

# Brand och explosion på en fabrik för produktion av pesticider.

880717 MARS 1988\_16

Tidigt på morgonen fattade en tank eld och exploderade. Tanken innehöll 40 ton av en blandning av cyklohexanon (55%) och dimethoate. Ursprungligen hade man antagit att ett starkt visselljud härrörde från en ångläcka. Reparatörslaget upptäckte ett gulgrönt moln och slog larm. En brand spred sig och drygt fem minuter efter att larmet ljöd kom explosionen. Den nedre delen av tanken blåstes bort och resten for som en missil och landade 45 m bort. Branden släcktes inom 20 minuter av företagets interna brandkår i samarbete med räddningstjänsten. Kontaminerat släckningsvatten rann ut i havet vilket resulterade i ett temporärt badförbud i området.

## Inblandade ämnen och mängder

	CAS Nr.	Mängd
cyklohexanon	108-94-1	22 000 kg
dimethoate		18 000 kg
förbränningsprodukter		okänt

## Skador:

**Människor:** 163 människor med förgiftningssymptom fördes till sjukhus. Under de närmaste tre dagarna togs ytterligare 40 personer in och hölls på sjukhus i 1-2 dagar. Ytterligare 56 personer med gasförgiftningssymptom fördes till ett andra sjukhus, där 3 av dem lades in.

**Materiella:** Anläggningen skadades.

**Miljö/ekologi:** En del av släckningsvattnet rann så småningom ut i havet. Ett temporärt badförbud infördes. Föroreningen av mark, luft och vatten kontrollerades fortlöpande. Lokalbefolkningen uppmanades att tvätta frukt och grönsaker innan konsumtion. Fortfarande 10 dagar efter olyckan kunde man konstatera närvaron av giftiga ämnen .

**Infrastruktur:** Inga.

## Erfarenheter redovisade (Ja/Nej): Ja

Kortfattat anges förebyggande åtgärder.

## Report Profile

### Identification of Report:

country: FA ident key: 1988\_016\_01

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

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

start: 1988-07-17 start: 06:15:00

finish: finish:

### Establishment:

name:

address:

industry: 2004 pesticides, pharmaceuticals, other fine chemicals

Pesticide

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: 1988\_016\_01

### **Accident Types:**

release: Yes explosion: Yes

water contamination: Yes other: No

fire: Yes

#### **description:**

On July 17, 1988 at 06:15 tank D-103, containing 40 tonnes of a mixture of Cyclohexanone 55% and Dymethoate 45% caught fire and exploded. Initially, a strong whistle from this tank had been noticed but it was supposed to be a steam leak. Re... see Appendix Short Report / description of accident types

### **Substance(s) Directly Involved:**

toxic: Yes explosive: Yes

ecotoxic: Yes other: No

flammable: Yes

#### **description:**

The tank involved in the accident was containing about 40 tonnes of a mixture of cyclohexanone (55%) and dimethoate (45%)... see Appendix Short Report / description of substances involved

### **Immediate Sources of Accident:**

storage: Yes transfer: No

process: Yes other: No

#### **description:**

The accident involved one of the 13 tanks of the storage area in a pesticide industry. The factory was located

in the industrial area of Massa Carrara over an area of about 550,000 m2 (about 230,000 m2 for production plants). In the factory... see Appendix Short Report / description of immediate sources

### **Suspected Causes:**

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

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

**description:**

CAUSE:... see Appendix Short Report / description of suspected causes

### **Immediate Effects:**

**material loss:** Yes

**human deaths:** No

**human injuries:** Yes **community disruption:** Yes

**other:** No

**ecological harm:** Yes

**national heritage loss:** No

**description:**

EFFECTS ON PEOPLE:... see Appendix Short Report / description of immediate effects

### **Emergency Measures taken:**

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

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

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

**evacuation:** No

**description:**

INTERNAL TO THE ESTABLISHMENT:... see Appendix Short Report / description of emergency measures taken

### **Immediate Lessons Learned:**

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

**mitigation:** Yes

**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:** 1988\_016\_01

### **1 Type of Accident**

**remarks:** Probably due to a leakage (code 1102), a tank containing several tonnes of a cyclohexanone and dimethoate mixture caught fire (code 1202) and exploded (code 1307). Combustion products and toxic substances from insulating and plastic materia... see Appendix Full Report A / type of accident

### **2 Dangerous Substances**

**remarks:** The total establishment and the potential directly involved inventories of

cyclohexanone and dimethoate (Rogor) refer to the whole contents of tank involved in the accident (40 tonnes of a mixture of cyclohexanone [55%] and dimethoate [45%... see Appendix Full Report A / dangerous substances

### 3 Source of Accident

**illustration:** - not applicable -

**remarks:** The accident involved one of the 13 tanks (code 4003) of the storage area (code 3201) in a pesticide industry (code 2004). The factory was located in the industrial area of Massa Carrara over an area of about 550,000 m<sup>2</sup> (about 230,000 m<sup>2</sup> fo... 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):**

**direction (from):**

**stability (Pasquill):**

**ambient temperature (°C):**

**remarks:** - not applicable -

### 5 Causes of Major Occurrence

**main causes**

**technical / physical** 5101 operation: vessel/container/containment-equipment failure

5107 operation: unexpected reaction/phase-transition

- not applicable -

- not applicable -

- not applicable -

**human / organizational** 5401 person: operator error

- not applicable -

- not applicable -

- not applicable -

- not applicable -

**remarks:** When the Original Report was prepared, the causes were still under investigation, but at least two hypotheses may be advanced: 1- being known that Rogor in the tank was out of specification, secondary exothermic reactions (code 5107) could ... see Appendix Full Report A / causes of major occurrence

### 6 Discussion about the Occurrence

- not applicable -

**Type of Accident** country: FA ident key: 1988\_016\_01

**event:**

**major occurrence** - not applicable -

**initiating event** - not applicable -

**associated event** - not applicable -

**event:**

**major occurrence** 1202 fire: pool fire (burning pool of liquid, contained or uncontained)

**initiating event** 1102 release: fluid release to ground

**associated event** - not applicable -

## **Dangerous substances**

**country:** FA **ident key:** 1988\_016\_01

### **a) total establishment inventory**

**CAS number: identity:** Toxic Substances

**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:** ABNORMAL PRODUCT

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

**actual quantity:** -1 **potential quantity:** -1

**c) substance belongs to relevant inventory indirectly involved:** No

**actual quantity:** -1 **indir\_pot\_quant:** -1

### **a) total establishment inventory**

**CAS number: identity:** Dimethoate - Rogor

**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):** 18

**use of substance as:** STARTING MATERIAL

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

**actual quantity:** 18 **potential quantity:** 18

**c) substance belongs to relevant inventory indirectly involved:** No

**actual quantity:** -1 **indir\_pot\_quant:** -1

### **a) total establishment inventory**

**CAS number:** 108-94-1 **identity:** Cyclohexanone

**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):** 22

**use of substance as:** STARTING MATERIAL

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

**actual quantity:** 22 **potential quantity:** 22

**c) substance belongs to relevant inventory indirectly involved:** No

**actual quantity:** -1 **indir\_pot\_quant:** -1

**a) total establishment inventory**

**CAS number: identity:** Combustion Products

**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:** ABNORMAL PRODUCT

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

**actual quantity:** -1 **potential quantity:** -1

**c) substance belongs to relevant inventory indirectly involved:** No

**actual quantity:** -1 **indir\_pot\_quant:** -1

**Source of Accident - Situation** country: FA ident key: 1988\_016\_01

**situation**

**industry**

**initiating event** 2004 pesticides, pharmaceuticals, other fine chemicals

**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** 4003 container; non-pressurised (hopper, tank, drum, bag, etc.)

**initiating event** 4003 container; non-pressurised (hopper, tank, drum, bag, etc.)

**associated event** - not applicable -

## B Consequences Full Report

country: FA ident key: 1988\_016\_01

**1 Area concerned**

**affected**

**extent of effects installation:** Yes

**establishment:** Yes

**off-site; local:** Yes

**off-site; regional:** Yes

**off-site; transboundary:** No

**illustration of effects** - not applicable -

**remarks** A certain part of the water used to extinguish the fire flowed into the nearby L... 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** 206

**other serious injuries** 53

**health monitoring**

**remarks** The day of the accident, 163 people with gas intoxication symptoms were carried ... see Appendix

Full Report B / people

## **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** A certain part of the water used to extinguish the fire flowed into the nearby L... 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 The explosion projected the tank towards the plant for the formulation of pestic... 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 No No

- political interest No No No

remarks A certain part of the water used to extinguish the fire flowed into the nearby L... see Appendix

## 7 Discussion of Consequences

### Ecological Components involved

country: FA ident key: 1988\_016\_01

type: 6403 offshore: sea/seabed

threatened: not applicable affected: not applicable

type: 6402 offshore: estuary

threatened: not applicable affected: not applicable

type: 6204 freshwater: river

threatened: not applicable affected: not applicable

## C Response Full Report

country: FA ident key: 1988\_016\_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 the accident, on July 18... see Appendix Full Report C / lesson learned - prevent

**measures to mitigate consequences:**

This installation, according to... see Appendix Full Report C / lesson learned - mitigate

**useful references:**

- not applicable -

## 5 Discussion about Response

- not applicable -

# Appendices for the FA / 1988\_016\_01 report

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

On July 17, 1988 at 06:15 tank D-103, containing 40 tonnes of a mixture of Cyclohexanone 55% and Dimethoate 45% caught fire and exploded. Initially, a strong whistle from this tank had been noticed but it was supposed to be a steam leak. Repair of the steam duct had been organized. The operators sent on the top of the tank for the repair works noticed a cloud with a yellow-green colour escaping from the tank and gave the alarm. A large fire developed and a strong explosion occurred 6 or 7 minutes after the whistle was noticed. Combustion products of cyclohexanone and dimethoate together with the toxic substances from the insulating and plastic materials of the nearby pipings, structures and plants involved in the fire were released into the environment. Due to the explosion, the front bottom part of the tank was thrown towards the Rogor plant and the remaining part, as a missile, against the reinforced concrete wall of the control room about 45 m away. The fire that followed the explosion had been extinguished by water-sprays in about 20 minutes with the intervention of the plant firemen and the National Fire Brigade. Although most of the water used in fire fighting operations had been contained within the tanks dikes (after the interception of the sewer network and by means of dedicated pumps), a certain part of it flowed into the nearby Lavello channel and then in the Tirrenean sea. Prohibition of bathing followed.

The degree of pollution of the air, soil and water due to the release of toxic substances and combustion products as well as the fire extinguishing water were continuously controlled (the results of these checks are shown in a document attached to the Original Report). People were warned to carefully wash fruits and vegetables before to eat them and to follow the normal rules of personal hygiene.

When the Original Report was prepared (27/08/1988) the type of danger was still present because traces of Rogor have been found in some samples taken in the discharge water from FARMOPLANT and in the Lavello torrent. Besides, the danger of water contamination in case of persistent rain existed.

### Appendix Short Report / description of substances involved:

The tank involved in the accident was containing about 40 tonnes of a mixture of cyclohexanone (55%) and dimethoate (45%).

- Cyclohexanone (C.A.S. CODE: 108-94-1): amount involved = 22,000 kg.

- Dimethoate [Rogor]: amount involved = 18,000 kg.

- Combustion Products of Cyclohexanone and Dimethoate: composition and amount involved = not known.

- Toxic Substances from insulating materials and plastic materials of the nearby pipings, structures and plants: composition and amount involved = not known.

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

The accident involved one of the 13 tanks of the storage area in a pesticide industry. The factory was located in the industrial area of Massa Carrara over an area of about 550,000 m<sup>2</sup> (about 230,000 m<sup>2</sup> for production plants). In the factory were carried out the following productions: phosphoric esters, pesticides, fungicides, aliphatic amines. Besides, there were some storage areas annexed to the production plants, a finished product storage building, the laboratory, an incineration plant for production residues and a biological treatment plant of liquid effluents. This installation, according to the Seveso-Directive, was not subjected to Notification (art. 5) but, according to the Italian Law, it was subjected to a Declaration and an external emergency plan was not required. In any case, the local authorities (Prefect, Local Health Authority, Fire Brigade) had previously set an external emergency plan that was very useful during the accident. The stainless steel AISI-304 tank involved in the accident (labelled D-103) had a nominal volumetric capacity of 55.15 m<sup>3</sup>, a diameter of 2.5 metres and was 8 metres long. It was containing about 40 tonnes of a mixture of cyclohexanone (55%) and dimethoate (45%). The tank was nitrogen blanketed under automatic pressure control. During the loading phase nitrogen, contaminated with volatile substances from the tank, was sent to the incinerator whilst, during the unloading phase, pure nitrogen was sent to the tank from a centralized nitrogen storage. Further the tank was equipped with a vent having a water seal. The nitrogen pressure was reduced to 200 mm of water for tank blanketing. When the accident occurred the Rogor plant was out of service because FARMOPLANT had not the authorization for its production.

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

**CAUSE:**

When the Original Report the causes were still under investigation, but at least two hypotheses may be advanced for this accident:

1- being known that Rogor contained in the tank was out of specification, secondary exothermic reactions could have occurred resulting in the overpressurization of the tank up to its failure and causing the release of Rogor and cyclohexanone. Ignition of cyclohexanone vapours due to the exothermic reactions might have caused the following fire and the explosion.

2- operational error that could have caused the overpressurization or tank failure (leakage) resulting in the release of Rogor and cyclohexanone. Ignition of cyclohexanone vapours due to unknown causes may have caused the following fire and the explosion.

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

**EFFECTS ON PEOPLE:**

The day of the accident, 163 people with gas intoxication symptoms were carried out to the Massa's Hospital. The following three days (July 20) others 40 people were hospitalized for 1 or 2 days. 56 people with gas intoxication symptoms were instead carried out to the Carrara's Hospital and 3 of them were hospitalized.

Blood samples had been taken from people directly involved in the accident (FARMOPLANT personnel and fire fighters), but the analysis did not detect anything abnormal.

#### MATERIAL LOSS:

The explosion projected the tank towards the plant for the formulation of liquid pesticides as far as the reinforced concrete wall of the nearby control room, which resulted seriously damaged. No data are available about the cost of these damages.

#### ECOLOGICAL HARM:

Although most of the water used in fire fighting operations had been contained within the tanks dikes (after the interception of the sewer network and by means of dedicated pumps), a certain part of it flowed into the nearby Lavello channel and then in the Tirreanean sea. Prohibition of bathing followed.

The degree of pollution of the air, soil and water due to the release of toxic substances and combustion products as well as the fire extinguishing water were continuously controlled (the results of these checks are shown in a document attached to the Original Report). People was warned to careful wash fruits and vegetables before to eat them and to follow the normal rules of personal hygiene.

When the Original Report was prepared (27/08/1988) the type of danger was still present because traces of Rogor have been found in some samples taken in the discharge water from FARMOPLANT and in the Lavello torrent. Besides, the danger of water contamination in case of persistent rain existed. No data are available about the actual situation.

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

##### INTERNAL TO THE ESTABLISHMENT:

The fire that followed the explosion had been extinguished by water-sprays in about 20 minutes with the intervention of the plant firemen and the National Fire Brigade. Although most of the water used in fire fighting operations had been contained within the tanks dikes (after the interception of the sewer network and by means of dedicated pumps), a certain part of it flowed into the nearby Lavello channel and then in the Tirreanean sea.

##### EXTERNAL TO THE ESTABLISHMENT:

The degree of pollution of the air, soil and water due to the release of toxic substances and combustion products as well as the fire extinguishing water were continuously controlled (the results of these checks are shown in a document attached to the Original Report).

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

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

After the accident, on July 18 the Environment Minister emitted an ordinance to stop the installation activities for a period of 6 months to carry out the necessary controls and define the plant safety level needed to prevent similar accidents. The same day, the Mayor of Massa emitted an ordinance to stop the installation activities (except the operations necessary for a safety shut-down of the plant). When the Original Report was prepared the production plants were still stopped and only an incineration plant for production residues and a biological treatment plant of liquid effluents were operating.

##### MEASURES TO MITIGATE THE EFFECTS OF THE ACCIDENT:

This installation, according to the Seveso-Directive, was not subjected to Notification (article 5 of Directive N° EEC/501/82) but, according to the Italian Laws, it was subjected to a Declaration and an external emergency plan was not required. In any case, the local authorities (Prefect, Local Health Authority, Fire Brigade) had previously set an external emergency plan that was very useful during the accident.

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

Probably due to a leakage (code 1102), a tank containing several tonnes of a cyclohexanone and dimethoate mixture caught fire (code 1202) and exploded (code 1307). Combustion products and toxic substances from insulating and plastic materials involved in the fire were released into the environment (codes 1401, 1402 and 1403). Part of the water used to extinguish the fire flowed into a nearby channel and then into the Tirreanean sea (code 1405).

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

The total establishment and the potential directly involved inventories of cyclohexanone and dimethoate (Rogor) refer to the whole contents of tank involved in the accident (40 tonnes of a mixture of cyclohexanone [55%] and dimethoate [45%]). No data are available about the composition and the amount of combustion products and of toxic substances from insulating materials and plastic materials of the nearby pipings, structures and plants that were released during the accident.

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

The accident involved one of the 13 tanks (code 4003) of the storage area (code 3201) in a pesticide industry (code 2004). The factory was located in the industrial area of Massa Carrara over an area of about 550,000 m<sup>2</sup> (about 230,000 m<sup>2</sup> for production plants). The tank was containing about 40 tonnes of a mixture of cyclohexanone (55%) and dimethoate (45%). The tank was nitrogen blanketed under automatic pressure control.

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

When the Original Report was prepared, the causes were still under investigation, but at least two hypotheses may be advanced: 1- being known that Rogor in the tank was out of specification, secondary exothermic reactions (code 5107) could have occurred resulting in an overpressurization; 2- operational error (code 5401) that could have caused an overpressurization or tank failure. Both cases resulted in tank failure (code 5101) and liquid release.

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

A certain part of the water used to extinguish the fire flowed into the nearby Lavello channel and then in the Tirreanean sea and the prohibition of bathing followed. The degree of pollution of the air, soil and water due to the release of toxic substances and combustion products as well as the fire extinguishing water were constantly controlled. People was warned to careful wash fruits and vegetables before to eat them and to follow the normal rules of personal hygiene.

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

The day of the accident, 163 people with gas intoxication symptoms were carried out to the Massa's Hospital. The following three days (July 20) others 40 people were hospitalized for 1 or 2 days. 56 people with gas intoxication symptoms were instead carried out to the Carrara's Hospital and 3 of them were hospitalized. Blood samples had been taken from people directly involved in the accident (FARMOPLANT personnel and fire fighters), but the analysis did not detected anything abnormal.

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

A certain part of the water used to extinguish the fire flowed into the nearby Lavello channel and then in the Tirreanean sea and the prohibition of bathing followed. The

degree of pollution of the air, soil and water due to the release of toxic substances and combustion products as well as the fire extinguishing water were constantly controlled. People was warned to careful wash fruits and vegetables before to eat them and to follow the normal rules of personal hygiene.

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

The explosion projected the tank towards the plant for the formulation of pesticides as far as the reinforced concrete wall of the nearby control room, which resulted seriously damaged. No data are available about the cost of the damages.

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

A certain part of the water used to extinguish the fire flowed into the nearby Lavello channel and then in the Tirrean sea and the prohibition of bathing followed. The degree of pollution of the air, soil and water due to the release of toxic substances and combustion products as well as the fire extinguishing water were constantly controlled. People was warned to careful wash fruits and vegetables before to eat them and to follow the normal rules of personal hygiene.

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

After the accident, on July 18 the Environment Minister emitted an ordinance to stop the installation activities for a period of 6 months to carry out the necessary controls and define the plant safety level needed to prevent similar accidents. The same day, the Mayor of Massa emitted an ordinance to stop the installation activities (except the operations necessary for a safety shut-down of the plant).

#### **Appendix Full Report C / lesson learned - mitigate:**

This installation, according to the Seveso-Directive, was not subjected to Notification (article 5 of Directive N° EEC/501/82) but, according to the Italian Law, it was subjected to a Declaration and an external emergency plan was not required. In any case, the local authorities (Prefect, Local Health Authority, Fire Brigade) had previously set an external emergency plan that was very useful during the accident.