

FACTS Database with hazardous materials used for industrial safety maintained by the Department of Industrial Safety of TNO Coded Accident Abstract		Accident Nr. 12537
Identification		
<i>Type</i>	<i>Value</i>	<i>Text</i>
Class	* * * * *	-
Abstr	Extended abstract english	-
Abstr	Extended abstract french	-
Address	Ch	
Adate	1994	
Time		0256
Activ	Railtransport	Running
Loctn	Railwaystation	-
Surr	Built-up-area	City
Encir	Clear	Warm weather during night
Encir	Hot	During day
Encir	Temperature	33/C (in shadow)
Dtype	Public-utility	-
Cause		
<i>Type</i>	<i>Value</i>	<i>Text</i>
Cause	Unknown-cause	Derailment
Description		
<i>Type</i>	<i>Value</i>	<i>Text</i>
Occur	Drive	Drove
Eqinv	Freighttrain	50 cars
Length		690/m
Load		1753e+3/Kg (total)
Occur	Constructionwork	In railwaystation, train had
Occur	Drive	Passed the railway-station by
Eqinv	Railtrack	Another track
Occur	Human-operations	Stopped for change of
Hminv	Operator/Driver	Engine-driver
Speed		Low
Occur	Derailment	Lifted and derailed, one axle
Eqinv	Freightwagon	No.25 (in the middle), 2-axled
Load	Empty	-
Eqinv	Freighttrain	Continued its ride
Occur	Drive-out	Of empty wagon and other 14
Eqinv	Freightwagon	Derailed no. 23-36
Occur	Overturn/Capsize	Of 5 wagons, 3 of them were
Eqinv	Tankwagon (railroad tank car)	3, no. 31+32 filled with
Chem	Epichlorohydrin (ech)	-
State	Liquid	-
Qcont		47/M3 each
Load		112e+3/Kg (total)
Eqinv	Tankwagon (railroad tank car)	No. 34 filled with
Chem	Thionyl chloride	-
State	Liquid	-
Qcont		24/M3
Occur	Penetrate/Puncture	Tankwagon no. 31
Occur	Release	Leaking
Spill		2240/Kg or 400/l
Eqdm	Tankwagon (railroad tank car)	No. 34, no release

Occur	Pollution/Contamination	Of epichlorhydrin
Occur	Penetrate/Puncture	Into subterranean water
Eqinv	Drain	Canalisation /Sewer-system
Occur	Fire fighting/Emergency response	Foam to prevent explosion
Occur	Safety-measures	Ventilation of canalisations
Psa/Ppe		Wear heavy protected gear
Occur	Pump-over	From overturned tankwagons
Eqinv	Tankwagon (railroad tank car)	No. 31+32 (epichlorohydrin)
Eqinv	Tankwagon (railroad tank car)	No. 34 (thionyl chloride)
Eqinv	Tankwagon (railroad tank car)	Into empty and clean
Occur	Clean-up	-
Occur	Remove	Waste-treatment by specialists
Occur	Fire fighting/Emergency response	Police and firemen
Time		0629 705 persons
Time		0630 850 persons
Time		0701 826 persons
Time		0702 214 persons
Time		0703 78 persons
Occur	Evacuation	Explosion danger and toxic gas
Hminv	Citizen/Resident	1050/2200 in buildings
Date		29 jun.1992
Time		1050 (explosion-danger)
Date		1 jul.1992
Time		2200 (toxic gas)
Injurs	Fireman/Firefighter	11
Wdng	Wound	Minor injuries
Occur	Traffic-interruption	In railwaystation
Dtime		3/Days
Cost	Loss-of-property	>5e+6 ch francs
Photo		2
Lesson		See extended abstract

Scene

<u>Type</u>	<u>Value</u>	<u>Text</u>
Scene		Derailment and roll over of tankwagons
Scene		While entering railwaystation caused
Scene		Evacuation and 11 casualties

EXTENDED ABSTRACT ENGLISH

In the night, at 0256 hours, a freighttrain composed of 50 wagons (1753E+3/kg) circulates at low speed in the railway station of Lausanne. This 690/m long convoy composed of 50 railroad tanker cars (130 axles) with a tonnage of 1753E+3/kg entered the Lausanne train station on platform 3. When it travelled over switch 75a located on the station's east side, the 25th car (empty 2-axle car) jumped the track. It continued its course, travelled over the railroad ties and hugged the edge of the platform.

While at the station, this train was stopped for service and change of mechanic. At the time of departure, the wheels of the derailed car remained caught between the track and the curb. At the end of the platform, in the switching area, the 2 cars preceding the empty car and the 11 others following it derailed.

Of a total of 14 cars, partially or totally derailed, 5 - including 3 container cars with hazardous materials - flipped over. The first contained thionyl chloride (UN-1836), the 2 others epichlorhydrin (UN-2023). The first container of epichlorhydrin became slightly

perforated and caused leakage. The cars with hazardous materials involved in the accident had a capacity of 47/m³ each for epichlorhydrin and 24/m³ for thionyl chloride. Out of 14 involved cars, 5 end up lying on their side, in particular, 2 tankwagons (47/m³ each) containing epichlorohydrin and 1 tankwagon (24/m³) containing thionyl chloride. One epichlorohydrin tank was perforated and leaked about 400/l, the thionyl chloride one did not leak but had been severely damaged.

At 0256 hours, a resident dialed 117 to inform the switchboard of the municipal police that a unusual event had just taken place at the end of the railway station. At the same time, by dialing the service number of the state police, the traffic chief of the station notified cantonal authorities that a derailment had just taken place at the city train station across from the command post.

The first alarm was triggered pursuant to the provisions contained in the Disaster Preparedness Plan of the city. It was followed at 0321 hours by a general alarm. All emergency personnel - fire and police departments, sanitation, civil protection, water utility and environmental protection - soon arrived on the scene. Organization, task assignment and command operations were implemented in accordance with the existing plan K (city) and ORCA (canton).

Emergency intervention took place in 13 phases spread over 4 periods. The first period corresponded to the initial situation, the minutes that followed the accident, the alarm, and the rush to gather information on the nature of the product transported by the freight train.

During the second period, the event itself took control: the situation had to be managed immediately to keep things under control (chemical leak). The third period started when the situation was under control. Product transfer operations were planned and conducted with a calculated risk and dictated by safety considerations. The fourth period concerned the normalization of the situation: restoration of train station operations, removal of damaged cars, cleaning and dismantling.

Foam was used to prevent evaporation of the epichlorhydrin.

Various problems of different type had to be overcome during the operation. The chemical characteristics of the products dictated the intervention parameters. Since the product that leaked from the train car was epichlorhydrin, it had to be recovered rapidly and the leak stopped. The run-off into the ballast and into water evacuation channels caused a risk of explosion in the neighborhood below the station. With the train car flipped on its side, there was a problem to transfer the product. As far as the thionyl chloride is concerned, the seriously damaged train car on its side made the situation extremely complicated especially in terms of transfer. Lifting the train cars required heavy equipment and the use of considerable resources: collecting basin around the train car, product neutralization, and evacuation around the site. Product transfer required the use of a pump especially adapted to the product. In addition, during the entire chemical intervention, firemen operated in heavy gear at temperatures often exceeding 30/??C.

The evacuation of the population was conducted in close collaboration with the police department (actual evacuation and site monitoring), sanitation services (hospitality and sanitary inspection) and civil protection for welcoming evacuated individuals to the facilities.

Some 1050 persons were evacuated on day one, some 2200 on day three.

Cause

It is possible that during braking, the light empty car travelling over a switch and being out of alignment in regard to the heavy following cars, is submitted to the thrust of these cars, is lifted and jumps the track.

Lessons learned

Among the lessons that can be learned from this intervention there are some that are

well worth mentioning. Despite all safety precautions, such an accident is always possible even if the likelihood is low. This time, chance was not on our side. An analysis of the accident and the entire situation has shown that several conditions combined to trigger a major accident. The perfect management of a crisis and emergency situation with the considerable risk of a major accident has demonstrated the adequate level of overall intervention services put in place on the cantonal level.

Through the creation of case-specific files, the implementation of the Lausanne disaster plan facilitated operations. In addition to the training of personnel and emergency drills, the mutual familiarity of crews and their equipment was a major asset which made work much easier.

Overall organization of the command proved perfectly adapted to the situation. In the field, command setup proved to be operational. It was based on task delegation and on compiling reports involving action, orientation and coordination, scheduling and decision-making.

The time factor was decisive at all times in the sequence of operations. Technical and chemical constraints extended each operation and the complexity of the problems made it necessary to take the time to properly plan task implementation.

Intervention on the site of the accident required the wearing of heavy gear particularly for work on the damaged rail cars and on the product. Accordingly, a compromise had to be found between protection and practicality for the execution of tasks that were particularly delicate.

Businesses that were concerned to varying degrees by the accident - as suppliers or as users - offered spontaneous support to the emergency crews.

The railway company never put these crews under pressure at any time. Despite the financial losses due to the non-operation of the station and a part of the regional rail system, they reiterated that safety had to prevail over any economic concerns.

The relations with the printed and broadcast media were excellent and constructive throughout. They were allowed to inform the public in an optimal manner. In addition, the switchboard of the municipal police department recorded 6166 calls between 0600 hours on Wednesday June 29 and 10 hours Saturday July 2.

Overall, it can be confirmed that evacuees reacted well to the crisis situation following the accident. Indeed, they followed immediately the evacuation orders issued by the police despite the advanced hour (nighttime).

With the chief physician constantly present at the command post, the excellent coordination of the sanitation department with the other authorities made it possible to continually adapt services to a changing situation.

The chief physician was forced to recognize that in the event of a true catastrophe, the capacity potential of local, regional, cantonal and even national services would have been insufficient to respond to a large number of injured.

This derailment brought about a total interruption of traffic at the Lausanne train station from Wednesday June 29 0256 hours until Friday July 1, 1994 at about 2300 hours. The epichlorhydrin car caused the loss of some 2,240 kg product out of 112E+3/kg transported (in two cars). Only 11 individuals suffered minor injuries during the crisis. The accident mobilized 705 emergency personnel on day one, 850 on day two, 826 on day three, 214 on day four and 78 on the fifth and last day of the accident. All emergency personnel - fire fighting, police, medical, civil protection and environmental protection services - arrived quickly at the scene.

Two different interventions can be distinguished:

a.

immediately stopping the epichlorhydrin leakage and

b. the very complex transfer of the thionyl chloride into a new container.

The epichlorhydrin problem (toxic, inflammable):
leakage and infiltration into the sewer system caused:

1. installation of a triple fire prevention: water, foam, powder (water for cooling the containers and feeding the water screens in order to confine inflammable vapours, a foam cover to prevent evaporation and powder to fight a fire at its very beginning), preventive evacuation of the neighbouring population (1050 persons), ventilation of the sewer system (using hydro-blowers in order to avoid ignition of explosive gaseous mixtures),
 2. clogging of the leakage, made difficult by the deformations of the container,
 3. recovering of the leaking substance,
 4. transfer of the substance to a new tankwagon (this was hard as the car was lying on its side),
 5. inertisation with CO₂ of the empty containers (in order to avoid formation of explosive mixtures with air),
 6. removal of the damaged tankwagons.
- Out of 112E+3/kg transported substance, 108E+3/kg were directly transferred, 1.8E+3/kg were recuperated in small containers and 2.2E+3/kg were lost.

The thionyl chloride problem (toxic, non-inflammable):
the substance reacts violently with water liberating toxic gases; it reacts with metals giving inflammable gases.

1. it was impossible to transfer the substance with the container lying on its side,
 2. preventive evacuation of the neighbouring population (2200 persons),
 3. installation of a collecting basin around the container (filled with absorbent and slake lime),
 4. installation of a preventive water screen (water with 3% NaOH) and nozzles (fed with the same solution) ready to use in case of leakage,
 5. lifting of the tankwagon, very complex operation,
 6. transfer of the substance, employing a Teflon lined pump, to a new container,
 7. removal of the damaged tankwagon.
- At the end of this intervention, the absorbent and slake lime were used to decontaminate the epichlorohydrin polluted area.

Final observations:

1. the interventions were conducted in hot weather (temperature above the flash-point of epichlorohydrin),
2. wearing of heavy protective gear was required,
3. mobilization of a large number of personnel (maximum of 850 on one day),
4. traffic in the railway station of Lausanne was totally interrupted for 68 hours,

5.

11 individuals suffered minor injuries,

The cost of the accident was about 4E+6 USA dollars.

Efficacy of emergency plans was confirmed. However, the medical authorities were forced to recognize that in the event of an important catastrophe, they would have been in serious trouble dealing with a large number of injured people.

Lessons learned

A delegation from the Swiss chemical industry association SGCI is to meet with the Swiss rail company to propose that the Swiss railway introduce a quality system incorporating transparent standards for rail transport of dangerous goods, similar to that already applied in some countries for road transport.

EXTENDED ABSTRACT FRENCH

Un train de 50 wagons mesurant près de 700 mètres de longueur en gare. Sept wagons se couchent sur la voie et deux d'entre eux contenant 80000 l de dichlorhydrate, laissent échapper 400 l de ce produit toxique, volatil et inflammable. Plus de 500 pompiers interviennent afin de colmater les brèches et ventiler les dégâts. Par mesure de sécurité, l'ensemble du quartier est évacué, soit environ 1500 personnes; aucun blessé n'est à déplorer. Cet accident serait vraisemblablement dû à une erreur d'aiguillage.

Un train de longueur 2h56 en gare de X; 7 des 50 wagons du convoi de 690 m (1753 t) se couchent sur la voie, 2 d'entre eux transportant au total 80000 l de dichlorhydrate fuient, laissant échapper 400 l de produit chimique toxique, volatil et inflammable. L'alerte est donnée à 3h14, plus de 500 pompiers interviennent pour colmater les brèches, récupérer le produit répandu et ventiler les dégâts. Tout le quartier, soit 1 500 personnes, est évacué par mesure de sécurité durant l'intervention des secours. Aucun blessé n'est à déplorer. Dans les 4 jours qui suivent, les citernes de dichlorhydrate et de chlorure de thionyle sont vidées, les wagons renversés sont relevés, évacués ou remis à leurs destinataires. La population sera à nouveau évacuée durant les opérations dangereuses (relevage). L'accident est dû à une erreur d'aiguillage. Le train entre en gare sur la voie no 3. Lors de son passage sur l'aiguille 76a, c'est-à-dire de la gare, le 25^{ème} wagon vide et 2 essieux se soulèvent, retombent sur les voies et poursuivent sa course en roulant sur les traverses, tout en s'appuyant sur le bord du quai. Le train effectue un arrêt de service en gare pour remplacement du mécanicien, mais au redémarrage du convoi, les roues du wagon déraillent restent prisonnières entre le rail et la bordure. À l'extrémité du quai, dans la zone des aiguilles, les 2 wagons qui précèdent le wagon vide et les 11 autres qui le suivent déraillent. Sur 14 wagons, sortis totalement ou partiellement des rails, 5 dont 3 citernes contenant des marchandises dangereuses, se couchent sur les voies. L'une transporte du chlorure de thionyle et les 2 autres de dichlorhydrate. La première citerne de dichlorhydrate est gravement percée ce qui provoque un coulement. Les wagons de matières dangereuses accidentés ont une capacité respective de 47000 l pour le dichlorhydrate et de 24000 l pour le chlorure de thionyle.