

EXPERIENCE FEEDBACK RIVER ACCIDENT LA VOULTE SUR RHÔNE



18 January 2004

Capitain Alain LARATTA SDIS 07

"Accidental pollution of inland waters 22 March 2007 INHES"



ACCOUNT OF EVENTS

- **On Sunday 18 January 2004 at 6:30 am, a CFT (Compagnie Fluviale de Transport) river convoy was travelling up the river from Fos-sur-Mer to Lyon, when, as it passed under the rail bridge which crosses the Rhône in the commune of Voulte, it was unable, for unknown reasons, to stay in lane. The flooded push tug began to sink.**
- **Of the five crew members onboard, one lost his life, while the four others managed to reach the container barge before the push tug sank.**
- **It was a week later before the situation was back to normal.**

North

Diagram (BEFORE)

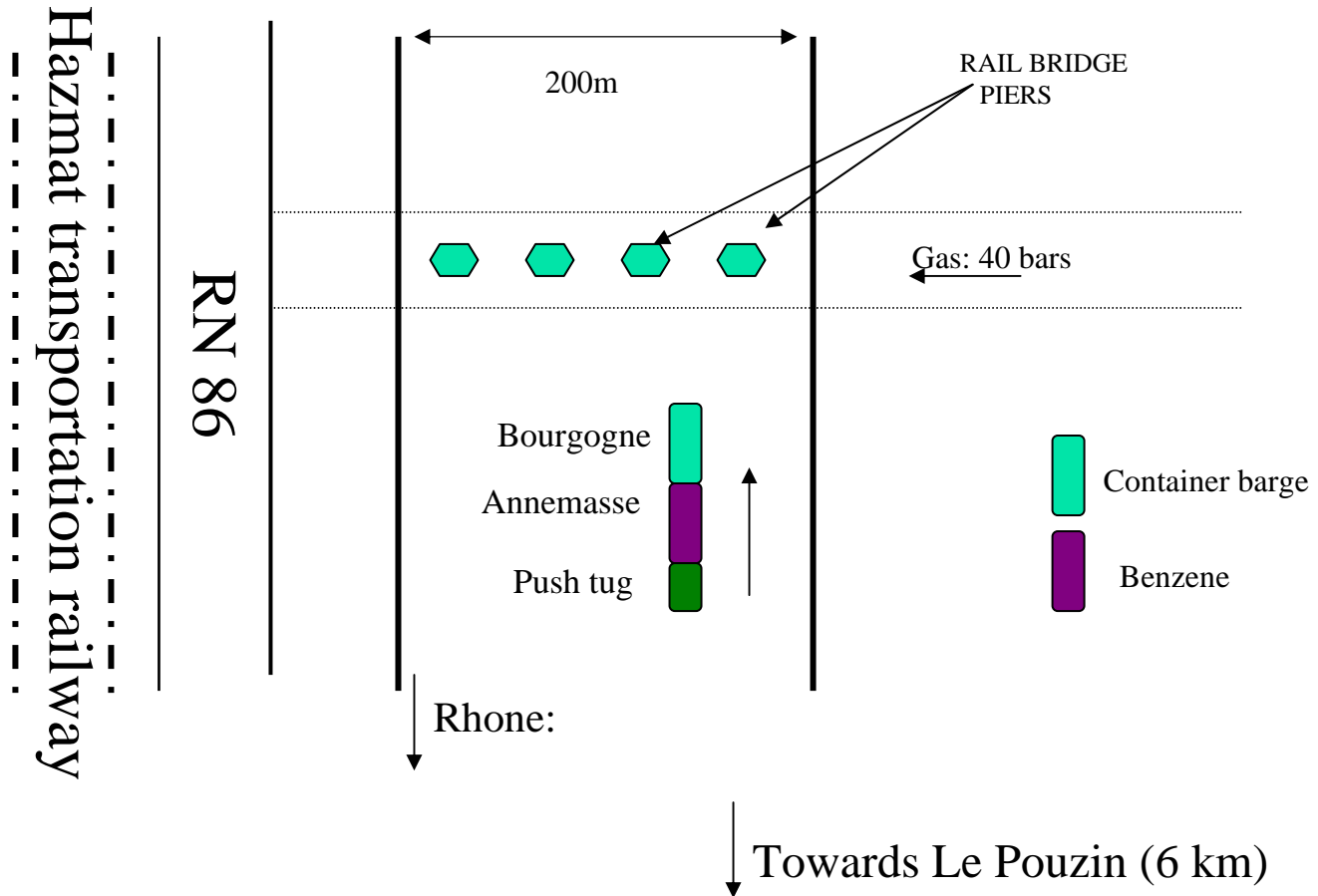
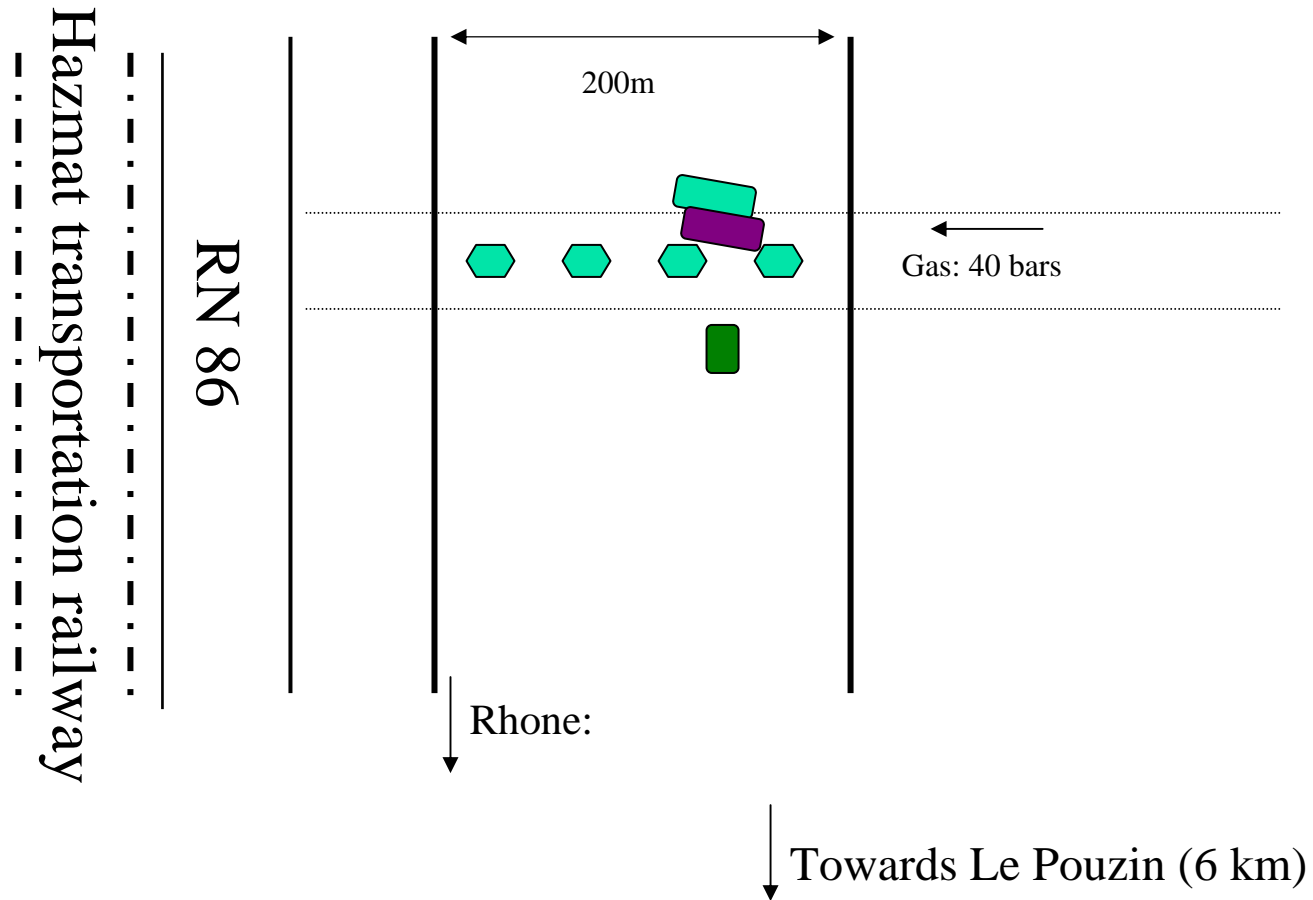


Diagram (AFTER)

North





IMMEDIATE REACTIONS of first S.O.C.

- Surveying to identify the presence of LEAK(S)
- Identification of merchandise:
 - Container barge
 - Hazmat transportation barge
- Reflex perimeter 300 metres away



STAGE 1

- CONTACT ZONAL OPERATIONAL CENTRE (Z.O.C.)
- ▶ Confirmation of perimeter using equivalent T.N.T. perimeters



STAGE 2

- Set up an operational response centre (ORC)
 - Assessment of dangers and actions to be taken in case of fire.
- Set up a permanent response centre (PRC)
 1. Assessment of resistance of the bridge pier
 2. Maintenance of gas transportation
 3. Evacuation of barges



ACTIONS TAKEN BY THE EMERGENCY OPERATIONS OFFICER

- **Stop** the GAS supply
- Set up GAS distribution by **truck**
- **Stop** rail traffic
- Working group **EVACUATION** of BARGES
- Working group **RESISTANCE** of piers
- CONCERN: **CHEMICAL RISK**



FURTHER PROBLEMS

- **STOP GAS SUPPLY**

- Supply to commune
- Supply to industries
- **Distribution by truck**

- **STOP RAIL TRAFFIC**

- **Build-up at the station in Valence (26)**



ROLE AND MISSION OF THE FIRE SERVICE

- **Safety** at each stage:
 1. Evacuation of inhabitants
 2. Evacuation of barges
 3. Unloading
- Setting up a **network of measures**
- **Fire** protection/lighting



ROLE AND MISSION OF THE FIRE SERVICE (cont.)

- **Risk** assessment
- **Communication** network for the whole system
- **Logistics** for all participants



Risk assessment during each phase according to the different scenarios

- Phase 1: **Evacuation** of the container barge (barge Bourgogne)
- Phase 2: **Unloading** of the barge transporting benzene (Annemasse)
- Phase 3: **Evacuation** of the barge Annemasse



Source

- Product transported: **Benzene**
- Quantity: 2200m³
- Storage: 7 compartments
- Temperature in tanks: 12°C
- Pressure inside tanks: 1.06 bars

BENZÈNE

C₆H₆

33

1114



Syn. —
Angl. Benzene
All. Benzol

2 3 0 0 4

Ho 39
INRS 49
KB B12
Sax 403
440

DESCRIPTION

Liquide très mobile, incolore, odeur aromatique caractéristique.
Vapeurs beaucoup plus lourdes que l'air. Liquide plus léger que l'eau.
Insoluble dans l'eau. Ne réagit pas avec l'eau.
Réaction neutre. Non corrosif. Excellent dissolvant. (Caoutchouc).

DANGERS

Liquide très **INFLAMMABLE** et excessivement volatil.
Les vapeurs forment à **toutes** températures des mélanges **EXPLOSIFS** avec l'air.
Produit **TOXIQUE** par inhalations **répétées**: empoisonnement du sang. Effet narcotique avec paralysie respiratoire. Produit irritant pour les voies respiratoires, les yeux et la peau.
Attention: Liquide absorbé par la peau.

FEU

Extinction: MOUSSE, POUDRE, eau pulvérisée. Refroidir la citerne.

MATÉRIEL

Appareils respiratoires. Gants, bottes, pantalon ou tablier plastique. Explosimètre.
Pompes, lampes, outils, etc. de type "Ex". Si nécessaire combinaison légère.
(Pompe: Inox; Tuyau: "Viton"). (Filtre: BRUN: A).

DÉVERSEMENT

Terre: Endiguer le liquide. Pomper et/ou absorber. Boucher les égouts.
Evacuer et ventiler les sous-sols. **Attention au FEU.**
Eau: Endiguer le liquide. Laisser décanter. Pomper et/ou absorber.
Attention au FEU. POLLUTION.

INTOXICATION

Contact: Retirer les vêtements souillés. Rincer la peau et spécialement les yeux à grande eau. Intoxication possible par contact. Cf. ci-dessous.
Respiration ou contact: Air frais, respiration artificielle, oxygène. Médecin.

Constantes

PE: 80°C / PF: - 6°C / P vap: 76 Torr / T inflam.: 550°C /
Pt éclair: - 11°C / Lim. expl.: 1,2-8 % vol / Index évap.: 3 /
d vap: 2,7 / d liq: 0,88 / Sol. eau: 0,7 g/l / MAK: 8 ppm /
Odeur seuil: 5 ppm /
C₆H₆ / PM: 78 /



Hazards

- U.V.C.E.: - toxic or explosive
- B.L.E.V.E.
- Toxic
- Thermal
- Pollution



Targets

- General public: local inhabitants
- Personnel in the vicinity (Fire service, private personnel)
- Environment: the Rhone and the atmosphere
- Communications: RN86 and hazmat by rail



Parameters

- North wind blowing at 30-40Km/h i.e. 8-11m/s
- Rate of Rhone: 3000m³/s
- Water temperature: 7°C
- Double hull vessel, outer hull pierced.



Risks

- **Fragilisation** of rail bridge pillar on which the barges rely
- **Leak**
- **Explosion**



Exacerbating factors

- **Steady increase** in the flow of the Rhone throughout operations
- **Unknown** resistance of the bridge piers
- **Gas pipe** with a pressure of 40 bars passing over the rail bridge



Phase 1: Evacuation of the barge Bourgogne

- Risk of 2 barges **scraping**
- Risk of 2 barges **colliding**

These 2 risks can lead to all the above-mentioned hazards

Voulte sur Rhône
Around 5250 inhabitants
11 companies

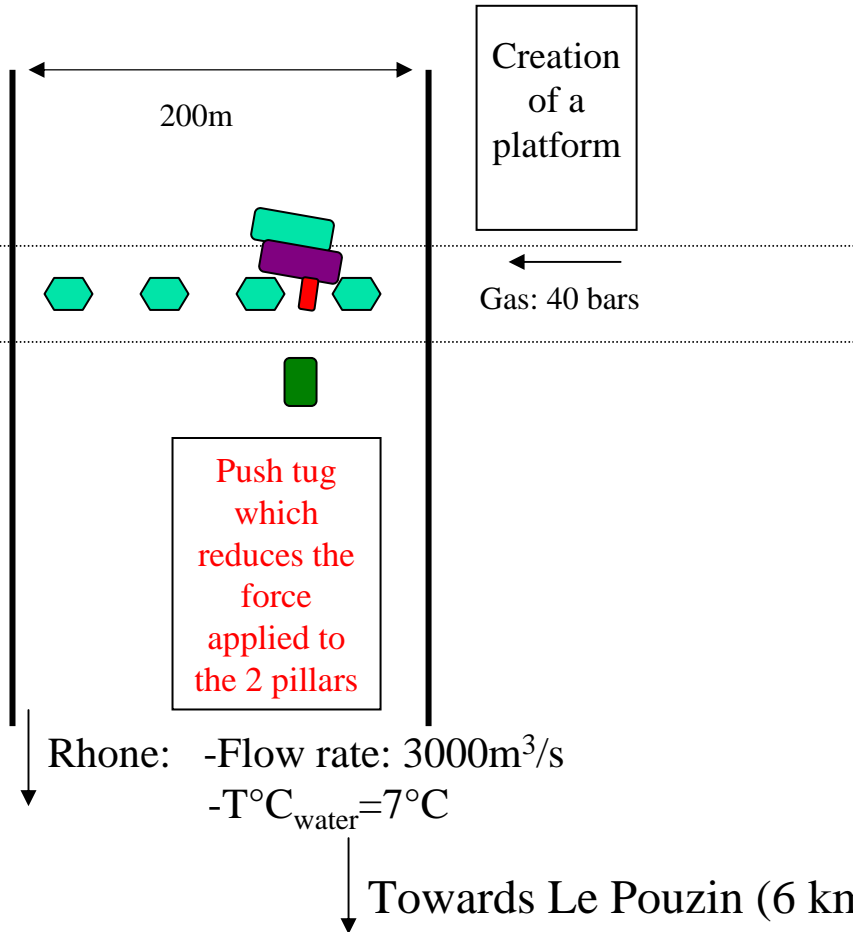
North wind
30-40 km/h
i.e. 8-12 m/s

North



Hazmat transportation railway

RN 86





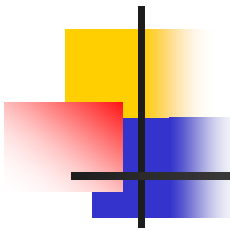
Phase two: Unloading of the barge Annemasse

- By rail:

= > Pb: -1 carriage = 60m^3 , therefore require **37**

- **Long time** needed for transportation

- Convoy around 150 m long, hence pressure drop and increase in the **risk of leaks** at joints



Phase 2: Unloading of the barge Annemasse

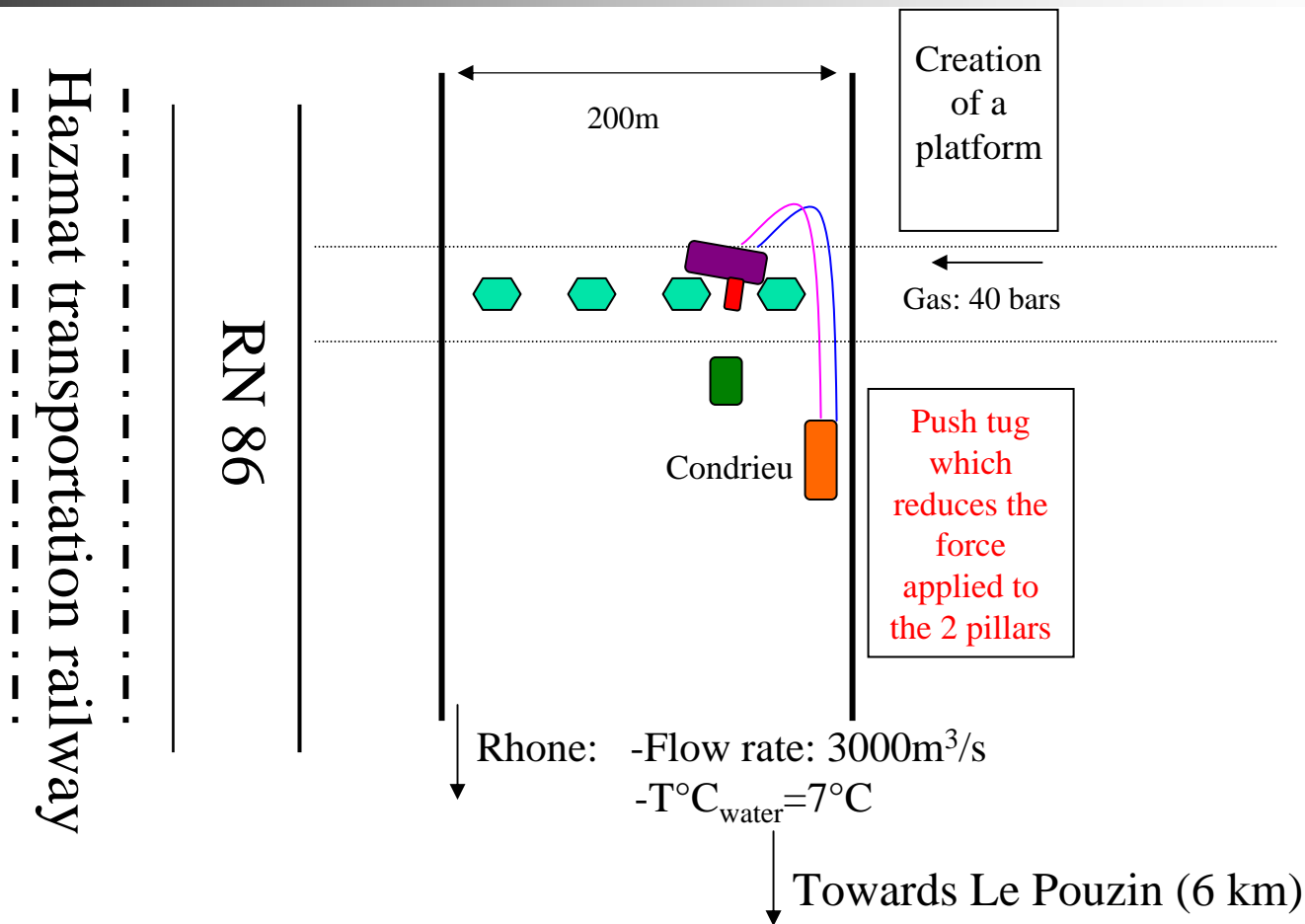
- By river: using another barge

=>Pb: Only one vessel (Condrieu) which had not operated for 1 year and was a **single hull**, resulting in a loss of time to obtain a ship's passport

Voulte sur Rhône
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North wind
30-40Km/h
i.e. 8-12 m/s

North





Phase 2: Unloading of the barge Annemasse

The second solution is chosen.

- If unloaded using the barge Condrieu filled with air, risk of entering the LEL-UEL => **risk of explosion**

=> Proposition: **nitrogen inerting** of the tanks of the Condrieu.

As the tanks of the Condrieu are filled (from the bottom), the nitrogen is sent into the barge Annemasse by a dual pipe network.



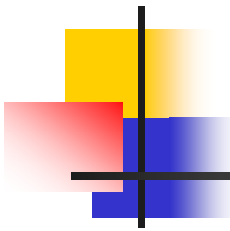
Phase 2: Unloading of the barge Annemasse

- **Risk of a leak in a pipe**

=> formation of an **EXPLOSIVE ATMOSPHERE** if watertightness is not ensured but also due to the variation in the product's vapour pressure according to the temperature and changes in atmospheric pressure.

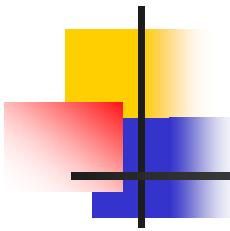
=> formation of a **U.V.C.E.**

=> **pollution:** -gas
 -liquid



Phase 2: Unloading of the barge Annemasse

- Explosion: minimised by the presence of N_2 .



Phase 2: Evacuation of the barge Annemasse

- Once the cargo has been unloaded, the risks during the evacuation of the Annemasse are **very minimal**.





DETERMINING SAFETY PERIMETERS

- T.N.T. equivalent: for the **RISK OF EXPLOSION**
 - $P=50\text{mb}$ $\lambda=22$ $R=560\text{m}$
 - $P=140\text{mb}$ $\lambda=10$ $R=252\text{m}$

The **EMERGENCY OPERATIONS OFFICER** will enforce a public exclusion zone of **500** metres

DETERMINING SAFETY PERIMETERS



- I.N.E.R.I.S. model: for the **RISK OF EXPLOSION**
 - at 500 ppm  160 metres (I.D.L.H.)
 - at 1 ppm  6.2 km (M.E.V.)

The **EMERGENCY OPERATIONS OFFICER** will enforce a public exclusion zone of **160** metres



Positive aspects

- **Stable, favourable** weather conditions
- **Small population** in the vicinity
- **Double hull** benzene barge
- Fire department of Voulte chosen as the O.R.C.
- **Good inter-service collaboration**



Negative aspects

- **Lack of coordination** O.R.C./P.R.C. at beginning of crisis
- Too much **scattered information**
 - Several requests
- **Absence** of a specialised river hazmat contingency plan
- **Absence** of experience feedback on the manoeuvring of the barges



Conclusions

- The duration depended on private means
- Our competences were only recognised gradually
- Recognition of the **INERIS EMERGENCY SUPPORT UNIT**
- Experience feedback caused us to:
 - Revise safety management and risk analysis policies
 - Accelerate the "RISQUE TECHNO" plan