

Klorutsläpp till följd av ett strömavbrott på en fabrik för produktion av färgämnen.

911115 MARS 1991_26

Olyckan inträffade under rutinmässig drift. Till följd av att strömförsörjningen fallerade släpptes klor från produktionen ut i klorhanteringsystemet. Då anläggningens reservström också fallerade släpptes klorgas ut på marknivå. Klorgasen undgick detektorerna som var placerade på 3 m höjd. Klorgas är tyngre än luft. Det är dessutom tveksamt om detektorerna fungerade med tanke på strömproblemen. Man blev varse utsläppet via ett telefonsamtal från ett grannföretag. Utrymningen beskrivs som kaotisk. Klorgasen skingrades så småningom.

Inblandade ämnen och mängder

	CAS Nr.	Mängd
klor	7782-50-5	100-120 kg

Skador:

Människor:	32 människor utanför anläggningen fördes till sjukhus för kontroll.
Materiella:	Inga.
Miljö/ekologi:	Inga effekter rapporterade.
Infrastruktur:	Störningar i strömförsörjningsnätet orsakade olyckan.

Erfarenheter redovisade (Ja/Nej): Ja

Kortfattat anges förebyggande åtgärder.

Report Profile

Identification of Report:

country: FA ident key: 1991_026_01

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

Date of Major Occurrence: Time of Major Occurrence

start: 1991-11-15 start: 13:45:00

finish: finish:

Establishment:

name:

address:

industry: 2001 general chemicals manufacture

Surface Coating & Dyes (Titaniumdioxide production via KMCC-Chloride process)

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:** 1991_026_01

Accident Types:

release: Yes **explosion:** No

water contamination: No **other:** No

fire: No

description:

As a result of a failure of the public power supply there have been problems with telephoning. Possibly due to an overburdening of the telephone net companies have trouble reaching the Chemical Incident Number in the period just after the p... see Appendix Short Report / description of accident types

Substance(s) Directly Involved:

toxic: Yes **explosive:** No

ecotoxic: No **other:** No

flammable: No

description:

7782-50-5, CEE-nr: 017-001-00-7, Chlorine

Involved mass: 100-120 kg.

Immediate Sources of Accident:

storage: No **transfer:** No

process: Yes **other:** No

description:

The plant was operating under standard conditions.... see Appendix Short Report / description of immediate sources

Suspected Causes:

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

human: Yes **other:** No

description:

- Failure in public power supply... see Appendix Short Report / description of suspected causes

Immediate Effects:

material loss: No

human deaths: No

human injuries: Yes **community disruption:** No

other: No

ecological harm: No

national heritage loss: No

description:

Not significant damage

32 hospitalized people (by release) for medical check ups.

Emergency Measures taken:

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

external services: No **restoration:** No

sheltering: Yes **other:** No

evacuation: Yes

description:

Intervention of ambulance

police closed off cross

Immediate Lessons Learned:

prevention: Yes **other:** No

mitigation: No

description:

- The complete plant is reviewed and all possible measures have been taken to prevent any dangerous situations after a total power failure. In the initial development of the factory the chance of a double power failure was seen as al... see Appendix Short Report / description of immediate lessons learned

A Occurrence Full Report

country: FA **ident key:** 1991_026_01

1 Type of Accident

remarks: release of chlorine, involved mass 100-120 kg

2 Dangerous Substances

remarks: release of chlorine, 100-120 kg

3 Source of Accident

illustration: - not applicable -

remarks: The plant was operating under standard conditions.

4 Meteorological Conditions

precipitation none: fog: rain: hail: snow:

Yes No No No No

wind speed (m/s): 6

direction (from): 277 dgrs

stability (Pasquill):

ambient temperature (∞C):

remarks: - not applicable -

5 Causes of Major Occurrence

main causes

technical / physical 5205 environment: utilities failure (electricity, gas, water, steam air, etc.)

- not applicable -

- not applicable -

- not applicable -

- not applicable -

human / organizational - not applicable -

- not applicable -

- not applicable -

- not applicable -

- not applicable -

remarks: initiating event was failure in public power supply. Additional events were failure of emergency power supply of TDF Tiofine, system error in that the valve to the chimney is closed during a power failure, failure of the chlorine gas detect... see Appendix Full

Report A / causes of major occurrence

6 Discussion about the Occurrence

- not applicable -

Type of Accident country: FA ident key: 1991_026_01

event:

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

initiating event - not applicable -

associated event - not applicable -

Source of Accident - Situation country: FA ident key: 1991_026_01

situation

industry

initiating event 2001 general chemicals manufacture

associated event - not applicable -

activity/unit

major occurrence - not applicable -

initiating event - not applicable -

associated event - not applicable -

component

major occurrence - not applicable -

initiating event - not applicable -

associated event - not applicable -

B Consequences Full Report

country: FA ident key: 1991_026_01

1 Area concerned

affected

extent of effects installation: Yes

establishment: Yes

off-site; local: Yes

off-site; regional: not applicable

off-site; transboundary: not applicable

illustration of effects - not applicable -

remarks minor material damage within establishment, outside 32 people hospitalized/medic... see Appendix

Full Report B / area concerned - remarks

2 People

establishment popul. emergency personnel off-site population

total at risk

immediate fatalities 0 0 0

subsequent fatalities 0 0 0

hospitalizing injuries 0 0 32

other serious injuries 0 0 0

health monitoring 0 0 0

remarks - not applicable -

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 - not applicable -

4 National Heritage Loss

effects on:

- historical sites Suspected - historic monuments Suspected

- historic buildings Suspected - art treasures Suspected

remarks - not applicable -

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 inside establishment minor material losses.

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 No No

- **media interest** No No No

- **political interest** No No No

remarks - not applicable -

7 Discussion of Consequences

- not applicable -

C Response Full Report

country: FA **ident key:** 1991_026_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

- review of plant in order to ... 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 / 1991_026_01 report

Appendix Short Report / description of accident types:

As a result of a failure of the public power supply there have been problems with telephoning. Possibly due to an overburdening of the telephone net companies have trouble reaching the Chemical Incident Number in the period just after the power failure. No reports have come in at CIN (Chemical Incident Network Line) between 13.40 and 13.56 hour. Therefore, directly or indirectly due to the complete power failure the TDF/Tiofine company was not able to inform the public services at once (exact information about this problem can not be retrieved any more). It took about 8 minutes to inform the Police Alarm Centre via the CIN.

The chlorine went underneath the chlorine detection system which was located at the height of 3 meter. This may explain why the emission went unnoticed and why no gas alarm was given. Another factor of influence may have been that due to the power failure the system was not working anyway. Unfortunately it is not possible to retrieve the exact reason why the gas detection system did not function. As a result the company did not notice the emission at all. A telephone call from the neighbouring company learned them about the existing problem. As described earlier there was nothing left to do but examining the effects of the accident. The following evacuation process was very chaotic.

Appendix Short Report / description of immediate sources:

The plant was operating under standard conditions.

In oxidation unit 300 the following reaction occurs: $\text{TiCl}_4 + 0 \rightarrow \text{TiO}_2(\text{s}) + 2 \text{Cl}_2(\text{g})$. After the reaction the solid and the gas (a mixture of chlorine, nitrogen, hydrochloric acid and carbon dioxide) are separated. After treatment of the gas stream, the remaining gas ($\text{Cl}_2, \text{N}_2, \text{HCl}$ and CO_2) is returned to the reactors. The titanium dioxide is dispersed into water in the pre-treatment Sump TK 04. Oxidation takes place in three parallel systems (trains). When the above process fails, the gas is directed to the snake scrub system, a chlorine destruction unit. The gas is directed to this system via a vacuum, created by two ventilators.

A short power failure at the public power supply was followed by a power failure of the plant emergency power supply. This blocked the two ventilators mentioned above and prevented the working of the snake scrub system. As a result chlorine gas was released at ground level. On the nearby premises of waste-disposal company AVR 32 employees of a building company working on the building of a new chemical oven were injured by the chlorine cloud.

Appendix Short Report / description of suspected causes:

- Failure in public power supply
- Failure of emergency power supply of TDF Tiofine
- System error in that the valve to the chimney is closed during a power failure.
- Failure of the chlorine gas detection system through a power failure and/or a design error.
- Procedural error in that TDF personnel awaited the consequences of the incident too passively.
- In general, a relatively low safety policy at TDF/Tiofine.

Appendix Short Report / description of immediate lessons learned:

- The complete plant is reviewed and all possible measures have been taken to prevent any dangerous situations after a total power failure. In the initial development of the factory the chance of a double power failure was seen as almost zero.
- a check on all safety measures;
- the steam driven emergency generator is completed with a diesel;
- the gas detection system has been significantly improved through the installation of extra detection systems and a link with neighbouring company AVR;
- the alarm procedures have been significantly improved.

Appendix Full Report A / causes of major occurrence:

initiating event was failure in public power supply. Additional events were failure of emergency power supply of TDF Tiofine, system error in that the valve to the chimney is closed during a power failure, failure of the chlorine gas detection system through a power failure and/or a design error, procedural error in that TDF personnel awaited the consequences of the incident too passively, and, in general, a relatively low safety policy at TDF / Tiofine.

Appendix Full Report B / area concerned - remarks:

minor material damage within establishment, outside 32 people hospitalized/medical checks.

Appendix Full Report C / lesson learned - prevent:

- review of plant in order to prevent dangerous situations following a total loss of power
- check of all safety measures
- the steam driven emergency generator is completed with a diesel
- the gas detection system has been significantly improved through extra detection systems (redundancy) and a link with neighbouring company AVR
- the alarm procedures have significantly been improved