

Natural triggering event: Severe cold spell

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Crushing of a butadiene tank at a marshalling yard

27 December 2010

Woippy (57)

France



DREAL Alsace Regional Agency

THE ACCIDENT AND ITS CONSEQUENCES

A pressurised liquefied butadiene tank, which had been drained but not yet degassed, collapsed on one of the tracks at the Woippy marshalling yard during a period of intense cold weather (temperatures as low as -17°C). Due to its ensuing deformation, the railcar was no longer in a state to circulate and furthermore caused a micro leak on a tank valve.

Prior to being moved, the tanker car first had to be inerted with nitrogen and drained onsite. This step was performed by technicians specially called to the scene as part of the TRANSAID accident response protocol. The entire sequence of steps was carried out under continuous supervision of fire-fighters with the Moselle Departmental Fire Services unit.

In order to avoid igniting a cloud of butadiene in the event the leak worsened during these operations, a 300-m safety perimeter was set up, in conjunction with total stoppage of night-time rail traffic on all nearby tracks, notably affecting traffic on the Luxembourg-Metz line.

No incident occurred during these operations, during which the tank was suddenly re-inflated and nearly restored to its initial shape, thus allowing it to be moved along the marshalling yard's adjacent tracks before transfer to the repair shop.

Nonetheless, the tank remained heavily damaged and unsuitable for transport (property loss: approx. €200,000).

ORIGIN / CAUSES

This drained, yet not degassed, tanker car had contained a residual quantity of some 870 kg of product, which during the winter period was exposed to temperatures below its boiling point (-4.5°C). The butadiene gas, which had formed the car's vapour expansion space, subsequently liquefied, triggering a pressure loss estimated at 0.35 bar (i.e. the tank's lower limit design pressure).

After being parked at an industrial site in Chalampé (department: 68), during its transit at the Woippy train station the tank was drained on 20 December 2010 and placed back on the tracks on the 22, headed for Creutzwald, where it was to undergo periodic maintenance in a repair shop. The ambient temperature at the time was around 0°C.

The industrial firm assigned to drain the railcar in Chalampé had followed a procedure that specified injecting nitrogen into the tank so as to avoid depressurisation, but this instruction was only applicable once the site's ambient temperature had reached -10°C.

It had not been anticipated therefore that the tank might subsequently be subjected to more severe depressurisation conditions. On 26 December, the ambient temperature dropped to -17°C and exposed the tank to a substantial pressure loss, eventually leading to its collapse.

ACTIONS TAKEN

The investigations, observations and analyses conducted by the Lorraine Region's DREAL Environmental Agency were transmitted both during and after the incident to the Risk Management Directorate as part of the Agency's technical and regulatory exchanges.

Additional investigations enabled analysts to determine that during construction of this tank (in 1968), no strength guideline had been adopted to cope with an external pressure surge of at least 0.4 bar; such a measure is now included in regulations governing the transport of hazardous materials.

An analysis of accident statistics revealed that a similar incident involving the same phenomenon but on a wider scale (over 20 butadiene tanks collapsed) had previously occurred during the winter of 1976 at the Neufchâteau train station (Vosges department).

Following this 1976 event, as of February of that year, professionals working with pressurised liquefied gas had recommended that industry actors adopt precautionary measures upon completion of unloading and before reshipment of tanker cars in order to avoid such accidents. These measures, applicable not only during the coldest period (1st

December through 31 March) but at other designated times during the rest of the year, consisted of reinforcing this category of railcar and/or systematically injecting nitrogen whenever winter conditions arose.

The Woippy event resulted in two actions:

- as of January 2011, the particular railcar owner reminded all its clients of the recommendations already in effect since February 1976, as issued by the French Committee of Butane and Propane Professionals: in so doing, the owner once again drew their attention to the set of measures to be implemented in order to systematically maintain sufficient residual pressure inside the tanks during periods of intense cold weather;
- moreover, in March 2011, a proposed modification to the international legislation overseeing the transport of hazardous materials by both rail (RID) and road (ADR) presented by France was adopted, making it possible to alter regulations in favour of protecting tanks against the risk of deformation during periods of severe cold.

LESSONS LEARNT

This incident served to underscore that existing recommendations issued to gas industry professionals regarding necessary precautions during periods of intense cold were not adequate and, moreover, that it was preferable to include them in regulations governing the transport of hazardous materials so as to ensure mandatory application.

At present, the international regulation of such transport for both road and rail modes has set guidelines intended to protect empty tanks having previously transported liquefied gas at low pressure against the risks of deformation, by means, for example, of filling with nitrogen or another inert gas in order to maintain sufficient pressure inside the tank. Such steps are specifically aimed at avoiding the collapse of older tanks that were not designed or built to withstand pressure drops.