosion (usually exothermic)

associated event - not applicable -

Dangerous substances

country: FA ident key: 1800_021_01

a) total establishment inventory

CAS number: 7664-93-9 **identity:** Sulphuric 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): -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

a) total establishment inventory

CAS number: 7697-37-2 **identity:** Nitric 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): -1

use of substance as: STARTING MATERIAL

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_021_01

situation

industry

initiating event 2004 pesticides, pharmaceuticals, other fine chemicals

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 4009 heat exchanger (boiler, refrigerator, heating coils, etc.)

initiating event 4001 reaction vessel; non-pressurised

associated event - not applicable -

B Consequences Full Report

country: FA ident key: 1800_021_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 synthesis unit was completely destroyed and many fragments were projected at... see Appendix

Full Report B / area concerned - remarks

2 People

establishment popul. emergency personnel off-site population

total at risk 6

immediate fatalities

subsequent fatalities

hospitalizing injuries 1

other serious injuries

health monitoring

remarks Only 1 people out of the 6 that were in the plant or in its proximity when the a... 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 ECU

material losses

response, clean up, restoration

remarks The synthesis unit was completely destroyed and many fragments were projected at... 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 No No

- political interest No No No

remarks Window panes were broken up to 700 metres from the explosion point.... see Appendix Full Report B

7 Discussion of Consequences

C Response Full Report

country: FA ident key: 1800_021_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, on June 22... 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 / 1800_021_01 report

Appendix Short Report / description of accident types:

ACCIDENT CASE HISTORY DESCRIPTION:

An accidental inversion of the order of introducing the sulphuric acid and nitric acid during the nitration phase of thioanisole to thionium caused the formation of methyl nitrate which, in turn, initiated an unexpected runaway reaction leading presumably to the explosion in the condenser associated with the reactor.

Appendix Short Report / description of substances involved:

- Nitric Acid (C.A.S. CODE: 7697-37-2): amount involved = not known.
- Sulphuric Acid (C.A.S. CODE: 7664-93-9): amount involved = not known.

Appendix Short Report / description of immediate sources:

The accident occurred during normal operation in the reaction section of a pharmaceutical industry for the synthesis of 3-methylthioaniline during the nitration phase of thioanisole to thionium (an intermediate product in the synthesis of 3-methylthioaniline). The component involved by the explosion was the condenser associated with the reactor where the runaway reaction initiated.

Appendix Short Report / description of suspected causes:

CAUSES:

An accidental inversion (due to a human error) of the order of introducing the sulphuric acid and nitric acid during the nitration phase of thioanisole to thionium caused the formation of methyl nitrate which, in turn, initiated an unexpected runaway reaction leading presumably to the explosion in the condenser associated with the reactor.

Appendix Short Report / description of immediate effects:

EFFECTS ON PEOPLE:

Only 1 people out of the 6 that were in the plant or in its proximity when the accident occurred was injured by the explosion.

MATERIAL LOSS:

The synthesis unit was completely destroyed and many fragments were projected at significant distances by the explosion. Outside the establishment, window panes were broken up to 700 metres from the explosion point. No data are available about the cost of the damages.

Appendix Short Report / description of emergency measures taken:

INTERNAL TO THE ESTABLISHMENT:

The alarm was sounded and the injured people were evacuated. The Les-Sapeurs fire brigade quickly intervened.

EXTERNAL TO THE ESTABLISHMENT:

The Authorities (Police, Les-Sapeurs fire brigade, S.A.M.U. and Civil Protection) were alerted. The Les-Sapeurs fire brigade quickly intervened.

Appendix Short Report / description of immediate lessons learned:

MEASURES TO PREVENT ANY RECURRENCE OF SIMILAR ACCIDENTS:

After the accident, on June 22, 1986 the Prefect ordered the suspension of productions until a decision should be taken about a new authorization to operate and asked company to improve the procedures related to installation surveillance, storage and manipulation of dangerous substances.

When the Original Report was prepared, a judicial investigation was already in course.

Appendix Full Report A / type of accident:

An accidental inversion of the order of introducing the sulphuric acid and nitric acid during the nitration phase of thioanisole to thionium caused the formation of methyl nitrate which, in turn, initiated an unexpected runaway reaction leading presumably to the explosion in the condenser associated with the reactor (code 1304).

Appendix Full Report A / source of accident - remarks:

The accident occurred during normal operation in the reaction section of a pharmaceutical industry (code 2004) for the synthesis of 3-methylthioaniline during the nitration phase of thioanisole to thionium which was an intermediate product in the synthesis of 3-methylthioaniline (code 3101). The component involved by the explosion was the condenser (code 4009) associated with the reactor where the runaway reaction initiated (code 4001).

Appendix Full Report A / causes of major occurrence:

An accidental inversion (due to a human error [codes 5401, 5303 and 5304]) of the order of introducing the sulphuric acid and nitric acid during the nitration phase of thioanisole to thionium caused the formation of methyl nitrate which, in turn, initiated an unexpected runaway reaction (codes 5106 and 5307) leading presumably to the explosion in the condenser associated with the reactor.

Appendix Full Report B / area concerned - remarks:

The synthesis unit was completely destroyed and many fragments were projected at significant distances by the explosion. Outside the establishment, window panes were broken up to 700 metres from the explosion point.

Appendix Full Report B / people:

Only 1 people out of the 6 that were in the plant or in its proximity when the accident occurred was injured by the explosion.

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 synthesis unit was completely destroyed and many fragments were projected at significant distances by the explosion. Outside the establishment, window panes were broken up to 700 metres from the explosion point. No data are available about the cost fo the damages.

Appendix Full Report B / disruption of community life:

Window panes were broken up to 700 metres from the explosion point.

Appendix Full Report C / lesson learned - prevent:

After the accident, on June 22, 1986 the Prefect ordered the suspension of productions until a decision should be taken about a new authorization to operate and asked company to improve the procedures related to installation surveillance, storage and manipulation of dangerous substances.