

## Klorgasutsläpp på en fabrik för omsmältning av aluminium.

850425 MARS 1800\_13

Polisen larmades strax före klockan 18 av en medborgare som kände doften av klorgas på gatan utanför fabriken. Räddningstjänsten anlände samtidigt som polisen. Efter ungefär två timmar lokaliserades läckan och åtgärdades. Det var en bussning på en klorgascylinder som inte skruvats åt ordentligt. Det gick inte att avgöra vem som hade skruvat loss den. I fabriken utkanter uppmättes halter på 6-20 ppm klor. Allmänheten varnades på radio, och uppmanades att hålla dörrar och fönster stängda.

### Inblandade ämnen och mängder

	CAS Nr.	Mängd
Klor	7782-50-5	160 kg

### Skador:

Människor:	Fyra arbetare och fyra poliser hölls för observation under ett dygn.
Materiella:	Inga.
Miljö/ekologi:	Inga skador rapporterade.
Infrastruktur:	Polisen spärrade av området och dirigerade om busstrafiken. Allmänheten varnades på radio och uppmanades att stanna inne och hålla dörrar och fönster stängda.

### Erfarenheter redovisade (Ja/Nej): Ja

Endast att låsningsmekanismen på klorgascylindrarna skulle bytas ut.

## Report Profile

### Identification of Report:

country: FA ident key: 1800\_013\_01

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

### Date of Major Occurrence: Time of Major Occurrence

start: 25/04/1985 start: 17:30:00

finish: finish:

### Establishment:

name:

address:

industry: 2011 metal refining and processing (includes foundries, electrochemical refining, plating, etc.)

Metal (Aluminium Remelting)

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\_013\_01

**Accident Types:**

**release:** Yes **explosion:** No

**water contamination:** No **other:** No

**fire:** No

**description:**

OTHER SYSTEMS INVOLVED AND OPERATING CONDITIONS:... see Appendix Short Report / description of accident types

**Substance(s) Directly Involved:**

**toxic:** Yes **explosive:** No

**ecotoxic:** No **other:** No

**flammable:** No

**description:**

- Chlorine (C.A.S. CODE: 7782-50-5, E.E.C. CODE: 017-001-00-7); amount involved = 160 kg.

**Immediate Sources of Accident:**

**storage:** No **transfer:** No

**process:** Yes **other:** No

**description:**

The accident occurred in a metal industry for the aluminium remelting. The aluminium melting was carried out

in 3 foundry furnaces at temperatures of about 800°1,000° C. One of the furnace had a capacity of 20

tonnes/charge; the others had 6... see Appendix Short Report / description of immediate sources

**Suspected Causes:**

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

**human:** Yes **other:** No

**description:**

INITIATING EVENT AND CONSEQUENCES:... see Appendix Short Report / description of suspected causes

**Immediate Effects:**

**material loss:** No

**human deaths:** No

**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:** No **decontamination:** No

**external services:** Yes **restoration:** No

**sheltering:** Yes **other:** Yes

**evacuation:** No

**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\_013\_01

### **1 Type of Accident**

**remarks:** Due to the ejection of the bushing and the valve stem of an extension rod

used to close a chlorine cylinder in emergencies, a chlorine leak occurred

(code 1101). The chlorine gas, initially released in a special room

containing two chlorine... see Appendix Full Report A / type of accident

### **2 Dangerous Substances**

**remarks:** The total establishment inventory of chlorine refers to the whole capacity

of the two 500 Kg cylinders located in the special, partially open, room

where the release occurred. The potential inventory directly involved of

chlorine refers to ... see Appendix Full Report A / dangerous substances

### **3 Source of Accident**

**illustration:** - not applicable -

**remarks:** The accident occurred in a metal industry (code 2011) for the aluminium

remelting. The chlorine was used to remove magnesium from the melt. The

plant had normally two 500 Kg Chlorine cylinders (code 4004) located in a

special, partially open... 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):** 11

**direction (from):** W

**stability (Pasquill):**

**ambient temperature (°C):**

**remarks:** The wind direction was West at a speed of 5-11 m/sec from 17:00 to 20:00. Relative humidity = approximately 50%.

#### 5 Causes of Major Occurrence

**main causes**

**technical / physical** - not applicable -

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

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

5401 person: operator error

- not applicable -

- not applicable -

**remarks:** The cause of the accident was the unscrewing of the bushing and valve stem of the closing valve on the chlorine cylinder. It was not possible, after the accident, to establish who unscrewed the valve stem or whether this was done by mistake... see Appendix Full Report A

/ causes of major occurrence

#### 6 Discussion about the Occurrence

- not applicable -

**Type of Accident** country: FA ident key: 1800\_013\_01

**event:**

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

**initiating event** 1101 release: gas/vapour/mist/etc release to air

**associated event** - not applicable -

#### Dangerous substances

country: FA ident key: 1800\_013\_01

##### 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:** STARTING MATERIAL

**b) substance belongs to relevant inventory directly involved:** Yes

**actual quantity:** 0,16 **potential quantity:** 0,5

**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\_013\_01

## **situation**

### **industry**

**initiating event** 2011 metal refining and processing (includes foundries, electrochemical refining, plating, etc.)

**associated event** - not applicable -

### **activity/unit**

**major occurrence** 3201 storage: process-associated (stockholding, etc. on-site of manufacture)

**initiating event** 3201 storage: process-associated (stockholding, etc. on-site of manufacture)

**associated event** - not applicable -

### **component**

**major occurrence** 4004 container; pressurised (bullet, sphere, cylinder, etc.)

**initiating event** 4004 container; pressurised (bullet, sphere, cylinder, etc.)

**associated event** - not applicable -

## **B Consequences Full Report**

country: FA ident key: 1800\_013\_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 chlorine concentrations at the establishment fence were estimated to be of t... see Appendix

Full Report B / area concerned - remarks

## 2 People

**establishment popul. emergency personnel off-site population**

**total at risk**

**immediate fatalities**

**subsequent fatalities**

**hospitalizing injuries** 4 4

**other serious injuries**

**health monitoring**

**remarks** 8 people (4 staff members and 4 Police Officers) were hospitalized for one day 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** No material losses occurred except the chlorine released during the accident.... 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 Yes No

- **political interest** No No No

**remarks** The Police sealed off the area and the buses were rerouted. The public were warn... see Appendix

## 7 Discussion of Consequences

# C Response Full Report

**country:** FA **ident key:** 1800\_013\_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 this accident, it was re... 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\_013\_01 report**

### **Appendix Short Report / description of accident types:**

OTHER SYSTEMS INVOLVED AND OPERATING CONDITIONS:

When the accident occurred, a hot water spray system used for the chlorine evaporation was operating showing that the chlorinating system was in operation or being prepared for operation.

ENVIRONMENTAL AND ATMOSPHERIC CONDITIONS:

The wind direction was West at a speed of 5-11 m/sec from 17:00 to 20:00. Relative humidity = approximately 50%.

ACCIDENT CASE HISTORY DESCRIPTION:

The police was alarmed by a person who smelled chlorine outside the plant (Trekronergade) at 17:43. The police responded together with the Fire Brigade. The area around the establishment was sealed off and a warning to the public was given through the National Broadcasting System. The Fire Brigade located the chlorine release, stopped the hot water spray system and finally stopped the leakage about 2 hours after the police was called, by refitting the bushing and the valve stem at 19:35. It has been estimated that the chlorine concentrations at the fence were in the order of 6-20 ppm. 4 staff members and 4 police officers were hospitalized 24 hours after the accident for observations but no permanent injuries have been reported.

### **Appendix Short Report / description of immediate sources:**

The accident occurred in a metal industry for the aluminium remelting. The aluminium melting was carried out in 3 foundry furnaces at temperatures of about 800°1,000°C. One of the furnace had a capacity of 20 tonnes/charge; the others had 6 tonnes/charge. Chlorine was used to remove magnesium from the melt. The plant had normally two 500 kg Chlorine cylinders located in a special, partially open, room. One cylinder was connected to a chlorination unit while the other was held as a spare. The closing valve on the cylinder (see the diagram attached to the Original Report) was provided with an extension rod, which may close the valve from the outside. This rod may be activated only in emergencies according to the chlorine supplier's instructions. The location of the establishment and the lay-out of the factory are shown in two maps attached to the Original Report.

### **Appendix Short Report / description of suspected causes:**

#### INITIATING EVENT AND CONSEQUENCES:

The valve stem and the threaded bushing of the rod were apparently forcefully unscrewed overriding the locking provided by a locking screw. Following this, the bushing and the valve stem were ejected or pulled out, allowing chlorine vapour to flow out through the valve into the chlorine room and further to the surroundings.

#### CAUSES:

The cause of the accident was the unscrewing of the bushing and valve stem. It was not possible, after the accident, to establish who unscrewed the valve stem or whether this was done by mistake (due to insufficient personnel training and/or operating procedures). It may be underlined that the workers present when the release occurred were foreigners and, therefore, language problems may have been involved.

### **Appendix Short Report / description of immediate effects:**

#### EFFECTS ON PEOPLE:

8 people (4 staff members and 4 Police Officers) were hospitalized for one day after the accident for medical observations, but no permanent injuries have been reported.

#### COMMUNITY DISRUPTION:

The Police sealed off the area around the establishment and the buses were rerouted. The public was warned at 19:46 by radio and asked to stay indoors and close doors and windows.

#### MAP OF THE ACCIDENT AREA AND MAX. DENSITY OF POPULATION:

Part of the city map showing the area around the plant is attached to the Original Report.

### **Appendix Short Report / description of emergency measures taken:**

#### INTERNAL TO THE ESTABLISHMENT:

There are no information about measures taken by the plant staff (the Authorities were alarmed by a person outside the plant who smelled the released chlorine). The Fire Brigade located the chlorine release, stopped the hot water spray system and finally stopped the leakage about 2 hours after the police was called, by refitting the bushing and the valve stem.

#### EXTERNAL TO THE ESTABLISHMENT:

The police sealed off the area and the buses were rerouted. The public were warned at 19:46 by radio and asked to stay indoors and close doors and windows. Some of the residents of the area contacted MJK (Local Environmental Control Authority) about the accident. They complained that no alarm was raised with the help of loud speaker vans. Approximately 20 people from police were mobilized for sealing the area and warning the population.

### **Appendix Short Report / description of immediate lessons learned:**

#### MEASURES TO PREVENT ANY RECURRENCE OF SIMILAR ACCIDENTS:

After this accident, it was recommended that the extension rod be provided with a one-way ratchet key ensuring that when operated from outside only valve closure is allowed.

### **Appendix Full Report A / type of accident:**

Due to the ejection of the bushing and the valve stem of an extension rod used to close a chlorine cylinder in emergencies, a chlorine leak occurred (code 1101). The chlorine gas, initially released in a special room containing two chlorine cylinders, then dispersed into the environment.

### **Appendix Full Report A / dangerous substances:**

The total establishment inventory of chlorine refers to the whole capacity of the two 500 Kg cylinders located in the special, partially open, room where the release occurred. The potential inventory directly involved of chlorine refers to the capacity of the cylinder connected to the chlorination unit and involved in the release. The other cylinder was held as a spare.

### **Appendix Full Report A / source of accident - remarks:**

The accident occurred in a metal industry (code 2011) for the aluminium remelting. The chlorine was used to remove magnesium from the melt. The plant had normally two 500 Kg Chlorine cylinders (code 4004) located in a special, partially open, room (code 3201). The closing valve on the cylinders was provided with an extension rod which may close the valve from the outside. The location of the establishment and the lay-out of the factory are shown on two maps attached to the Original Report.

### **Appendix Full Report A / causes of major occurrence:**

The cause of the accident was the unscrewing of the bushing and valve stem of the closing valve on the chlorine cylinder. It was not possible, after the accident, to establish who unscrewed the valve stem or whether this was done by mistake (codes 5303, 5304 and 5401). It may be underlined that the workers present when the release occurred were foreigners and, therefore, language problems may have been involved.

### **Appendix Full Report B / area concerned - remarks:**

The chlorine concentrations at the establishment fence were estimated to be of the order of 6\*20 ppm. The public was warned at 19:46 by radio and asked to stay indoors and close doors and windows. Part of the city map showing the area around the plant is attached to the Original Report.

### **Appendix Full Report B / people:**

8 people (4 staff members and 4 Police Officers) were hospitalized for one day after the accident for medical observations, but no permanent injuries have been reported.

**Appendix Full Report B / ecological harm:**

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

**Appendix Full Report B / material loss:**

No material losses occurred except the chlorine released during the accident.

**Appendix Full Report B / disruption of community life:**

The Police sealed off the area and the buses were rerouted. The public were warned at 19:46 by radio and asked to stay indoors and close doors and windows. Some of the residents of the area contacted MJK (Local Environmental Control Authority) about the accident. They complained that no alarm was raised with the help of loud speaker vans.

**Appendix Full Report C / lesson learned - prevent:**

After this accident, it was recommended that the extension rod be provided with a one-way ratchet key ensuring that when operated from outside only valve closure is allowed.