

TRAINING BULLETIN NUMBER 4
GASOLINE TANK TRUCK/TRAILER ROLLOVER INCIDENTS

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I. INTRODUCTION

Approximately 25 million gallons of gasoline are produced by oil refineries in and adjacent to the City of Los Angeles each day. This gasoline is pumped underground to distribution terminals where it is loaded into large tank trucks for delivery to the consumer by way of City streets and freeways. Given the volume of traffic and the amount of gasoline transported on our freeways and highways, the potential for a gasoline tank truck rollover is great.

When a tank truck/trailer is involved in an accident and a tank rollover occurs, it creates an incident that may take many hours to abate and many different agencies to help reopen the roadways. A tank truck rollover emergency will create major traffic congestion on freeways as well as local surrounding streets. Thousands of people and hundreds of businesses may be affected which will cause loss of revenue and productivity to the community.

Tank trucks transport approximately 90% of all the fuels used by vehicles. Truck transportation of these hazardous materials is strictly regulated by the Department of Transportation through the National Highway Traffic Safety Administration, Bureau of Motor Carrier Safety and the Office of Hazardous Materials. The State of California also imposes regulations on tank trucks which requires periodic CHP inspections. In addition, Division 38 of the Fire Code regulates tank vehicles for flammable and combustible liquids.

In spite of these requirements, accidents still occur and can present a variety of problems to Firefighters. These problems are not limited to the hazardous petroleum products. Tank trucks and their design present hazards all their own. For instance, the operation of the internal and external valves could result in the automatic opening of the vapor vents causing a larger spill. To avoid these types of problems it is necessary to have an understanding of tank truck design. This Training Bulletin will address these and other concerns and will assist in the handling of problems that can be encountered in tank truck/trailer rollover emergencies in a safe and expedient manner.

II. GASOLINE TANK TRUCK/TRAILERS

A. Tank Trucks (MC306 - Three Basic Types)

1. Single tank truck with two axles (see Figure 1) or three axles (see Figure 2). The capacity of the two axle truck is 3,000 gallons and the three axle truck is 5,000 gallons.

NO PICTURES ON THIS PAGE

2. Truck tractor with a semi-trailer connected together by a fifth wheel, have one tank that is approximately 40 feet long with a 9,000 gallon capacity (see Figure 3).

Figure 3: Tank Tractor with Tank Semi-Trailer (NO PICTURE)

3. Tank truck pulling a two axle trailer: Each truck and trailer tank is approximately 20 feet long. The, capacity of the truck tank is 4,200 gallons and the trailer tank is 4,800 gallons (see Figure 4).

Figure 4: Tank Truck and Two Axle Tank Trailer (NO PICTURE)

B. Tank Design and Construction

1. Most tanks are made of aluminum, maximum 3/16 inch thick at the bottom of the tank. The tank is designed to be very light so it can carry more product.
2. Tanks usually have two to four compartments, with single bulkheads separating the compartments. Double bulkheads are required when carrying flammable products with different flash points in the same tank, e.g., diesel and gasoline. Baffles are installed in the compartments for tank strength and do very little for reducing surge of the product (see Figures 5 and 6).

NO PICTURES

3. Vapor recovery/pressure vents and the combination spring-loaded fill cover and pressure-actuated vents on top of tanks are protected by an overturn rail that runs the length of the tank (see Figures 7 and 8). There is always a vapor space present for product expansion.

Figure 7: Top View of Tank With Vents (NO PICTURE)

Figure 8: Typical Cross-Section of Tank and Vent (NO PICTURE)

4. The product is off-loaded from the bottom by gravity through the internal valves. These internal valves are operated by either air, mechanically or a combination of both and are referred to as emergency valves (see Figure 9).

Figure 9: External Plumbing and Internal Emergency Valves (NO PICTURE)

5. The external piping has shear sections which will break to prevent internal damage to the tank and valves.
6. Products carried by tank truck/trailers include but are not limited to gasoline, diesel and jet fuels. The large capacity trucks are usually full or empty when traveling to and from their destinations. Partial loads are carried by the smaller single tank trucks which make small deliveries at various locations.

III. OVERTURN TANK TRUCK PROBLEMS

- A. Problems encountered when a two or three axle tank truck rolls over:
 1. Trapping or injuring the driver.
 2. Tank can have up to four compartments, with two or three different products, such as diesel and two grades of gasoline. These may be difficult to identify from a safe distance.
 3. When carrying two different products, the compartments are required to have double bulkheads with a void space in between. This void or air space may be illegally plugged because of a leak in one or both of the bulkheads. DO NOT REMOVE the plug because up to 200 gallons of mixed product may be present in the void space.

B. Problems encountered in a truck tractor and semi-trailer when rolled over:

1. The tractor will probably rollover with the semi-trailer and could trap or cause injury to the driver.
2. Greater risk of tanker failure due to the weight of the product and size of the tank.
3. Total weight of the tank can be as much as 80,000 pounds.

C. Contributing factors and problems that can cause a tank truck and two axle tank trailer to rollover:

1. The tank trailer may become unstable if the tank truck makes a high speed turn or an erratic move which can cause the tank trailer to rollover on its side or top.
2. The tank truck seldom rolls over in a tank trailer rollover incident because of the anti-rollover device incorporated into the tow bar of the trailer. If the tank truck is damaged due to the accident and cannot be driven the product shall be off-loaded before the vehicle is towed.
3. When the tow bar of the trailer becomes twisted it is very difficult to disconnect because it is under tension. It should not be disconnected until after the empty tank is uprighted or when safe to do so.

D. The tank may develop leaks in several areas caused by the accident/rollover. These leaks may not be able to be stopped. The major areas vulnerable to leaks are:

1. Vapor recovery/pressure vents on top of the tank.
2. Combination spring-loaded fill cover and pressure-actuated vent on top of the tank.
3. Internal valves and external piping.
4. Ends of the tank and at all welded seams.

E. Tank integrity is hard to determine and is affected by the following:

1. The internal and external structural damage to the tank caused by the accident.
 - a. The external damage is often under the tank and can only be seen when the tank is uprighted.

b. The internal damage, which is of greatest concern, cannot be verified until the product has been removed from the tank and inspected from the inside.

2. The lightweight design and construction.

3. Age of the tank and metal fatigue which is from traveling empty.

F. NO ATTEMPT SHOULD BE MADE TO UPRIGHT ANY TANK TRUCK OR TANK TRAILER BEFORE IT IS OFF-LOADED.

1. The weight of the product can make the tank six times heavier when full.

2. The structural integrity of the tank is hard to determine.

3. The frame of the tank is designed to carry the tank and its load only in the upright position.

4. The tank could fail without warning if uprighted full, resulting in one large instantaneous spill.

IV. VACUUM TRUCKS

A. Capacity

1. Vacuum trucks of 2,500 and 5,000 gallon capacity are available from most waste disposal companies for use in product off-loading or spill cleanup (see Figures 10 and 11).

Figure 10: 2500 Gallon Capacity Vacuum Truck (**NO PICTURE**)

Figure 11: 5000 Gallon Capacity Vacuum Truck **(NO PICTURE)**

2. These vacuum trucks require a vapor space and their actual capacity is approximately 400 to 500 gallons less than the rated capacity. The actual capacity is always less because of the vapor space and the specific gravity (weight) of the product.

B. Vapor Recovery

1. Vacuum trucks do not have a vapor recovery system, so a hose must be extended from the truck when it is loading so the vapor in the truck can be expelled as the liquid is being vacuumed up.
2. The total length of the vapor hose from the vacuum truck should be a minimum of 50 feet down wind from any ignition source and downhill because gasoline vapor is three to four times heavier than air.

C. Vacuum Truck Classification

1. Vacuum trucks are classified by three tank cleanliness standards:
 - a. Dirty - Tank is empty of product, but it has not been cleaned.
 - b. Clean - Tank is empty of product and has been washed with water, but there is a possible trace of water and product from the previous load.
 - c. Super Clean - Tank has been chemically cleaned and is free of product.

2. Clean vacuum trucks should be requested to prevent any reaction of the product in the vacuum truck tank. The contamination of the product is not a major concern, however, the overriding concern should be the availability of the vacuum truck within a reasonable time.

D. Vacuum Truck Equipment

1. Additional equipment is often needed by the disposal company to help clean up the site.
 - a. Additional vacuum/vapor hose and related fittings, i.e., 2 sections each of 4", 3" and 1 1/2" hose. Sections of vacuum hose are 25 feet in length.
 - b. Drums for contaminated sand, dirt or absorbents used to contain the spilled product.
 - c. Extra personnel to assist in the clean up.
2. The disposal company must be given the following information:
 - a. They are responding to an overturned tank truck/trailer.
 - b. The type of material spilled, or to be off-loaded.
 - c. The amount of material to be removed, the number and capacity of trucks needed.
 - d. Bring additional sections of hose.
3. The proper amount and type of equipment requested from the disposal company needs to be verified by Fire Department personnel, (OCD or Incident Commander).
4. Have the vacuum trucks meet the CHP or LAPD at a designated area to be escorted to the incident from the proper direction.

There may be a problem in determining how many vacuum trucks will be needed at an incident. This is because the tank truck/trailer together can hold 9,000 gallons or more. A vacuum truck rated at 5,000 gallons really only holds approximately 4,600 gallons due to product weight and required vapor space. At an incident where a full trailer tank is overturned which can hold 4,800 gallons, the off-loading will almost always require two vacuum trucks. You should request two vacuum trucks with a capacity of 5,000 gallons each. The first 5,000-gallon truck will be used to off-load the overturned tank and the second vacuum truck will be used to pick up any on-scene spills and/or any remaining product that is in the overturned tank. If the tank truck needs to be off-loaded, it is necessary to request a third 5,000 gallon capacity vacuum truck.

V. LARGE TOWING WRECKERS

When the overturned tank is empty, two 20-ton commercial towing wreckers are required to upright the tank. Usually, you cannot determine the mechanical status of the tank truck until you have off-loaded and uprighted the trailer tank. If it is obvious that the tank truck is damaged and needs to be towed, it shall be off-loaded before being moved.

VI. OFFLOADING OVERTURNED TANKERS

As of May 1988, the Shell Oil Company discontinued providing the service of their Response Action Team (RAT Team) for off-loading overturned gasoline tank trucks, except for those that are owned and operated by Shell Oil Company.

The Shell Oil Company has provided a "Tank Truck Rollover Emergency Manual" to all three Hazardous Materials Task Forces and the Research Unit. Their manual provides technical information and guidelines on how to handle overturned tank truck emergencies.

As of February 1989, Hazardous Materials Task Force 4 received equipment an training on what is considered the safest an quickest method of off-loading an overturned tanker. This method is accomplished by drilling a three inch hole in the ALUMINUM tank with an air drill. Once this hole is drilled, a metal tube or "stinger" is inserted into the fuel compartments. The hose from the vacuum truck is connected to the stinger and the entire product is then pumped out so the tanker can be uprighted safely.

NOTE: Each compartment in a multi-compartment tank must be drilled and pumped out individually.

Incident Commander's Request for Vacuum Trucks

In a tank truck/trailer rollover incident, the early ordering and arrival of the correct number and capacity of vacuum trucks are important factors in the abatement of the hazard. This will also expedite the cleanup and the reopening of state highways/freeways and City streets.

The owner of the vehicle involved in the truck/trailer rollover is legally responsible for product removal and cleanup of any spill on state highways/freeways or City streets. However; when a hazardous waste hauler company is contacted, they will not respond unless there is a "responsible party" who has approved and is prepared to accept financial responsibility for the waste hauler's services.

In emergency operations, the Fire Department initiates the Incident Command System which provides for multi-agency representation. On incidents that occur on state highways/freeways, the CHP is the on-scene manager, Los Angeles Fire Department is the Incident Commander. Cal Trans is responsible for cleanup of state highways/freeways, and has the authority to order and pay for vacuum trucks when:

1. An immediate fire/life hazard exists.
2. The truck driver does not know if the owner will accept the responsibility.
3. The owner cannot be contacted.
4. The owner cannot or will not pay.

If the Incident Commander on State Highways/Freeways has determined that the owner is not available or capable of providing the required resources, the Incident Commander may request the vacuum trucks through OCD. If the CHP or Cal Trans is on the scene, this action should be discussed at the command post.

On Los Angeles City streets, the Incident Commander shall always attempt to have the owner or responsible party accept the responsibility for ordering the vacuum trucks, but if this is not possible, the Incident Commander can order the number and capacity of vacuum trucks needed through OCD. When OCD orders the vacuum trucks directly from a hazardous waste hauling company, the Fire Department becomes the agency responsible for payment for the hazardous waste hauling and disposal. This request requires approval of the Deputy Department Commander. Refer to 2/1-49.47: SPECIAL PROCEDURES - REMOVAL OF HAZARDOUS WASTE. The required EPA Identification number for the Hazardous Waste Manifest will be obtained from the on-call Chief of the Bureau of Fire Prevention and Public Safety.

VII. CONCLUSION

At a rollover incident, the tank truck usually remains upright while the trailer tank has overturned. Time is always an important consideration when a tank truck or tank trailer is overturned. The abatement of the hazard of an overturned tank should be accomplished as quickly and safely as possible.

VIII. GLOSSARY OF TERMS

- BAFFLE: A transverse partition in a cargo tank which is not liquid tight. Main purpose is for tank strength.
- CAPACITY: The maximum volume of any tank in United States gallons or pounds.
- CARGO TANK: Any atmospheric tank, low pressure tank, pressure vessel or special vessel designed or used for the transportation of liquid or gaseous hazardous materials.
- COMPARTMENT: A separate product carrying space of a tank motor vehicle. One tank may have one or more such spaces.
- CROSSOVER LINE: A line installed in the tank piping system to allow unloading from either side of the tank.
- GLADHANDS: Fittings for connection of air brake lines between vehicles/trailers.
- HEAD AND
BULKHEAD: A liquid-tight transverse closure at the end of a cargo tank or between compartments of a cargo tank.
- INTERNAL VALVE: A valve designed and installed in such a manner as to remain in an operable condition when the exterior parts are damaged or sheared off. It will prevent the unintentional escape of the contents of the tank.
- LOW PRESSURE
TANK: Any tank designed to operate at pressures above 0.5 psig, but not more than 15 psig.
- MANIFEST BOX: A moisture proof container used for storage of important papers or records relating to the cargo being carried. This box is carried in the cab area of the truck.
- MANIFOLD: Used to join a number of pipelines to a common inlet or outlet.
- MC306: The code of Federal Regulations for Motor Carrier of flammable and combustible liquids for low pressure tanks.

- TANK TRAILER: (FULL TRAILER AS CALLED IN INDUSTRY)
Any vehicle without motive power, equipped with a tank mounted thereon and constructed so that it can be drawn by a motor vehicle. No part of its own weight rests upon or is carried by the towing motor vehicle.
- TANK TRUCK: Any motor vehicle equipped with a cargo tank mounted thereon.
- TRUCK TRACTOR: A powered motor vehicle designed primarily for drawing semi-trailers and so constructed as to carry part of the trailer weight and load.
- SEMI-TRAILER: A vehicle with no motive power, equipped with a tank mounted thereon. It is constructed so that part of its weight is carried by the truck tractor.
- SHEAR SECTION: A machined groove which reduces the wall thickness of an outlet valve or adjacent piping by at least 20 percent so that strain on piping will not affect the product retention capability of the outlet valve.
- VACUUM TRUCK: A truck with the ability to vacuum up chemical spills or remove hazardous materials/waste by using a pump on the truck.
- VAPOR RECOVERY
LINE: A line which connects the vapor recovery hood to a convenient location for attachment to a vapor recovery hose.
- VENTS: Devices which control or limit tank pressure. Some types are:
 - Pressure Relief Vent
 - Vacuum Relief Vent
 - Fusible Vent
 - Frangible Vent
- VOID: An enclosed space inside a tank or vessel between the individual compartments.

IX INCIDENT COMMAND CONSIDERATIONS

A. Size-Up Considerations - NO FIRE -

1. Overturned and a Spill - Where is it going; amount leaked and rate of release
2. Overturned Tank Leaking - Where, amount leaked and rate of release
3. ID the Product - Placards, shipping papers and driver
4. Containment - Storm drains
5. Control Ignition Sources - Traffic, sump pumps, etc.
6. Rescue Problems
7. Evacuation - Immediate area/downstream
8. Access and Water Problems
9. Direct Incoming Companies - Upwind and uphill
10. Name and Location of Command Post
11. Detain Truck Driver at Command Post
12. Tanker Rollovers are to be Regarded as a HAZARDOUS MATERIALS INCIDENTS

B. Los Angeles Fire Department Resources

1. Nearest Engines and Task Forces - Foam and foam nozzle
2. Hazardous Materials Task Force 4 (HMTF-4)
4. OCD - Vacuum trucks
 - a. State Highways, Freeways
 - b. City Streets
5. Rescue Ambulances/EMS Supervisor
6. Emergency Air and Light Utility
7. Hazardous Materials Response Unit (Mobile Lab)
8. Command Support Staff

9. Fire Station 88 - Sand/crushed asphalt

10. Supply and Maintenance - ATF Foam

11. Helicopter With Airborne Engine Company

C. Other Resources and Agencies

1. CHP - Scene Manager on State Highways and Freeways

2. Cal Trans

a. Authorizes Disposal Company on State Highways and Freeways

b. Shutting off sump pump stations on freeways

c. Sand

d. Portable toilets

3. Department of Public Works (Los Angeles City) for City Streets

a. Storm drain contamination

b. Sand

4. Los Angeles Police Department

5. Department of Transportation - For traffic control on City Streets

6. Los Angeles County Health

7. Office of Emergency Services

8. Environmental Protection Agency

9. L.A. County Department of Public Works (L.A. County Flood Control)

10. Wrecker/Tow Trucks

11. Owner/Operator of Transport Company

12. Disposal Company (vacuum trucks)

13. United States Coast Guard

14. Fish and Game

15. Red Cross (food)