

Explosion och brand i en kemikaliefabrik till följd av ett operatörsmisslag.

880608 MARS 1800_26

Explosionen orsakades av en felaktig blandningsoperation där vätgas oväntat utvecklades och antändes varvid reaktionsblandningen fattade eld. I byggnaden befann sig endast en operatör vid tillfället. Han brännskadades svårt. Klockan 03:07 larmades räddningstjänsten. Klockan 03:20 anlände den första bilen, följd 20 minuter senare av en andra. Explosionen hade förstört tre brandposter varför vatten hämtades från floden Brenne 500 m bort. Klockan 04:00 täckte branden ett område på 2-3000 m². Klockan 05:52 anlände två skumkanoner som sattes i operation kl 06:15 då två tankbilar med skum anlände. Skummet var mycket effektivt i släckningsarbetet. Klockan 05:00 beslöt de lokala myndigheterna att evakuera en byggnad i närheten där 200 handikappade bodde. Mellan 05:00 och 08:30 analyserades brandrökens sammansättning noggrant. Man fann förekomster av vätecyanid, kolmonoxid, kväveoxider och halogener. Klockan 08:30 fanns endast spårmängder av kolmonoxid kvar. Släckningsarbetet var riskabelt dels pga avsaknad av lämplig skyddsutrustning, och dels pga risken för explosion av angränsade reaktionskärl. Det vatten som användes för att kyla dessa kärl rann ut i Brenne, och fortsatte sedan ut i Loire. Dricksvattensförsörjningen stoppades i några dagar efter olyckan. Olycksorsaken tillskrevs oklara driftsinstruktioner och otillräcklig utbildning av operatören.

Inblandade ämnen och mängder

	CAS Nr.	Mängd
Ett hundratal kemiska substanser var inblandade i branden. De viktigaste var		
natriumhypoklorit	7681-52-9	800 kg
ammoniaklösning (22%)		5000 kg
väteklorid		11200 kg
naftalen	91-20-3	24900 kg
toluen	108-88-3	20400 kg
etanol	8030-30-6	6200 kg
metanol	67-56-1	4160 kg
butanol	71-36-3	12100 kg
isopropanol	67-63-0	16600 kg
fenolföreningar		10700 kg
förbränningsprodukter		
vätecyanid	74-90-8	okänt
koloxid	630-08-0	okänt
dikväveoxid	10024-97-2	okänt
kvävemonoxid	10102-43-9	okänt
kvävedioxid	10102-44-0	okänt
halogener		okänt

Skador:

Människor:	En svårt brännskadad person.
Materiella:	Anläggningen skadades. Ings kostnadsuppgifter anges.
Miljö/ekologi:	Släckningsvatten rann ut i floden Brenne, ett biflöde till Loire-floden. Trots försök att begränsa effekterna genom att gräva dräneringsdiken konstaterades förekomst av fenolföreningar i Loire kort efter olyckan.
Infrastruktur:	Evakuering av 200 handikappade från ett närliggande hem. Tre dagars avbrott i distribution av dricksvatten efter att man upptäckt förekomsten av fenolföreningar i flodvattnet. Dricksvattenbehovet täcktes av omdistribution från angränsande dricksvattenssystem, av beuteljerat vatten och av två tankbilar om 3000 m ³ vatten.

Erfarenheter redovisade (Ja/Nej): Ja

Endast konstaterande att säkerhetsföreskrifter brutits mot, och att beredskapen var otillräcklig.

Report Profile

Identification of Report:

country: FA ident key: 1800_026_01

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

Date of Major Occurrence: Time of Major Occurrence

start: 08/06/1988 start: 03:00:00

finish: finish:

Establishment:

name:

address:

industry: 2001 general chemicals manufacture

Organic Chemical (Production of Various Chemicals for Textile and Plastic Materials Industries)

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_026_01

Accident Types:

release: Yes explosion: Yes

water contamination: Yes other: No

fire: Yes

description:

ACCIDENT CASE HISTORY DESCRIPTION:... see Appendix Short Report / description of accident types

Substance(s) Directly Involved:

toxic: Yes **explosive:** Yes

ecotoxic: Yes **other:** No

flammable: Yes

description:

The chemical products involved in the fire was over 100. The most important substances were:... see Appendix Short Report / description of substances involved

Immediate Sources of Accident:

storage: No **transfer:** No

process: Yes **other:** No

description:

The accident occurred in an organic chemical industry for the production of various chemicals for the textile and the plastic materials industries. The factory, which employed 150 people, was built in 1958 and in 1985 was provided of a new ... see Appendix Short Report / description of immediate sources

Suspected Causes:

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

human: Yes **other:** No

description:

CAUSES:... 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:** Yes

external services: Yes **restoration:** No

sheltering: Yes **other:** No

evacuation: Yes

description:

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

Immediate Lessons Learned:

prevention: Yes **other:** No

mitigation: Yes

description:

The inquiry discovered the total lack of an internal emergency plan and violation of the existing safety rules.

A Occurrence Full Report

country: FA **ident key:** 1800_026_01

1 Type of Accident

remarks: A wrong mixture in a reactor caused a confined vapour cloud explosion (code 1307) followed by a fire (code 1202). Due to the combustion of the chemical products involved in the fire, a toxic cloud (containing hydrogen cyanide, carbon oxide.... see Appendix Full Report A / type of accident

2 Dangerous Substances

remarks: Though more than 100 chemical products were involved in the accident, only the most important substances have been shown in the preceding tables. The total establishment and the potential directly involved inventories of such substances re... see Appendix Full Report A / dangerous substances

3 Source of Accident

illustration: - not applicable -

remarks: The accident occurred during mixing operations (code 3104) in an organic chemical industry for the production of various chemicals for the textile and the plastic materials industries (code 2001). The factory, which employed 150 people, was... 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 5107 operation: unexpected reaction/phase-transition

- not applicable -

- not applicable -

- not applicable -

- 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: During the process in which an emulsion of oil and water was prepared with the addition of various tensioactives, a wrong mixing operation (code 5401) was performed in a reactor of area Z9 causing a release of hydrogen (code 5107), and perh... see Appendix Full Report A / causes of major occurrence

6 Discussion about the Occurrence

- not applicable -

Type of Accident country: FA ident key: 1800_026_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 1307 explosion: VCE (vapour cloud explosion; supersonic wave front)

associated event 1401 other: combustion products into air

Dangerous substances

country: FA ident key: 1800_026_01

a) total establishment inventory

CAS number: identity: White Spirit

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): 6,2

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 6,2 **potential quantity:** 6,2

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 **indir_pot_quant:** -1

a) total establishment inventory

CAS number: identity: Toluene

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): 20,4

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 20,4 potential quantity: 20,4

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: 7664-41-7 identity: Sodium Hypochlorite

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): 0,8

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 0,8 potential quantity: 0,8

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: identity: Phenols

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): 10,7

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 10,7 potential quantity: 10,7

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: identity: Nitrogen Oxides

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: No

actual quantity: -1 potential quantity: -1

c) substance belongs to relevant inventory indirectly involved: Yes

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: identity: Naphtalene

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): 24,9

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 24,9 potential quantity: 24,9

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: identity: Methanol

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): 4,16

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 4,16 potential quantity: 4,16

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: identity: Isopropanol

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): 16,6

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 16,6 potential quantity: 16,6

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: identity: Hydrogen Cyanide

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: No

actual quantity: -1 potential quantity: -1

c) substance belongs to relevant inventory indirectly involved: Yes

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: identity: Hydrogen Chloride

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): 11,12

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 11,12 potential quantity: 11,12

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: identity: Halogens

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: No

actual quantity: -1 potential quantity: -1

c) substance belongs to relevant inventory indirectly involved: Yes

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: identity: Carbon Oxide

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: No

actual quantity: -1 potential quantity: -1

c) substance belongs to relevant inventory indirectly involved: Yes

actual quantity: -1 indir_pot_quant: -1

a) total establishment inventory

CAS number: identity: Butanol

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): 12,2

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 12,1 **potential quantity:** 12,1

c) substance belongs to relevant inventory indirectly involved: No

actual quantity: -1 **indir_pot_quant:** -1

a) total establishment inventory

CAS number: 7647-01-0 **identity:** Ammonia 22% Solution

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): 5

use of substance as: STARTING MATERIAL

b) substance belongs to relevant inventory directly involved: Yes

actual quantity: 5 **potential quantity:** 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_026_01

situation

industry

initiating event 2001 general chemicals manufacture

associated event 2001 general chemicals manufacture

activity/unit

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

initiating event 3104 process: physical operations (mixing, melting crystallizing, etc.)

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

component

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

initiating event 4001 reaction vessel; non-pressurised

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

B Consequences Full Report

country: FA **ident key:** 1800_026_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 water used to cool the vessels and to extinguish the fire caused the polluti... 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 1

other serious injuries

health monitoring

remarks Inside the establishment the worker who was performing the operation was injured... 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 The water used to cool the vessels and to extinguish the fire (500'600m³/h) caus... 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 plant was damaged by the explosion and the following fire but no data are av... 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** Yes No No

- **other places of public assembly** No No No

interruption of utilities etc. no / yes duration

- **gas** No

- **electricity** No

- **water** No three days

- **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 The authorities decided to interrupt (for three days) the distribution of drinki... see Appendix

7 Discussion of Consequences

Ecological Components involved

country: FA **ident key:** 1800_026_01

type: 6204 freshwater: river

threatened: not applicable **affected:** not applicable

type: 6102 inland: urban development

threatened: not applicable **affected:** not applicable

C Response Full Report

country: FA **ident key:** 1800_026_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

The inquiry discovered the vio... see Appendix Full Report C / lesson learned - prevent

measures to mitigate consequences:

The inquiry discovered the tot... see Appendix Full Report C / lesson learned - mitigate

useful references:

- not applicable -

5 Discussion about Response

- not applicable -

Appendices for the FA / 1800_026_01 report

Appendix Short Report / description of accident types:

ACCIDENT CASE HISTORY DESCRIPTION:

A wrong mixing operation in a reactor in the production area Z9 could caused an explosion followed by a fire. More precisely, the addition of a new product to the silicon oil caused a release of hydrogen, and perhaps also sodium hydride, due to a wrong pH control (this reaction, when was experimentally performed in a laboratory, caused a deflagration). The worker who performed the defective operation was alone in the plant. Seriously burned, he had been found many tens of metres from the point where the explosion occurred; it is unknown however if he was displaced by the explosion or if he was transported there by other people or if he had escaped before the explosion. A call for help was received at 03:07 by the centre of alert transmission of Tours and it was re-transmitted to the centres of Chateau-Renault and Amboise. At 03:20 a fire fighting vehicle from Chateau-Renault arrived on-site. Since the accident led to the rupture of three fire hydrants, two lances were installed taking water from the Brenne river, 500 metres away. At 03:40 the fire fighting vehicle from Amboise arrived and at 04:06 4 lances were in operation. Meanwhile, the fire covered a surface of about 2,000'3,000 m². At 05:52 two foam guns arrived from Tours and, when at 06:15, 2 foam tankers arrived on-site, they were put in operation with positive effects due to the synthetic foam used. Owing to the formation of a toxic cloud inside the building, at about 05:00 the Mayor of Chateau-Renault decided to evacuate a building where 200 handicapped people were housed. From 05:00 to 08:30 analyses of the cloud composition have been performed every half an hour. Those analyses revealed the presence of hydrogen cyanide, carbon oxide, nitrogen oxides and halogens. At 08:30 the analysis revealed only some traces of carbon oxide. There was the risk of intoxication for the rescuers (because they had no suitable personnel protection equipment) and also a risk of explosion of nearby reactors and vessels. The water used to cool these vessels and to extinguish the fire (500'600m³/h) caused the pollution of the Brenne river crossing the site. A dike was built a few hours after the fire started to prevent discharge of used fire fighting water to this river. Despite these measures, phenols were found in Loire river fed by the Brenne river. The authorities decided to interrupt (for three days) the distribution of drinking water to 200,000 people. Drinking water needs were estimated to be 45,000m³/day and were covered by various sources (interconnection with water networks of nearby communities, the use of water sources not affected by the pollution, the use of deep wells, extended the use of bottled mineral water and the use of two trains of 3,000 m³ capacity each).

Appendix Short Report / description of substances involved:

The chemical products involved in the fire was over 100. The most important substances were:

- Sodium Hypochlorite (C.A.S. CODE: 7681-52-9): amount involved = 800 Kg.
- Aqueous Ammonia 22% Solution (C.A.S. CODE: 7647-01-0, E.E.C. CODE: 007-001-00-5): amount involved = 5,000 Kg.
- Hydrogen Chloride (C.A.S. CODE: 7647-01-0, E.E.C. CODE: 017-002-00-2): amount involved = 11,120 kg.
- Naphtalene (C.A.S. CODE: 91-20-3): amount involved = 24,900 Kg.
- Toluene (C.A.S. CODE: 108-88-3, E.E.C. CODE: 601-021-00-3): amount involved = 20,400 Kg.
- White Spirit (C.A.S. CODE: 8030-30-6): amount involved = 6,200 Kg.
- Methanol (C.A.S. CODE: 67-56-1, E.E.C. CODE: 603-001-00-X): amount involved = 4,160 Kg.
- Butanol (C.A.S. CODE: 71-36-3): amount involved = 12,100 Kg.
- Isopropanol (C.A.S. CODE: 67-63-0, E.E.C. CODE: 603-003-00-0): amount involved = 16,600 Kg.
- Phenols: amount involved = 10,700 Kg.

Due to the combustion of the chemical products involved in the fire, the following substances were released:

- Hydrogen Cyanide (C.A.S. CODE: 74-90-8): amount involved = not known.
- Carbon Oxide (C.A.S. CODE: 630-08-0): amount involved = not known.
- Nitrogen Oxides (C.A.S. CODE: 10102-44-0 [NO₂], 10102-43-9 [NO], 10024-97-2 [N₂O]): amount involved = not known.
- Halogens: amount involved = not known.

Appendix Short Report / description of immediate sources:

The accident occurred in an organic chemical industry for the production of various chemicals for the textile and the plastic materials industries. The factory, which employed 150 people, was built in 1958 and in 1985 was provided of a new polymers production plant using benzene as solvent. It produces about 800 different chemical products. The establishment was subdivided in chemical products storage areas and reaction area. The chemical products (more than 100) were stored without particular safety criterias (toxic substances together with flammable materials and so on). On a document attached to the Original Report the list and the related amounts of the chemical products stored in the establishment when the accident occurred are shown. On that document, also, the map of the surrounding area and the lay-out of the factory are shown. The component involved in the explosion was a reactor in the production area Z9, located in an old metallic hangar.

Appendix Short Report / description of suspected causes:

CAUSES:

During the process in which an emulsion of oil and water was prepared with the addition of various oxyethylenic tensioactives, a wrong mixing operation was performed in a reactor of area Z9 causing a release of hydrogen, and perhaps also sodium hydride, due to a wrong pH control (this reaction, when was experimentally performed in a laboratory, caused a deflagration) that resulted in an explosion. Investigations by an inspector established that the operating procedures were not well defined and training of personnel was insufficient.

Appendix Short Report / description of immediate effects:

EFFECTS ON PEOPLE:

Inside the establishment the worker who was performing the operation was injured (and hospitalized) by the explosion.

MATERIAL LOSS:

The plant was damaged by the explosion and the following fire but no data are available about the cost of the material losses.

ECOLOGICAL HARM:

The water used to cool the vessels and to extinguish the fire (500~600m³/h) caused the pollution of the Brenne river crossing the site. A dike was built a few hours after the fire started to prevent discharge of used fire fighting water to this river. Despite of these measures, phenols were found in Loire river fed by the Brenne river.

COMMUNITY DISRUPTION:

The authorities decided to interrupt (for three days) the distribution of drinking water to 200,000 people. Drinking water needs were estimated to be 45,000m³/day and were covered by various sources (interconnection with water networks of nearby communities, the use of water sources not affected by the pollution, the use of deep wells, extended the use of bottled mineral water and the use of two trains of 3,000 m³ capacity each).

Appendix Short Report / description of emergency measures taken:

INTERNAL TO THE ESTABLISHMENT:

A call for help was received by the centre of alert transmission of Tours and it was re-transmitted to the centres of Chateau-Renault and Amboise. First, a fire fighting vehicle from Chateau-Renault arrived on-site. Since the accident led to the rupture of three fire hydrants, two lances were installed taking water from the Brenne river, 500 metres away. After, a fire fighting vehicle from Amboise arrived and 4 lances were in operation. Meanwhile, the fire covered a surface of about 2,000~3,000 m². Later, when 2 foam guns from Tours and 2 foam tankers arrived on-site, they were put in operation with positive effects due to the synthetic foam used. The water used to cool these vessels and to extinguish the fire (500~600m³/h) caused the pollution of the Brenne river crossing the site. A dike was built a few hours after the fire started to prevent discharge of used fire fighting water to this river. Despite these measures, phenols were found in Loire river fed by the Brenne river.

EXTERNAL TO THE ESTABLISHMENT:

Owing to the formation of a toxic cloud inside the building, at about 05:00 the Mayor of Chateau-Renault decided to evacuate a building where 200 handicapped people were housed. Analyses of the cloud composition had been performed every half an hour. Those analyses revealed the presence of hydrogen cyanide, carbon oxide, nitrogen oxides and halogens. At 08:30 the analysis revealed only some traces of carbon oxide. As phenols were found in Loire river (fed by the Brenne river) the authorities decided to interrupt the distribution of drinking water to 200,000 people.

Appendix Full Report A / type of accident:

A wrong mixture in a reactor caused a confined vapour cloud explosion (code 1307) followed by a fire (code 1202). Due to the combustion of the chemical products involved in the fire, a toxic cloud (containing hydrogen cyanide, carbon oxide, nitrogen oxides and halogens) formed (code 1401) but with no particular effects. The water used to cool the vessels and extinguish the fire caused the pollution of the Brenne river, crossing the site, and of the Loire river fed by it (code 1405).

Appendix Full Report A / dangerous substances:

Though more than 100 chemical products were involved in the accident, only the most important substances have been shown in the preceding tables. The total establishment and the potential directly involved inventories of such substances refer to the amounts in the storage areas when the accident occurred. No data are available about the amounts of hydrogen cyanide, carbon oxide, nitrogen oxides and halogens released during the combustion of the chemical products involved in the fire.

Appendix Full Report A / source of accident - remarks:

The accident occurred during mixing operations (code 3104) in an organic chemical industry for the production of various chemicals for the textile and the plastic materials industries (code 2001). The factory, which employed 150 people, was built in 1958 and produces about 800 different chemical products. The component involved in the explosion was a reactor in the production area Z9 (code 4001). The fire involved the chemical products storage areas (codes 3201 and 4003).

Appendix Full Report A / causes of major occurrence:

During the process in which an emulsion of oil and water was prepared with the addition of various tensioactives, a wrong mixing operation (code 5401) was performed in a reactor of area Z9 causing a release of hydrogen (code 5107), and perhaps also sodium hydride, due to a wrong pH control that resulted in an explosion. Investigations by an inspector established that the operating procedures were not well defined (code 5303) and training of personnel was insufficient (code 5304).

Appendix Full Report B / area concerned - remarks:

The water used to cool the vessels and to extinguish the fire caused the pollution of the Brenne river crossing the site and phenols were found in Loire river fed it. Owing to the formation of a toxic cloud inside the building, the Mayor of Chateau-Renault decided to evacuate a building where 200 handicapped people were housed. Analyses of the cloud composition have been performed every half an hour, revealing the presence of hydrogen cyanide, carbon oxide, nitrogen oxides and halogens.

Appendix Full Report B / people:

Inside the establishment the worker who was performing the operation was injured (and hospitalized) by the explosion. Owing to the formation of a toxic cloud inside the building, the Mayor of Chateau-Renault decided to evacuate a building where 200 handicapped people were housed. As phenols were found in Loire river (fed by the Brenne river) the authorities decided to interrupt the distribution of drinking water to 200,000 people.

Appendix Full Report B / ecological harm:

The water used to cool the vessels and to extinguish the fire (500~600m³/h) caused the pollution of the Brenne river crossing the site. A dike was built a few hours after the fire started to prevent discharge of used fire fighting water to this river. Despite of these measures, phenols were found in Loire river fed by the Brenne river.

Appendix Full Report B / material loss:

The plant was damaged by the explosion and the following fire but no data are available about the cost of the material losses.

Appendix Full Report B / disruption of community life:

The authorities decided to interrupt (for three days) the distribution of drinking water to 200,000 people. Drinking water needs were estimated to be 45,000m³/day and were covered by various sources (interconnection with water networks of nearby communities, the use of water sources not affected by the pollution, the use of deep wells,

extended the use of bottled mineral water and the use of two trains of 3,000 m3 capacity each). A building where 200 handicapped people were housed was evacuated.

Appendix Full Report C / lesson learned - prevent:

The inquiry discovered the violation of the existing safety rules.

Appendix Full Report C / lesson learned - mitigate:

The inquiry discovered the total lack of an internal emergency plan.