

## Accident Profile

### Title

Release of chlorine in a plant as consequence of the power failure at the public power supply

### Date/Time of Major Occurrence

**Start Date** 15-11-1991

**End Date** 15-11-1991

### Event Type

Major Accident

### Reported under

EU Seveso I Directive

### Seveso II Status

- not known / not applicable -

### Industrial Activity

General chemicals manufacture (not otherwise specified in the list)

### Reasons for Reporting

- ☐ Substances involved: greater than 5% of quantity in Column 3 of Annex I
- ☒ Injury to persons: >= 1 fatalities, >= 6 hospitalizing injuries, evacuation, shelter-in-place, utility disruption and damage to real estate
- ☐ Immediate damage to the environment (according to Annex VI)
- ☐ Damage to property: on-site >2M &euro;; off-site > 0.5M &euro;;
- ☐ Cross-border damage: transboundary accidents
- ☐ Interesting for lessons learned.

## Accident Report

### Accident 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 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 metres. 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.

### Accident involving

- ☐ Domino effects
- ☐ Natech events
- ☐ Transboundary effects
- ☐ Contractors

### Release

#### Major Occurrences

gas/vapour/mist/etc release to air

## Site and installation

### Site description

not given

### Installation/Unit description

The plant was operating under standard conditions. In oxidation unit 300 the following reaction occurs:  $\text{TiCl} + 0 \rightarrow \text{TiO(s)} + 2 \text{Cl (g)}$ . 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  $\text{CO}_2$ ) 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.

## Substances

### Substances Involved

Chlorine (C.A.S. No: 7782-50-5, CEE-nr: 017-001-00-7), amount involved: 100-120 kg (0.1-0.12 tonnes).

### Substances Classification

02. TOXIC

00. NAMED SUBSTANCE

### Substances detail

Substance	CAS Number	Quantities (t.)	
		Involved	Potential
Chlorine	7782-50-5	0.12000	

## 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.

### Organizational

Causative Factor	Type
management organization inadequate	

other	
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## Plant/Equipment

Causative Factor	Type
instrument/control/monitoring-device failure	inappropriate

## External

Causative Factor	Type
utilities failure (electricity, gas, water, steam air, etc.)	

## Consequences

Not significant damage 32 hospitalized people (by release) for medical check ups.

Affected Area: installation

Affected Area: establishment

Affected Area: off-site: local

## Human

On site	Quantity	Quantity/Effect
At risk		Establishment Population: -1
Off site	Quantity	Quantity/Effect
At risk		Emergency Personnel : -1 OffSite Population : -1
Injuries	32.00	OffSite Population : 32

## Emergency Response

Intervention of ambulance

police closed off cross

Emergency Response	Quantity	Quantity/Effect
On-site systems		drenching systems (water sprays, monitors, etc.); plant emergency shut-down procedures; gas detection, quantification/dispersion prediction
Off-site external services		external ambulance/victim-recovery services; external services: police intervention
Sheltering		public alerted via media
Evacuation		
Other		
Remedial Measure	Quantity	Quantity/Effect
Decontamination		
Restoration		
Other		

## Lessons Learned

### Theme of the Lessons Learned

Causes - Plant/Equipment
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## Lessons Learned

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### Measures to prevent recurrence:

- 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

## Event Profile

### Publication Date