

LP Gas Explosion from the Overturning of a Tank Truck

Oct. 26, 1965, Nishinomiya, Hyogo

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(Summary)

During the nighttime of October 26th, 1965, a five-ton tank truck running on a national highway in Nishinomiya City overturned due to the improper steering by the driver who fell into a doze while driving. Sustaining a shock from the overturn, the safety valve and the slip tube level gauge protruding from the top of the tank truck were broken and caused LP gas to blow out. The spilled LP gas diffused into approximately 1m thick white fumes, which crawled ahead across the range of 200 m along the national highway. About five minutes later, LP gas ignited from an unknown source. Numerous ignition sources are conceivable, but the real one is still unknown. This fire resulted in a great disaster causing 5 deaths, 26 serious and minor injuries, and 31 residential destructions. The estimated amount of damage was 120,000,000 yen. The carrier company could not afford to compensate for the total amount of damage, thus causing the compensation negotiations to proceed slowly.

1. Component

Five-ton tank truck (inside diameter: 1,750 mm, length: 5,030 mm, barrel thickness: 12 mm, material: 60 kg class high strength steel) (See Fig. 1)

2. Event

During the evening hours, a five-ton tank truck running on a national highway in Nishinomiya City, Hyogo was overturned due to the improper steering by the driver who fell into a doze while driving. (See Figs. 2 and 3) The tank truck, which was estimated to be running at a speed of 60 km/h or more, overturned just before the pedestrian overpass, slid away about 8 m, and crashed against the support of the overpass.

Sustaining a shock from the overturn, the protruded safety valve (size 50A) and slip tube level gauge were damaged. Given a shock such as this, a safety valve of any material would break down in this situation. The tank truck struck the curb, causing the right side of the truck (seen from the loading position) to be dented 110 mm deep, 1,200 mm long, and 600 mm wide. However, no areas were found where LP gas leaked, and no marked abnormalities were identified in the other fittings, either.

The gas blown out from a rupture ($50A/19.6\text{cm}^2$) kept spreading, ignited, and exploded about five minutes after the initial blowout. Assuming that the LP gas freely escaped from the hole, most of the LP gas escaped in about five minutes before the inflammation. The escaped LP gas developed into about 1 m thick white fumes, which crawled ahead across the range of 200 mm along the national highway. (See Fig. 4) Part of the fumes filled the southeast area of the overpass and went downwind beyond a wall (about 2

m high) into the neighboring residential area. This was also identified by the fact that the concrete-block wall fell down toward the sidewalk. The LP gas diffused in such a wide range that numerous ignition sources were conceivable but none of them has been identified as the real one. Yet, the possible inflammation sources could be narrowed down into: (1) Inflammation sources in the neighboring private residences (such as thermostat of electric refrigerator, pilot lamp of gas range, motor of an outside home pump, or embers in an incinerator); (2) fire sparks from exhaust fumes of running vehicles; and/or (3) the engine or electric sparks from the tank truck.

3. Course

The tank truck that caused the accident left the garage at Higashi-nada Ward, Kobe City on Oct. 25th at about 7:00 p.m. and reached a fueling plant at Arita City, Wakayama on Oct. 26th around midnight. At the plant, 5,000 kg of LP gas, which was mainly composed of propane gas, was loaded onto the truck in about 20 minutes. After that the truck set out on its return at about 0:50 a.m. on the same date. Some time after 3:00 a.m., the driver, who had felt drowsy, turned the wheel left hastily to avoid a black passenger car crossing ahead from the right. However, noticing a light car running at left in the direction as the truck went, the driver suddenly turned the wheel right in a panic, causing the truck to lose its balance and overturned.

4. Cause

(1) Falling asleep at the wheel

The direct cause of the accident was the driver dozing off while driving. All drivers who transport hazardous substances should be well aware that they are driving a potential weapon/bomb and attend to their tasks in a perfect physical condition at any time.

(2) Damage to protruding parts

The cause of this accident having developed into such an extensive LP gas explosion was the leakage of LP gas from a punctured hole on the parts which protrude from the truck. The parts in question were the safety valve and the slip tube level gauge. It was ironic that these safety devices contributed to the spread of a disaster.

5. Immediate Action

There was no possible action to take against this accident, partly because it happened at midnight and partly because the time from the start of the leak of LP gas until its inflammation was short (five minutes). In the event of a large-scale LP gas leak, however, it is important to notify it to the fire department and inform to the local residents to stop using fire or flammable substances and evacuate to safety.

6. Countermeasure

With this accident as a turning point, the following amendments were made to the enforcement regulations of the High Pressure Gas Control Law (Dec. 1965):

(1) Notification system of a transport plan

- (2) Limitations on transport routes
- (3) Use of two drivers for a transport of 200 km or more
- (4) Prevention of damage to fittings such as valves and level gauges.

7. Knowledge

Design equipment and fittings with latent risks in mind.

To design equipment and fittings, assume the possibilities of an accident, and design such a structure that can prevent the spread of an accident.

8. Information Source

- (1) Discussion on the Report of Tank Truck Accident in Nishinomiya City (1965): Industry Div., Dept. of Commerce, Industry and Labor, Hyogo Prefecture.
- (2) Fusion and Explosion of Oxygen Gas Containers in Process of Filling Operation

9. Primary Scenario

- 01. Carelessness
- 02. Fatigue or Poor Health
- 03. Lack of Sleep/Rest
- 04. Regular Movement
- 05. Dangerous Movement
- 06. Drowsy Driving
- 07. Traffic Accident
- 08. Overturn of Tank Truck
- 09. Failure
- 10. Fracture/Damage
- 11. Rupture of the Safety Valve/Level Gauge
- 12. Leakage of LP Gas
- 13. Secondary Damage
- 14. External Damage
- 15. Fire
- 16. Bodily Harm
- 17. Death
- 18. Accidental Death
- 19. Loss to Organization
- 20. Social Loss
- 21. Destruction of Residences by Fire
- 22. Damage to Society
- 23. Social Systems Failure

24. Compensation for Damages

25. Difficulties in Compensation Negotiations

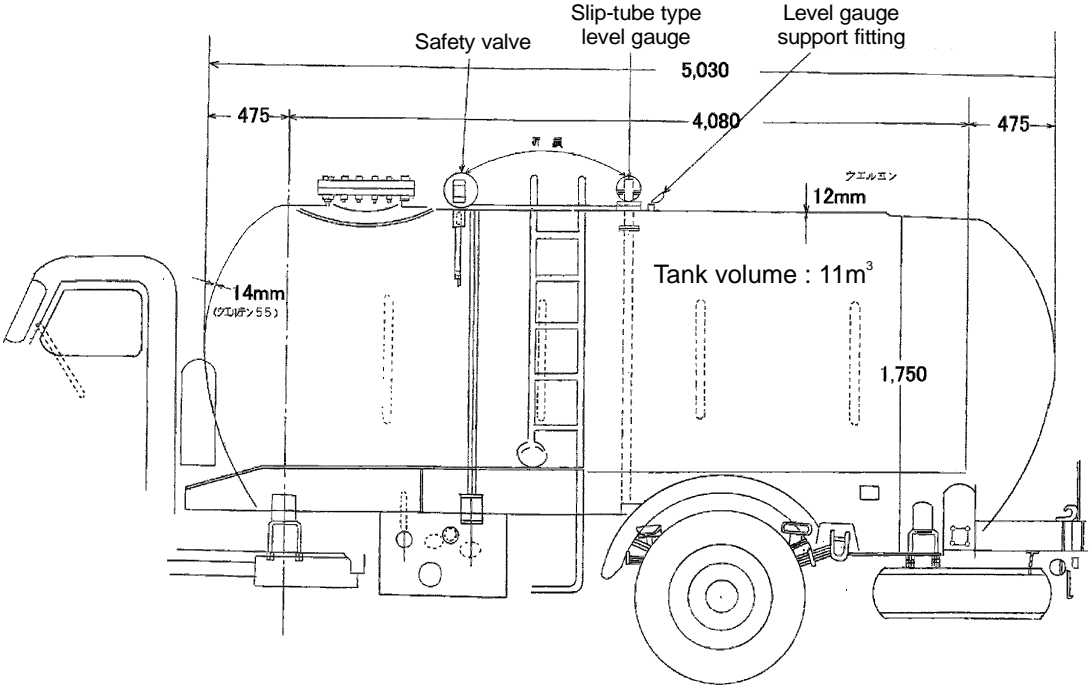


Fig. 1 Tank lorry.



Fig. 2 Turned lorry on its side (Rear view).



Fig. 3 Turned lorry on its side (Front view).

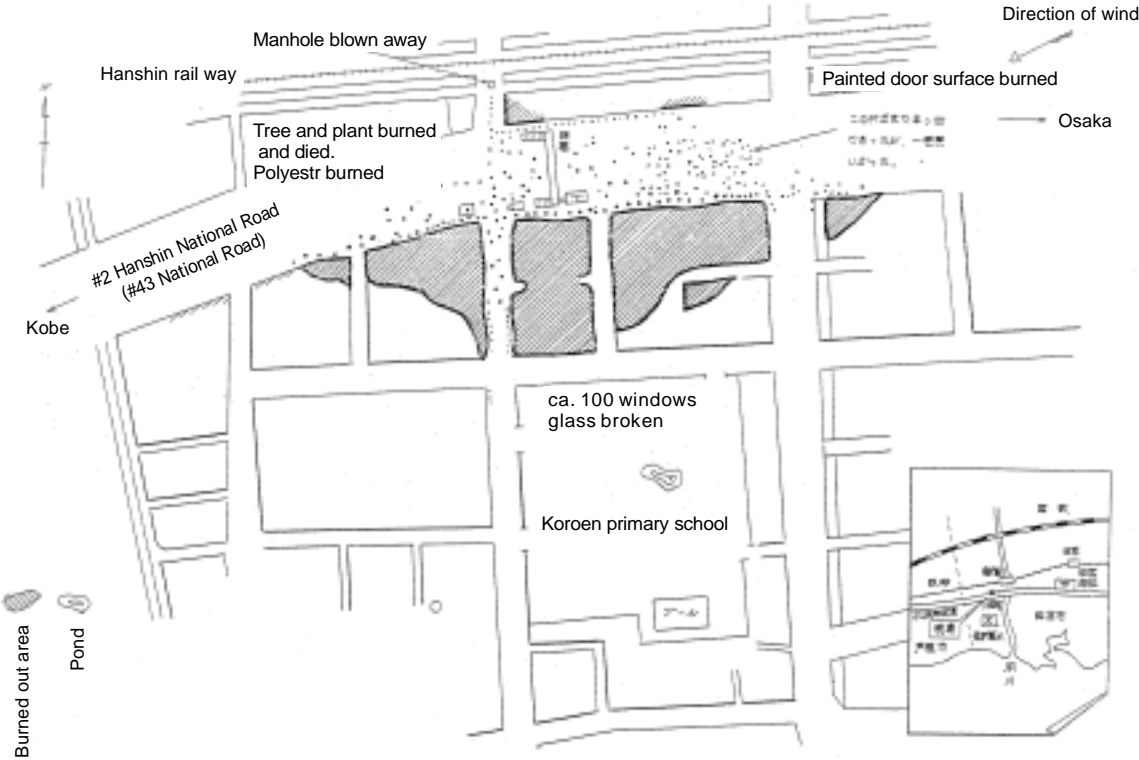


Fig. 4 Rough sketch of accident spot.