

MEMAN COMPENDIUM OF BEST PRACTICES FUEL TRANSPORTATION MANAGEMENT



11









3RD EDITION

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Huub Stokman Chairman, MEMAN Clement Isong CEO, MEMAN

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FOREWORD

The handling, transportation, and management of refined hydrocarbon products in their liquid and gaseous states require strict adherence to regulatory guidelines, procedures and industry best practices.

The Nigerian Midstream and Downstream Petroleum Regulatory Authority (the Authority) recognises that the effective management of people and equipment can only be achieved through processes, which promote best practices, knowledge sharing and the standardisation of safety protocols across the midstream and downstream value chain of the petroleum industry.

The Compendiums of Best Practices for Hydrocarbon Depot, Equipment and Operations, Fuel transportation Management, Retail Station Construction, Equipment and Safety standards, and Retail Safe Operations have been published by MEMAN for sharing industry best practices, which will enable stakeholders to conduct their operations in a safe and sustainable manner.

These Compendiums provide information to enhance safe petroleum operations and should serve as a learning resource for companies and personnel engaged in depot, transport, and retail petroleum operations in the downstream sector. It is recommended as an important resource for operational and safety personnel handling and transporting refined hydrocarbon products.

We welcome the publication of the MEMAN Compendiums which are expected to further the industry's compliance with the Regulations, Guidelines and Directives made by the Authority for safe and sustainable petroleum operations in Nigeria,

Farouk A. Ahmed

Authority Chief Executive Nigerian Midstream and Downstream Petroleum Regulatory Authority

INTRODUCTION

In the drive to improve the transportation of petroleum product across the country, MEMAN has developed this compendium of best practices for fuel transportation management.

Zero accident is achievable with the right administrative and engineering control in place. About 95% of the incidents that occur in the downstream industry are through road accidents during product movement from one point to another.

This compendium of best practices identifies critical equipment and tools that are required to be installed in a modern truck used in the transportation of petroleum product.

The driver plays a major role in transportation of petroleum product, So it is required that drivers training both in terms of driving practice and safety checks of their trucks is important to improve their behavior and reaction while driving.



BAFFLES

- Baffles are angled dividers with holes that slow down the front-toback sloshing and movement of the tanker's liquid cargo.
- This provision ensures stability of the vehicle during movement and the reduction of building static electricity within the inner walls of the tanker.
- Tank baffles evenly dissipate the force of liquid moving when the truck is accelerating or braking. When braking without baffles, the liquid keeps surging forward and pushing against the front wall of the tank, dramatically shifting the weight in the tanker and increasing risk of rollover.
- Baffles spread the energy evenly to the entire truck, making the truck easier and safer to handle.
- The use of baffles is in compliance with the Agreement international carriage of Dangerous goods by Road (ADR) which states that any moving receptables (semi-trailer) must be separated by baffles in the compartments when the quantity is 7,500 litres (7.5m³) and above.
- Baffles are made from aluminum alloy typically manufactured with mounting locations for ancillary items such as inspection hatch, vapour vents, and overfill protection sensors.



Fig1. Baffles installed in trailer tankers



MANHOLES

- Manholes provide personnel entry to the petroleum tanker compartment. manholes typically come in diameters of 16 and 20 Inches. They consist of a ring welded to the top of the compartment onto which the manhole cover is mounted.
- The manholes are equipped with pressure vacuum vent inside to adjust the pressure when there is pressure differences inside and outside the tanker. It will automatically inlet or exhaust air to adjust the pressure so that it can guarantee safety and environmental protection.
- ADR (Agreement international carriage of Dangerous goods by Road) stipulates that Manhole sizing should be such that to discourage adult human being from entering the compartments. This provision is to guide against risk of suffocation in a confined space. The manhole cover should have a proper locking device and a pressure relief valve of about 18 bars.



Fig 2 : Manholes

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BOTTOM VALVE

- Bottom valves are emergency valves located at the bottom of each compartment which controls the entry and exit of petroleum product.
- Bottom valves are attached to each compartment at the bottom of the tanker. The SON (Standard Organization of Nigeria) and ADR (Agreement international carriage of Dangerous goods by Road) stipulates that a moving receptacle must be locked at 3 points at the base or bottom, to ensure securing content being transported.
- The points that locks are bottom valves, foot or discharge valves and the cap locks. No spilling is allowed during transportation of petroleum products.



Fig 3: Bottom valve



SEMI-TRAILER DIMENSIONS

Semi-trailer dimensions should be such as will prevent rollover due to loss of center of gravity, as stipulated in SON (Standard Organization of Nigeria) standards.

The semi-trailer should be fitted with complete braking system devices on the semi-trailer, which is minimally ABS (Anti-lock Braking System) maximally EBS (Electronic Braking System).

VEHICLE	Length	Width	Height	IMAGE
TYPE	(max)	(Max)	(Max)	
ARTICULATED VEHICLE (TRUCK + TRAILER)	16500	2550	4500	

Table 6 [.]	Dimensions	of Articulated	Vehicle
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Table 7: Semi-trailer dimensions



Fig 4: Semi -trailer dimensions



BRAKING SYSTEM

- An ABS (Anti-lock Braking System) prevents the wheels from locking by reducing the braking force. Any vehicle equipped with ABS (Anti-lock Braking System) remains directionally stable and steerable even during emergency braking on slippery road surfaces, since the wheels do not lock.
- On truck-trailers and articulated trucks, the ABS (Anti-lock Braking System) system also prevents jack-knifing of the trailer during emergency braking.

ABS (Anti-lock Braking System) components:

- 1. Operating brake valve
- 2. Pressure control valve
- 3. Control unit
- 4. Brake cylinder
- 5. Speed sensor



Fig 5: Braking system



EMERGENCY VALVE / FOOT VALVE

- Truck emergency valves provide a safe means of flow control in the outlet of tank truck compartments.
- The emergency valve can either be mechanically or pneumatically operated. It is designed to minimize turbulence and spray of petroleum product therefore reducing the possibility of generating static electricity.
- The emergency valve remains shut and prevents compartment discharge should a vehicular collision occur.



Fig 6: Emergency valve



HANDRAILS ON TOP OF THE TANK

- The handrail serves as a level of protection to the loader. The loader clips his or her body harness to the handrail this helps hold him to prevent fall.
- The handrail is installed in trucks and can allow truck drivers to safely go up and move around on the top of their trucks.
- The railing locks in the upright position for use and locks in the collapsed position for stowage during transport of the tanker trailer.



Fig 7: Truck handrail



ANTI-SLIPPERY WALKWAY

- Non-slip platform fabricated with slip resistant material or coated with slip resistant surface.
- The walkway is usually of sufficient length to provide easy access for a person to get to the manholes and other tank roof mounted fittings which require periodic inspection and maintenance.
- Minimum width of a walkway between rollover protection curb shall be 1.0 meter (3.28 feet).



Fig 8: Anti-slippery walkway



VAPOR VENT

- Vapor vents are required to allow air/vapor in or out of the compartment during loading and unloading. They prevent a vacuum or pressure buildup in the compartment and allow for smooth and rapid filling or unloading.
- Today, vapor vents are generally mounted onto the manhole and are pneumatically operated. Pneumatic manhole mounted vents are popular because they can be controlled by air valves and are normally operated with the emergency valve by a pneumatic control box on the tanker.





Fig 9: Vapor vent

EARTHING DEVICE (CABLE AND CROCODILE CLIP/CLAMP)



- An earthing device grounds the truck tank to earth which mitigates any risk of explosion due to sparks generated by static electricity.
- Any static generated by the liquid transfer process is immediately transferred to ground by the earthing stud. For best practices, it must be calibrated to only recognized hydrocarbon trucks.
- The bonding device will initiate loading and should not be bypassed.



Fig 10: Earthing device



LADDER

- A ladder provides access to the walkway connected to a frame on the tanker trailer.
- Ladders are made of non-slip materials and the rungs must be uniform across the section with no sharp protrusions or edges.
- If round, side rail diameter shall not be less than 20 mm (³/₄ inch) nor more than 25mm (1 inch) diameter.
- Steps shall be slip resistant capable of withstanding a static vertical load of 450 pounds.
- If round, step diameter shall be 20mm (³/₄ inch) to 25mm (1 inch) in diameter.
- Step width shall not be less than 300mm (12 inches) nor more than 400mm (16 inches).
- Minimum depth of top step shall be 90mm (3.5 inches).
- The bottom or access step shall be no more than 650mm (26 inches) from the ground or no more than 550mm (22 inches) from access area such as trailer frame or bumper.
- Vertical spacing of steps shall be uniform and not less than 250mm (10 inches) nor more than 300mm (12 inches) except near bumpers.
- Minimum toe clearance shall be 150mm (6 inches.). The horizontal step across distance from the nearest edge of the step to the nearest edge of the structure shall not be more than 12 inches (300mm).



The horizontal step across distance from the nearest edge of the step to the nearest edge of the structure shall not be more than 12 inches. (300mm).



Fig 11: Ladder



C-CAUTION

C-caution is one of the requirements in a truck and every vehicle is expected to have at least a good one. It is a triangular reflector with a sitting base used by motorists to alert other road users of a possible vehicle breakdown ahead.



Fig 12: C-caution



FIRE EXTINGUISHER

- Each tanker must be equipped with at least two 9kg and a 6kg portable fire extinguishers.
- The 9kg fire extinguisher should be firmly mounted at each side of the tanker trailer while the 6kg must be kept inside the driver and motor boy's cabin for quick access.
- They must be inspected regularly and serviced two times in a year.



Fig 13 : Fire extinguisher



WARNING SIGNS AND MARKINGS

- All safety signages/HAZCOM (hazard communication) labels shall be in accordance with the requirements of united nations classification plate.
- Trucks shall have at least three warning signs provided on each side of a cargo tank, one at the rear of the tank-trailer and the other two near the front of the tank-trailer on both sides.



Fig 14 : Warning signs and markings



COMPOSITE HOSES

Provision of composite hose for systematic discharge of products from the tanker. The hose must be earthed to arrest static electricity generated during discharge of product or static already gathered in the tank. The hose must be doublecabled, continuous and un-broken end-to-end full length of the hose.



Fig 15 : Composite hoses



MAINTENANCE

Trucks should be adequately checked before proceeding for product loading.

The integrity of corroded parts must be properly checked.

The level of static electricity should be confirmed.

All couplings of the fleet should be well maintained to eliminate corrosion.



Fig 16 : Truck Maintenance/Checking



ON-BOARD COMPUTER

An on-board computer (OBC) is a tiny computer that is mounted on trucks. It records, computes and displays variety of data, including the amount of distance traveled, the average speed, the amount of fuel consumed on average and the amount of fuel consumed in real time.

Information on driver's bad behaviors such as harsh braking and late-night driving can be downloaded from the OBC which are used as monitoring indices for safe transportation.



Fig 17: On-board computer



ELECTRONIC SEALING

To prevent unauthorized access to the loaded product while on transit, all manholes and valves should be sealed with electronic seals and the code of each seal transmitted electronically to the receiver at the loaded destination. This prevents product loss on transit and enhance transporter profitability.



Fig 18: Electronic Sealing



TRACKING DEVICE

Fuel transportation now requires truck tracking system to mitigate transit-losses by theft, diversion or leakages. The device can also monitor and report incidents along the journey real time.



Fig 19:: Tracking Device



SPEED LIMITER

A speed limiter measures and controls the engine speed of a truck. The device prevents a truck from exceeding a predetermined speed.

The speed limiter will reduce the maximum speed that a truck can travel on our roads, reducing the maximum potential distance required in an emergency braking situation as well as the maximum potential force in the event of a collision. This will help save lives and prevent injuries caused by speed-related truck accidents.



Fig 20 : Speed limiter



AUTOMATIC TANK GAUGING (ATG) SYSTEM

This is recommended to be installed on trucks for stock monitoring and ensure that every liter of the product is delivered as planned.



Fig 21: Automatic Tank Gauging (ATG) on a truck

UNITED NATIONS AGREEMENT INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR)/FEDERAL ROAD SAFETY CORPS STANDARDS REQUIREMENTS ON TRACTORS

- Brake System: Tractors are expected to have or updated with ABS (anti-lock braking system, based on automobile upgrade of 1985) minimally or at best with EBS (electronic braking system, based on automobile upgrade of millennium 2000).
- Use of OBC (on-board-computers) and speed limiters stipulated by ADR (agreement international carriage of dangerous goods by road) and FRSC (Federal road safety corps) respectively. Tested service providers are available in the country.
- 3. Use of on-board-cameras also additional device to monitor fatigue in drivers.
- 4. Use of DRG (drivers-route-guide), researched and invented to guide drivers on the road by giving advance warnings of dangers on the road by providing route survey showing hotspots or situations that are not safe. The study used to be done manually and physically but has now been upgraded to electronic data adaptable in navigation machines.
- 5. Semi-trailer dimensions should be such as will prevent

UNITED NATIONS AGREEMENT INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR)/FEDERAL ROAD SAFETY CORPS STANDARDS REQUIREMENTS ON TRACTORS

rollover due to loss of center of gravity, as stipulated in SON (Standard Organization of Nigeria) standards.

- 6. It is important to have semi-trailer manufacturers screened to ensure the use of correct skills and materials suitable for tankers that carry petroleum products. This provision will assure safe tanker production.
- 7. It is also important to have processes of checking the trucks (both tractors and semi-trailers) at different levels to ensure compliance. Therefore, use of technical invariants, safe-toload (STL) and bi-annual vetting are prescribed by the professional transport safety practitioners to monitor and give continuous guarantee of safety conditions of the trucks.

OTHER ACCESSORIES ON A TRAILER TRUCK.

- 1. Anti skid, anti rollover protection and vapor recovery.
- 2. Reflectors shall be provided on the following locations:
 - Around the end head
 - Spare tire metal guard
 - Rear bumper
 - Any other sharp edges, i.e., countered fenders
- 3. Truck shall be provided with a ready means of towing the vehicle.
- 4. All wiring shall be installed in conduits or otherwise physically protected.
- 5. All truck tractors shall be equipped with spare wheel and tyres, jack and lug wrench and spare tire carrier, and tire pressure monitor.





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