

## Accident Profile

### Title

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### Date/Time of Major Occurrence

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**Start Date** 15-08-2002

**End Date** 02-09-2002

### Accident Type

Major Accident

### Reported under

EU Seveso II Directive

### Seveso II Status

Art. 9 (Safety Report)

### Industrial Activity

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General chemicals manufacture (not included above)

### Reasons for Reporting

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Substances involved: greater than 5% of quantity in Column 3 of Annex I

## Accident Report

### Accident description

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Large flooding of Vltava River in August 2002 has inundated premises of the Spolana plant. During the flooding of the site between 14.8. and 18.8. 2002 water entered into establishments E 4990 and E 4920 and inundated the emergency retention sumps, in which are located the liquid chlorine storage tanks. Chlorine was released to the air and water on 15.8., 17.8. and 23.8. 2002.

A class III chemical alert was announced on the 15.8. at 12.47. This alert was reduced to class II at 19.25 after sealing the establishment. Air in the sodium chloride storage was temporarily extracted on the 18.8.2002. The alert was reduced to class I at 11.58 on the 19.8.2002.

The inside of establishment E 4990 was inspected for the first time since 14.8 in the morning of 23.8.2002. A further release of chlorine occurred during extraction of tank 7 in establishment 4990 on the 23.8.2002. A class III chemical alert was announced at 20.02. The alert was reduced to class II at 00.25. After extraction of the chlorine from the stabilized containers on 2.9. the alert was reduced to class I.

### Accident involving

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Domino effects

Natech events

Transboundary effects

Contractors

### Release

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#### Major Occurrences

gas/vapour/mist/etc release to air

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### Fire

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## Site and installation

### Site description

Most elements of security direction were not applied, because the accident was originated by a natural disaster - flood - more than 100-year floodwater, which had not been forecasted by official bodies and had not been expected by the establishment.

### Installation/Unit description

Electrolysis plant, sodium chloride and hydrochloric acid operation and gas processing. Establishments E 4920 and E 4990 chlorine storage, storage tanks Additional comments: There are 5 storage tanks located in establishment E 4920. These tanks contain liquid chlorine and an acid egg with a total capacity of 5 x 85 t and 16 t of chlorine, respectively. Establishment E 4990 contains 5 storage tanks with a total capacity of 5 x 85 t of chlorine. Two tanks are permanently left empty in reserve for emergency provisions. Producer of damaged equipment: SPOLANA a. s., date of production: 1979, in operation since: 1982 Cause of accident: The containers were lifted by the force of the floodwaters, which lead to a burst in the piping and detachment of the socket on tank 10. The scale of damage and an approximation of the volume of released chlorine were made during the afternoon of the 23.8.2002 during the inspection of storage E 4990.

### Storage

Major occurrences	Equipment Type
process-associated (stockholding, etc. on-site of manufacture)	container; pressurised (bullet, sphere, cylinder, etc.)

## Substances

### Substances Involved

In total, 80.841 t of chlorine (C.A.S. No: 7782-50-5) was released.

#### Remarks:

Chlorine (classification according to the Law No.157/1998 Coll.) - T R23, Xi R36/37/38, N R50 In gaseous condition a yellow-green heavy gas, with a pungent odor, which irritates mucous membranes even in small quantity, produces headaches, eye irritation, conjunctives are reddish, membrane of respiratory organs is considerably congested, persistent cough and sharp pains in the breastbone. In greater concentration, there is a danger of edema or even death. NPK-P 3 mg/m<sup>3</sup> = 1,03 ppm, PEL 1,5 mg/m<sup>3</sup> =0,52 ppm Physical properties: Relative molecule mass 70,91 Density (liquefied) 1507 kg/m<sup>3</sup> Boiling point -33,8

### Substances Classification

00. NAMED SUBSTANCE

### Substances detail

Substance	CAS Number	Quantities (t.)	
		Involved	Potential
chlorine	07782-50-5	0.29000	80.84100

## Causes

Large scale flooding plus inadequate anti-flooding measures.

Cause of accident:

The containers were lifted by the force of the floodwaters, which lead to a burst in the piping and detachment of the socket on tank 10. The scale of damage and an approximation of the volume of released chlorine were made during the afternoon of the 23.8.2002 during the inspection of storage E 4990.

## Plant/Equipment

Causative Factor	Type
loss of process control	
corrosion/fatigue	

## External

Causative Factor	Type
natural event (weather, temperature, earthquake, etc.)	

## Consequences

Large scale flooding plus inadequate anti-flooding measures.

Cause of accident:

The containers were lifted by the force of the floodwaters, which lead to a burst in the piping and detachment of the socket on tank 10. The scale of damage and an approximation of the volume of released chlorine were made during the afternoon of the 23.8.2002 during the inspection of storage E 4990.

## Human

Off site	Quantity	Quantity/Effect
At risk		
Fatalities		
Injuries		
Other		

## Emergency Response

The operational control room at SPOLANA a. s. reported the accident on 15.8.2002 at 12.47 pm (Class III chemical alert) to the Melnik fire brigade. They remained in permanent communication until the end of the occurrence.

Emergency measures - Remarks:

Used code 7999 - in the time of the promulgation of the III.degree of chemical alert in SPOLANA a. s., that means on 23.8.2002 from 20:02 to 00:25, the people were required to leave the free spaces and to enter closed

Official action taken - legal action:

CIZP started administrative procedures considering the case of the release of chlorine with SPOLANA a.s. The Police of CZ is performing an investigation because of the considerable threat to lives, health and propriety as a consequence of the flood.

Passed through discussions in the directory of the plant and in the meetings of the directory and emergency staff.

A III degree Chemical alert was declared as a precaution, the concentration of chlorine within the borders of the plant did not reached the parameters for this type of alert.

Emergency Response	Quantity	Quantity/Effect
On-site systems		drenching systems (water sprays, monitors, etc.); internal emergency teams (fire, ambulance, etc.)
Off-site external services		external fire-fighting services; external ambulance/victim-recovery services; military intervention; police intervention
Sheltering		public alerted via media
Evacuation		
Other		

  

Remedial Measure	Quantity	Quantity/Effect
Decontamination		containing spread of substance
Restoration		
Other		environmental monitoring

## Lessons Learned

### Theme of the Lessons Learned

- Causes - Plant/Equipment
- Causes - Organisational
- Emergency Response

### Lessons Learned

Measures to prevent recurrence:

Technical measures to prevent events - inundation of the chlorine store:

To separate constructions of galleries, so that the containers, when lifted, could not lift the constructions of galleries of neighboring containers.

To put the containers into special construction, which would hold the container inside and would prevent the containers being moved.

Measures to mitigate consequences:

Technical measures for mitigation of consequences in case of chlorine release:

- To install, as a steady water screen, a dry air pipe system out of the store of chlorine with a possibility to connect it to an autonomous pump with a capacity determined by a project.

- To limit chlorine depositing only to the deposit E 4920, that means to 50 % of original depositing capacity.

- To screen further risks in the chlorine storage by a form HAZOP.

- To ensure suction of the chlorine deposit by other distribution tubes in sufficient height for a possible level of floodwater, so that it is possible to remove even if the retention tanks are inundated.

- To install an autonomous monitoring of accidents with an uninterrupted source of electric energy, with a signaling siren and a lighthouse to deposit E 4920.

- To construct deposit E 4920 as sealed, with fuses against extreme pressure and with a possibility to inundate in cases that the whole building could be lifted by floodwater.

Organization measures

- During any non-operation of the sodium hypochlorite plant for longer than 8 hours, carry out exhaustion of tube distributors into shut-off armature from the containers of chlorine up to the distributors.
- On the basis of the study of HAZOP, to prepare adequate organization regulations and to put them into use.