

Kväveoxidutsläpp från en fabrik för produktion av gödningsämnen.

960824

En spontan och oförutsedd nedbrytningsreaktion inträffade i ett reaktionskärl till följd av blandning av reaktanter från två olika satsvisa körningar. Temperaturen steg och kväveoxider bildades. Processen gick så snabbt att operatörerna inte hann sätta igång kylning. Kväveoxiderna släpptes ut i byggnaden. Fabrikens katastrofplan sattes i verket och fungerade tillfredsställande och effektivt. Tre anställda fick utrymmas. Fyra sändes till sjukhus för observation. Även samhällets katastrofplan aktiverades. Allmänheten varnades och uppmanades att stanna inne bakom stängda dörrar och fönster. Faran blåstes över efter 2 timmar.

Inblandade ämnen och mängder

	CAS Nr.	Mängd
kväveoxider		600 kg
NPK-gödningsämnen		

Skador:

Människor:	Fyra personer fördes till sjukhus för observation.
Materiella:	Inga skador.
Miljö/ekologi:	Inga effekter förväntade.
Infrastruktur:	Allmänheten varnades.

Erfarenheter redovisade (Ja/Nej): Ja

Rapport på danska

"Undersøgelsesrapport over uheldet på Kemira den 24. august 1996", Udarbejdet af Vejle Amt i samarbejde med COWI, Arbejdstilsynet, Fredericia Kommune, Brand & Redning. Daterad September 4 1996

Report Profile

Identification of Report:

country: FA ident key: 1800_171_01

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

Date of Major Occurrence: Time of Major Occurrence

start: 24/08/1996 start: 05:42:00

finish: 24/08/1996 finish: 11:00:00

Establishment:

name:

address:

industry: 2001 general chemicals manufacture

The company produces fertilisers containing NPK

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) The accident occurred before Seveso II That's why Establishment status is considered not applicable. At the moment the company is actually not covered by the Seveso I directive. At the moment the company is actually not covered by the Seveso... see Appendix Profile Text a

b) Authorities Reporting are: ... see Appendix Profile Text b

c) - not applicable -

d) - not applicable -

e) - not applicable -

Short Report

country: FA **ident key:** 1800_171_01

Accident Types:

release: Yes **explosion:** No

water contamination: No **other:** No

fire: No

description:

Release of NOx into the atmosphere inside the factory building and to the environment through a stack and other openings, doors, windows etc. of the process building. The release was a hazard to people inside the factory building, at the si... see Appendix Short Report / description of accident types

Substance(s) Directly Involved:

toxic: Yes **explosive:** No

ecotoxic: No **other:** Yes

flammable: No

description:

Release of NOx due to decomposition of NPK- fertilisers.

NOx is toxic and ammonium nitrate in the NPK is oxidising. The content of N (nitrogen) is app. 10 %.

Immediate Sources of Accident:

storage: No **transfer:** No

process: Yes **other:** No

description:

The decomposition took place in a spherodizer for crystallisation and drying, due to decomposition or runaway reactions.

Suspected Causes:

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

human: Yes **other:** No

description:

Due to a preceding production of a product containing copper, and subsequent production of a chloride containing product, these two products were mixed and formed a product with self sustaining decomposition properties (class B fertiliser),... 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:

There were only material losses.

Emergency Measures taken:

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

external services: Yes **restoration:** No

sheltering: Yes **other:** Yes

evacuation: No

description:

The on-site emergency plan was put into action. The on-site emergency plan was efficient and sufficient. The actions taken included evacuation of 3 employees. 4 operators were hospitalised for observation. The off-site emergency plan was al... see Appendix Short Report / description of emergency measures taken

Immediate Lessons Learned:

prevention: Yes **other:** No

mitigation: No

description:

The Authorities and the Company agreed to: ... see Appendix Short Report / description of immediate lessons learned

A Occurrence Full Report

country: FA **ident key:** 1800_171_01

1 Type of Accident

remarks: The major occurrence (1101) release of gas to the atmosphere was caused by the initiating event (1306) decomposition of NPK-fertiliser to NOx. The decomposition was only possible because of mixing two products, one containing copper and the... see Appendix Full Report A / type of accident

2 Dangerous Substances

remarks: Inventory: 0 tonnes of ammoniumnitrat of 28 % N. Due to a preceding production of a product containing copper, the spherodizer received a

chloride copper containing product with self sustaining decomposition properties (class B fertiliser).... see Appendix Full Report A / dangerous substances

3 Source of Accident

illustration: The site is located in the harbour area south of the city close to the centre. The affected part of the city is residential area with shopping centres, office blocks and a school for children. A map of the area is attached.

remarks: 2001 The company produces ammonium nitrate containing NPK fertiliser normally without self sustaining decomposition properties at a plant, which mainly were established in the late sixties. Ammonium nitrate is produced in separate reactors,... 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): 3

direction (from): S

stability (Pasquill): E

ambient temperature (°C): 20

remarks: None

5 Causes of Major Occurrence

main causes

technical / physical 5105 operation: instrument/control/monitoring-device failure

5106 operation: runaway reaction

5107 operation: unexpected reaction/phase-transition

5108 operation: blockage

5999 other: other

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

5307 organization: process analysis (inadequate, incorrect)

5309 organization: user-unfriendliness (apparatus, system, etc.)

- not applicable -

- not applicable -

remarks: Due to preceding production of a product containing copper, and subsequent production of a chloride containing product, these two products were mixed and formed a product with self sustaining decomposition properties (class B fertiliser), w... see Appendix Full Report A / causes of major occurrence

6 Discussion about the Occurrence

- not applicable -

Type of Accident country: FA ident key: 1800_171_01

event:

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

initiating event 1306 explosion: explosive decomposition (of unstable material)

associated event 1401 other: combustion products into air

Dangerous substances

country: FA **ident key:** 1800_171_01

a) total establishment inventory

CAS number: identity: Nitrogen oxides

name from Seveso I Directive: Ammonium nitrate in form of fertilisers

name from Seveso II Directive: Ammonium nitrate fertilisers

category from Seveso II: oxidising

other hazards (1): - not applicable -

other hazards (2): - not applicable -

maximum quantity (tonnes): -1

use of substance as: possible abnormal product

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 6 **potential quantity:** 24

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: 0 **indir_pot_quant:** 0

Source of Accident - Situation **country:** FA **ident key:** 1800_171_01

situation

industry

initiating event 2001 general chemicals manufacture

associated event 2001 general chemicals manufacture

activity/unit

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

initiating event 3102 process: chemical continuous reaction

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

component

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

initiating event 4001 reaction vessel; non-pressurised

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

B Consequences Full Report

country: FA **ident key:** 1800_171_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 The installation was damaged

remarks The citizens were warned out to a distance of 2 kilometres in the wind direction... see Appendix

Full Report B / area concerned - remarks

2 People

establishment popul. emergency personnel off-site population

total at risk 4 0 0

immediate fatalities 0 0 0

subsequent fatalities 0 0 0

hospitalizing injuries 0 0 0

other serious injuries 0 0 0

health monitoring 4 0 0

remarks Nobody from the off-site population was injured. Firstly it was Saturday morning... see Appendix

Full Report B / people

3 Ecological Harm

pollution/contamination/damage of:

- residential area (covered by toxic cloud) Yes

- common wild flora/fauna (death or elimination) No

- rare or protected flora/fauna (death or elimination) No

- water catchment areas and supplies for consumption or recreation No

- land (with known potential for long term ecological harm or No

preventing human access or activities)

- marine or fresh water habitat No

- areas of high conservation value or given special protection No

remarks Expectation of ecological harm or damage should not be expected for that type of... 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 Non national Heritage loss.

5 Material Loss

establishment losses off site losses

costs (direct costs to operator) (social costs)

in ECU DKK ECU DKK

material losses 1700000 1.25E+09 0 0

response, clean up, restoration 0 0 0 0

remarks 10 - 15 000 000 DKR estimated cost to operator.

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 Yes 2 hours

- railways No

- waterways No

- air transport No

significant public concern none local level national level

- off site populations No Yes No

- media interest No Yes Yes

- political interest No Yes Yes

remarks Roads close to the site were closed by police.

7 Discussion of Consequences

Ecological Components involved

country: FA ident key: 1800_171_01

type: 6102 inland: urban development

threatened: Yes affected: No

C Response Full Report

country: FA ident key: 1800_171_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

a) Full cleaning of the facili... see Appendix Full Report C / lesson learned - prevent

measures to mitigate consequences:

No changes

useful references:

Rapport in Danish:... see Appendix Full Report C / lesson learned - references

5 Discussion about Response

- not applicable -

Appendices for the FA / 1800_171_01 report

Appendix Profile Text a:

The accident occurred before Seveso II That's why Establishment status is considered not applicable. At the moment the company is actually not covered by the Seveso I directive. At the moment the company is actually not covered by the Seveso I directive. Earlier the company had to notify due to a storage of liquefied anhydrous ammonia.

Appendix Profile Text b:

Authorities Reporting are:

Vejle Amtskommune, Teknik og Miljø, Att. Kirsten Jensen, Damhaven 12, DK-7100 Vejle

Fredericia Kommune, Brand & Redning, Att. Ib Bertelsen, Prangervej 7, DK-7000 Fredericia

Arbejdstilsynet Kredsvejle Amt, Att. Tove Albrechtsen, Hjulmagervej 8, DK-7100 Vejle

Arbejdstilsynet, Risikosekretariatet, Att. Hans Hagen, Holbækvej 106 B, DK-4000 Roskilde

Appendix Short Report / description of accident types:

Release of NOx into the atmosphere inside the factory building and to the environment through a stack and other openings, doors, windows etc. of the process building. The release was a hazard to people inside the factory building, at the site and in the environment. Warning to the public for 2 hours, ordering people to stay indoors.

Appendix Short Report / description of suspected causes:

Due to a preceding production of a product containing copper, and subsequent production of a chloride containing product, these two products were mixed and formed a product with self-sustaining decomposition properties (class B fertiliser), which the spherodizer received. Caused by blocking of the outlet of the spherodizer the temperature and the retention time in the spherodizer increased. As a consequence decomposition of the product was initiated. This process generated mainly nitrogen oxides which escaped to the building and through the stack.

The rate of decomposition/run away process was so fast, that the operators were not able to initiate water spraying of the spherodizer.

Appendix Short Report / description of emergency measures taken:

The on-site emergency plan was put into action. The on-site emergency plan was efficient and sufficient. The actions taken included evacuation of 3 employees. 4 operators were hospitalised for observation. The off-site emergency plan was also initiated, the actions taken included that neighbours were ordered to stay indoors and ordered to close doors and windows. The duration for these measures was two hours.

Appendix Short Report / description of immediate lessons learned:

The Authorities and the Company agreed to:

- Establish possibility of water spraying directly into the dryer, to stop possible future decomposition.
- The dryer should be subject to cleaning between manufacturing of different products.
- The company should perform a revised risk analysis.
- Suitability of the escape routes should be re-evaluated.

Appendix Full Report A / type of accident:

The major occurrence (1101) release of gas to the atmosphere was caused by the initiating event (1306) decomposition of NPK-fertiliser to NOx. The decomposition was only possible because of mixing two products, one containing copper and the other containing chloride, these formed together a product with self-sustaining decomposition properties. The temperature increase caused by the decomposition initiated minor secondary fires e.g. in electrical cables.

Appendix Full Report A / dangerous substances:

Inventory: 0 tonnes of ammoniumnitrat of 28 % N. Due to a preceding production of a product containing copper, the spherodizer received a chloride copper containing product with self-sustaining decomposition properties (class B fertiliser). After the process change the outlet of the spherodizer was blocked and caused the temperature and the retention time of the product in the spherodizer to increase. This led to decomposition of the product generating mainly nitrogen oxides (possible abnormal product) which escaped to the building and through the stack. The release is stipulated to 0,6 tonnes NOx.

Appendix Full Report A / source of accident - remarks:

2001 The company produces ammonium nitrate containing NPK fertiliser normally without self-sustaining decomposition properties at a plant, which mainly were established in the late sixties. Ammonium nitrate is produced in separate reactors, where the chemical reactions are taking place and the slurry from there is pumped to the spherodizers for drying and production of granulated fertilisers. The spherodizer is heated up by N-gas burners.

Appendix Full Report A / causes of major occurrence:

Due to preceding production of a product containing copper, and subsequent production of a chloride containing product, these two products were mixed and formed a product with self-sustaining decomposition properties (class B fertiliser), which the spherodizer received. Caused by blocking of the outlet of the spherodizer the temperature and the retention time in the spherodizer increased. As a consequence decomposition of the product was initiated. This process generated mainly nitrogen oxides which escaped to the building and through the stack. The rate of decomposition/run away process was so fast, that the operators were not able to initiate water spraying of the spherodizer. Code 5999 inadequate emergency water supply.

Appendix Full Report B / area concerned - remarks:

The citizens were warned out to a distance of 2 kilometres in the wind direction. No damage outside the factory building. No persons in the city were affected. The concentration of nitrogen oxides are not known.

Appendix Full Report B / people:

Nobody from the off-site population was injured. Firstly it was Saturday morning (weekend), secondly due to early warning, thirdly the concentration of nitrogen oxides was not high enough to cause harm as most of the gas was vented through the factory stack.

Appendix Full Report B / ecological harm:

Expectation of ecological harm or damage should not be expected for that type of accident because of dilution of the gasses escaping from the stack.

Water used for stopping decomposition was transported to the public water treatment plant.

Appendix Full Report C / lesson learned - prevent:

- a) Full cleaning of the facility after production of copper containing products.
- b) Improved control system and separation between control and safety systems.
- c) Systematic storage of process data.
- d) Improved working procedures and instructions.
- e) Automatic stop of N-gas heater in case of spherodizer stop.
- f) Reassessment of the internal emergency plan.
- g) Emergency water supply to all spherodizers.

Appendix Full Report C / lesson learned - references:

Rapport in Danish:

"Undersøgelsesrapport over uheldet på Kemira den 24. august 1996", Udarbejdet af Vejle Amt i samarbejde med COWI, Arbejdstilsynet, Fredericia Kommune, Brand & Redning. Dated September 4 1996