

Kväveoxidutsläpp från en fabrik för produktion av gödningsmedel.

861026 MARS 1986_12

Olyckan inträffade under rutinmässig drift en fabrik för produktion av gödningsmedel baserade på ammonium nitrat. En snabb värmeutvecklande nedbrytningsreaktion inträffade i gödningsämnen som torkades vid hög temperatur. Nedbrytningsreaktionen ledde till utveckling och spridning av kväveoxider. Förmodligen utvecklades även klorgas. Personalen utrymdes och kylning sattes in. Allmänheten varnades.

Inblandade ämnen och mängder

	CAS Nr.	Mängd
gödningsämnen		5 ton
kväveoxider:		2500 kg
N2O	10024-97-2	
NO	10102-43-9	
NO2	10102-44-0	
klor	7782-50-5	okänt

Skador:

Människor:	En person omkom och 6 skadades av giftgasutsläppet på fabriksområdet. Utanför anläggningen skadades 12 personer av giftgaserna. Ungefär 100 000 människor berördes av olyckan.
Materiella:	Skadorna begränsades till anläggningen.
Miljö/ekologi:	Inga effekter rapporterade.
Infrastruktur:	Den lokala katastrofplanen aktiverades och människor upp till 4 km från anläggningen varnades.

Erfarenheter redovisade (Ja/Nej): Ja

Mycket kortfattat anges förebyggande åtgärder.

Report Profile

Identification of Report:

country: FA ident key: 1986_012_01

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

Date of Major Occurrence: Time of Major Occurrence

start: 1986-10-26 start: 09:00:00

finish: finish:

Establishment:

name:

address:

industry: 2001 general chemicals manufacture

General Chemical (Production of Fertilizers based on Ammonium Nitrate)

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: 1986_012_01

Accident Types:

release: Yes explosion: No

water contamination: No other: No

fire: Yes

description:

ENVIRONMENT AND ATMOSPHERICAL CONDITIONS:... see Appendix Short Report / description of accident types

Substance(s) Directly Involved:

toxic: Yes explosive: No

ecotoxic: No other: No

flammable: Yes

description:

- Fertilizers (including NPK and blended fertilisers containing super-phosphate and ammonium nitrate): amount

involved = 5,000 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 during normal operation in a drying unit of an organic chemical industry manufacturing

ammonium nitrate based fertilizers. The component involved was a rotary dryer used to dry the fertilizers

products. Fertilizers wer... see Appendix Short Report / description of immediate sources

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: Yes

human injuries: Yes **community disruption:** Yes

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: Yes **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: Yes

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:** 1986_012_01

1 Type of Accident

remarks: A rapid exothermic reaction of fertilizers occurred within a dryer giving rise to a rapid decomposition of the bulk of the material (code 1201). The decomposition of the fertilizers resulted in the evolution and dispersion of toxic fumes of... see Appendix Full Report A / type of accident

2 Dangerous Substances

remarks: The substances involved in the accident were NPK-fertilizers and blended fertilizers containing single and triple super-phosphates and ammonium nitrate. The amount of nitrogen oxides developed during the fire has been estimated to be half... see Appendix Full Report A / dangerous substances

3 Source of Accident

illustration: - not applicable -

remarks: The accident occurred during normal operation in a drying unit (code 3104) of fertilizers in an organic chemical industry (code 2001) manufacturing ammonium nitrate based fertilizers. The component involved was a rotary dryer used to dry th... see Appendix Full Report A / source of accident - remarks

4 Meteorological Conditions

precipitation none: fog: rain: hail: snow:

Yes No No No No

wind speed (m/s):

direction (from): WNW

stability (Pasquill):

ambient temperature (°C):

remarks: Fine weather with a moderate West-North-West wind.

5 Causes of Major Occurrence

main causes

technical / physical 5107 operation: unexpected reaction/phase-transition

- not applicable -

- not applicable -

- not applicable -

- not applicable -

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

5307 organization: process analysis (inadequate, incorrect)

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

- not applicable -

- not applicable -

remarks: The combination of blended fertilizers (containing single and triple super-phosphates) with a mixture of NPK fertilizers gave rise to a combined fertilizer which had the property of self-sustained decomposition. This is thought to be due to... see Appendix Full Report A / causes of major occurrence

6 Discussion about the Occurrence

- not applicable -

Type of Accident country: FA ident key: 1986_012_01

event:

major occurrence 1401 other: combustion products into air

initiating event 1201 fire: conflagration (a general engulfment fire)

associated event - not applicable -

Dangerous substances

country: FA ident key: 1986_012_01

a) total establishment inventory

CAS number: 10024-97-2 identity: Nitrogen Oxide

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): 2,5

use of substance as: ABNORMAL PRODUCT

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 2,5 potential quantity: 2,5

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: 10102-43-9 identity: Nitrogen Monoxide

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): 2,5

use of substance as: ABNORMAL PRODUCT

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 2,5 potential quantity: 2,5

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: 10102-44-0 identity: Nitrogen Dioxide

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): 2,5

use of substance as: ABNORMAL PRODUCT

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 2,5 potential quantity: 2,5

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: identity: Fertilizers

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): 5

use of substance as: NORMAL FINISHED PRODUCT

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 5 potential quantity: 5

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: 7782-50-5 identity: Chlorine

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

Source of Accident - Situation country: FA ident key: 1986_012_01

situation

industry

initiating event 2001 general chemicals manufacture

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 4007 machinery/equipment (pump, filter, column separator, mixer, etc.)

initiating event 4007 machinery/equipment (pump, filter, column separator, mixer, etc.)

associated event - not applicable -

B Consequences Full Report

country: FA **ident key:** 1986_012_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 On a map attached to the Original Report is shown the extent of the effects of t... see Appendix

Full Report B / area concerned - remarks

2 People

establishment popul. emergency personnel off-site population

total at risk 12 10000

immediate fatalities 1

subsequent fatalities

hospitalizing injuries 6 12

other serious injuries

health monitoring

remarks Inside the establishment 1 person was killed and 6 injured by the toxic release ... 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

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 Damages to the ductwork associated with the fume extraction system and subsequen... see Appendix

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 The Major Incident Emergency Scheme was activated and warnings to local people w... see Appendix

7 Discussion of Consequences

C Response Full Report

country: FA ident key: 1986_012_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:

When the Original Report was p... see Appendix Full Report C / lesson learned - mitigate

useful references:

- not applicable -

5 Discussion about Response

- not applicable -

Appendices for the FA / 1986_012_01 report

Appendix Short Report / description of accident types:

ENVIRONMENT AND ATMOSPHERICAL CONDITIONS:

Fine weather with a moderate West-North-Wet wind.

A rapid exothermic reaction of fertilizers occurred within a dryer giving rise to a rapid decomposition of the bulk of the material. The decomposition of the fertilizers resulted in the evolution and dispersion of toxic fumes of nitrogen oxides and, probably, of chlorine.

There had been no previous incidents relating to bulk decomposition of fertilizers at this plant although there had been decomposition of small amounts of fertilizers resting on hot surfaces throughout the life of the plant (30 years).

Appendix Short Report / description of substances involved:

- Fertilizers (including NPK and blended fertilisers containing super-phosphate and ammonium nitrate): amount involved = 5,000 kg.

- Nitrogen Oxides (C.A.S. CODE: 10024-97-2 [N₂O], C.A.S. CODE: 10102-43-9 [NO], C.A.S. CODE: 10102-44-0 [NO₂]): amount involved = 2,500 kg (estimated to be half of the amount of fertilizers involved in the accident).

- Chlorine (C.A.S. CODE: 7782-50-5, E.E.C. CODE: 017-001-00-7): amount involved = not known.

Appendix Short Report / description of immediate sources:

The accident occurred during normal operation in a drying unit of an organic chemical industry manufacturing ammonium nitrate based fertilizers. The component involved was a rotary dryer used to dry the fertilizers products. Fertilizers were produced by re-working a mixture of fertilizer products as the sole burden in the plant. The production process resulted in converting these products from loose to granular form. The plant was in a large multi-floor building (approximately 50m x 50m), 30m high, containing two fertilizers production plants. Each plant included conveyor and elevator feed systems with raw materials hoppers and weighing systems. These systems were connected to a blunger or mixer and into a 30m x 5m diameter rotary dryer, thence by off-take conveyors and elevators to a finishing plant. The location of the factory is shown on a map attached to the Original Report.

Appendix Short Report / description of suspected causes:

CAUSES:

The production of a fertilizer with cigar-burning or self-sustaining decomposition

properties, combined with an overheating of the material as it was being re-cycled through the dryer and with the stopping of the dryer for examination, gave rise to a rapid decomposition of the bulk of the material, resulting in the evolution of toxic fumes.

The combination of blended fertilizers containing single and triple super-phosphates with a mixture of NPK fertilisers gave rise to a combined fertiliser which had the property of self-sustaining decomposition. This is thought to be due to the unexpected presence of a high contents of insoluble phosphates. Whilst passing through the dryer, the temperature of the product rose to about 130 °C causing a rapid exothermic reaction within the dryer with evolution of toxic fumes.

Appendix Short Report / description of immediate effects:

EFFECTS ON PEOPLE:

Inside the establishment 1 person was killed and 6 injured by the toxic release inside the establishment. Outside the establishment 12 people were injured by the toxic release. About 10,000 people outside the establishment were affected by the accident (this number has to be considered as indicative).

MATERIAL LOSS:

Damages to the ductwork associated with the fume extraction system and subsequent damages to the hydraulic lubrication system were caused by the fire. No data are available about the cost of the damages.

COMMUNITY DISRUPTION:

The Major Incident Emergency Scheme was activated and warnings to local people were given by local radio. The police warned residents at distances up to 4 km from the site.

MAP OF THE ACCIDENT AREA:

The extent of the effects is shown on a map attached to the Original Report.

Appendix Short Report / description of emergency measures taken:

INTERNAL TO THE ESTABLISHMENT:

The operator stopped the dryer when the temperature (detected by means of a temperature gauge) became so high that it created concern. Evacuation of site personnel. Application of cooling water by Cleveland Fire Brigade to halt the fertilizers decomposition within the dryer.

EXTERNAL TO THE ESTABLISHMENT:

The Major Incident Emergency Scheme was activated and warnings to local people were given by local radio. The police warned residents at distances up to 4 km from the site.

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- closely defined procedures for testing fertilizer products to ensure that they are not

"cigar burning";

2- installation of permanently installed water drench system in the dryer together with instrumentation to ensure that any decomposition could be identified and controlled.

MEASURES TO MITIGATE THE EFFECTS OF THE ACCIDENT:

When the Original Report was prepared considerations were being given to amendment of the emergency procedure.

Appendix Full Report A / type of accident:

A rapid exothermic reaction of fertilizers occurred within a dryer giving rise to a rapid decomposition of the bulk of the material (code 1201). The decomposition of the fertilizers resulted in the evolution and dispersion of toxic fumes of nitrogen oxides and, probably, of chlorine (code 1401).

Appendix Full Report A / dangerous substances:

The substances involved in the accident were NPK-fertilizers and blended fertilizers containing single and triple super-phosphates and ammonium nitrate. The amount of nitrogen oxides developed during the fire has been estimated to be half mass of fertilizers involved in the accident. No data are available about the amount of the chlorine released during the fire.

Appendix Full Report A / source of accident - remarks:

The accident occurred during normal operation in a drying unit (code 3104) of fertilizers in an organic chemical industry (code 2001) manufacturing ammonium nitrate based fertilizers. The component involved was a rotary dryer used to dry the fertilizers products (code 4007). The location of the factory is shown on a map attached to the Original Report.

Appendix Full Report A / causes of major occurrence:

The combination of blended fertilizers (containing single and triple super-phosphates) with a mixture of NPK fertilizers gave rise to a combined fertilizer which had the property of self-sustained decomposition. This is thought to be due to the unexpected presence of a high contents of insoluble phosphates (codes 5303, 5307 and 5308). Whilst passing through the dryer, the fertilizers decomposed with evolution of toxic fumes (code 5107).

Appendix Full Report B / area concerned - remarks:

On a map attached to the Original Report is shown the extent of the effects of the accident. No data are available about the toxic fumes concentrations.

Appendix Full Report B / people:

Inside the establishment 1 person was killed and 6 injured by the toxic release inside the establishment. Outside the establishment 12 people were injured by the toxic release. About 10,000 people outside the establishment were affected by the accident (this number has to be considered as indicative)

Appendix Full Report B / ecological harm:

In the Original Report there is no evidence of significant ecological harms.

Appendix Full Report B / material loss:

Damages to the ductwork associated with the fume extraction system and subsequent damages to the hydraulic lubrication system were caused by the fire. No data are available about the cost of the damages.

Appendix Full Report B / disruption of community life:

The Major Incident Emergency Scheme was activated and warnings to local people were given by local radio. The police warned residents at distances up to 4 km from the site.

Appendix Full Report C / lesson learned - prevent:

After the accident, the following measures were established:

1- closely defined procedures for testing fertilizer products to ensure that they are not

"cigar burning";

2- installation of permanently installed water drench system in the dryer together with instrumentation to ensure that any decomposition could be identified and controlled.

Appendix Full Report C / lesson learned - mitigate:

When the Original Report was prepared considerations were being given to amendment of the emergency procedure.