

## Klorutsläpp efter explosion på en klor-alkalifabrik.

950304 MARS 1995\_01

Elektrolysen i klor-alkalifabriken hade drivits under rutinmässiga omständigheter ett par dagar nära maximal kapacitet. En kortslutning inträffade i en av cellerna, något som inte är ovanligt och brukar orsakas i fluktuationer i vätgassystemet. Operatören fann snart att vätgaskompressorn hade stannat. Vätgaskompressorn tillser att halten väte inte blir för hög i anläggningen. Operatören omstartade kompressorn, som dock stannade åter efter en stund. Skiftarbetarna observerade ett ansenligt utsläpp av vätgas. På grund av smutsavlagringar i säkerhetsanordningarna kom vätgasen att tränga in i cellutrymmet via kvicksilverpumpen. Den första explosionen förstörde cellen samt en kloruppsamlingsledning. Fabriken nödstoprades genast efter explosionen. En andra explosion inträffade något senare. Företagets interna brandkår

### Inblandade ämnen och mängder

	CAS Nr.	Mängd
klorgas och vätgas		totalt ca 100 kg
klor	7782-50-5	
väte	1333-74-0	

### Skador:

Människor:	3 av företagets brandmän och 1 annan anställd blev utsatta för klorgasen då deras gasmasker gick sönder vid explosionen. Den sistnämnde blev dessutom chockad och fick tillbringa ett par dagar på sjukhus.
Materiella:	Skador på elektrolysanläggningen.
Miljö/ekologi:	Inga effekter rapporterade.
Infrastruktur:	Inga.

Erfarenheter redovisade (Ja/Nej): Nej

## Report Profile

### Identification of Report:

country: FA ident key: 1995\_001\_01

reported under Seveso I directive as major accident reports: SHORT

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

start: 1995-03-04 start:

finish: 1995-03-04 finish:

### Establishment:

name:

address:

industry: - not applicable -

Plant for the production of halogens, halogen products, sulphur or sulphur products products

Plan

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: 1995\_001\_01

**Accident Types:**

release: Yes explosion: Yes

water contamination: No other: No

fire: No

**description:**

During chlor-alkali electrolysis an accident occurred in which chlorine was released due to a chlorine-hydrogen explosion: ... see Appendix Short Report / description of accident types

**Substance(s) Directly Involved:**

toxic: No explosive: Yes

ecotoxic: No other: No

flammable: No

**description:**

chlorine, hydrogen (approximately 100 kg)

**Immediate Sources of Accident:**

storage: No transfer: No

process: Yes other: No

**description:**

The initiating event was the break down of the hydrogen compressor. Neither electrical causes nor human causes could be determined. It has to be assumed that the break down has been caused by the under pressure blocking system.

## **Suspected Causes:**

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

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

### **description:**

technical error ( instruments/ accessories).

## **Immediate Effects:**

**material loss:** Yes

**human deaths:** No

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

**other:** No

**ecological harm:** No

**national heritage loss:** No

### **description:**

Three fire fighting officials and one collaborator were slightly injured (affected by irritation of the superior respiratory ducts), after their chlorine gas masks were broken by the power of the explosion. The exposed staff member was also... see Appendix Short Report / description of immediate effects

## **Emergency Measures taken:**

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

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

**sheltering:** No **other:** No

**evacuation:** No

### **description:**

The plant was immediately shut down after the explosion by the emergency shut down.

## **Immediate Lessons Learned:**

**prevention:** Yes **other:** No

**mitigation:** No

### **description:**

The aggregate affected was re-designed, avoiding the deposition of dirt. Further, periodic checks are to be performed on it in the future.

# **Appendices for the FA / 1995\_001\_01 report**

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

During chlor-alkali electrolysis an accident occurred in which chlorine was released due to a chlorine-hydrogen explosion:

The electrolysis of chloro-alkali was performed, as it had been for the previous days, near to the technical capacity. The plant produced 15,6 tonnes chlorine/h and was in normal conditions. There were no evident deviations from the safe operating mode. At the time of the disturbance (accident, failure, breakdown) the shift was manned with a regular crew of 9 persons. The person charged with the control of the measurements was informed by an acoustic signal that a short circuit had occurred in one of the cells. This occurrence is not exceptional and is generally caused by a slight pressure fluctuation in the hydrogen system, which is passed back through the sloping connection between the hydrogen and the chlorine sections. Searching the cause of the increased hydrogen pressure, the controller found immediately out that the hydrogen compressor, which removes all hydrogen from the plant, broke down. He then tried to restart the compressor, which succeeded in the first instance. But short time afterwards, the aggregate broke down again. It is assumed that the low-pressure blocking system caused the break down of the aggregate. The crew observed at that time that a considerable release of hydrogen occurred from the small pipes of the amalgam decomposers. The reason of it is a not sufficient discharge of hydrogen over roof passing through a hydraulic guard foreseen for such cases. This hydraulic guard was set on 70 mm water level and transports the hydrogen without danger over the roof. The container is laid out in accordance with such cases. On the day of the operational disturbance, however, the function of the safety devices was limited (which was not recognized), because a non-irrelevant dirt deposition had formed inside, which increased the counter pressure. Hydrogen reached the cell-space through the mercury pump, which transfers the regenerated mercury again in the electrolytic cell. This fast and massive intrusion of hydrogen caused at least locally the formation of an explosive

mixture. The first heavy explosion destroyed a part of the cells as well as the chlorine collection pipe of the new cell-block passing under the explosion point. The plant was shut down by emergency shut down by the crew immediately after the explosion. The after production of hydrogen due to the automatically ongoing decomposition of the amalgam present during that time was not affected by that. Following that, another heavy explosion occurred, which destroyed the externally passing chlorine collection pipe.

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

Three fire fighting officials and one collaborator were slightly injured (affected by irritation of the superior respiratory ducts), after their chlorine gas masks were broken by the power of the explosion. The exposed staff member was also some days under shock. There was a material loss of about 260.000 DM.