

## GENERAL ENGINEERING AND MECHANICS

### **Raksha Sergiy**

Doctor of Technical Sciences, Professor,  
Professor of the department «Applied Mechanics and Materials Science»  
Dnipro National Technical University of Railway Transport  
named after Academician V. Lazaryan, Ukraine

### **Cherkudinov Volodymyr**

Assistant of the department «Applied Mechanics and Materials Science»  
Dnipro National Technical University of Railway Transport  
named after Academician V. Lazaryan, Ukraine

## ISSUES OF SAFETY WHEN TRANSPORTING DANGEROUS LOADS BY TANK

The main characteristics of liquid dangerous cargoes, which causes their transport danger, include: flammability and spontaneous combustion, toxicity or toxicity, the ability to detonate and explode, radioactivity, oxidation and corrosion.

Conditions of the transport process under which transport danger may occur [1]:

- dynamic (mechanical) effects on the load;
- thermal effects on liquid dangerous cargoes (heating, open fire, spark, electric discharge, etc.);
- changes in vehicles with liquid dangerous cargoes established modes of maintaining certain temperatures, pressures, humidity;
- unpreparedness and malfunction of the tank truck, loading and unloading devices;
- violation of the rules of operation, accident and catastrophe of vehicles.

According to the analysis of accidents on the transport of Ukraine in 2018-2020 [2]: up to 35% of dangerous situations occur during the filling of tankers at the oil depot; up to 25% of emergencies can occur directly during the transportation of petroleum products; up to 25% of dangerous situations can occur when oil is spilled

at a gas station or oil depot; up to 10% of dangerous situations are recorded when driving empty tankers; there are accidents when servicing tank trucks (up to 5%).

The main criterion for the stability of the system of transportation of dangerous liquid cargoes by road is the level of product losses that occur at different stages of the system.

Depending on the causes, losses of petroleum products are divided into natural, operational and emergency, and by the nature of occurrence - into quantitative, qualitative and mixed (qualitative-quantitative). The nature of losses depends on whether they are accompanied by a decrease in the mass of the oil product or the deterioration of its physicochemical and operational properties.

The main faults of tank trucks for transportation of liquid dangerous cargoes that contribute to the quantitative loss of petroleum products are corrosion wear of structural elements (up to 60%), deformation of the geometric shape (25%) and defects of welds (15%).

According to the nature of the impact of sources of environmental pollution are divided into permanent, periodic and accidental.

The first group of sources of pollution includes large and small "breaths" of tanks; emissions from refueling and draining of petroleum products. Sources of this group pollute mainly atmospheric air in the territory.

The second group of sources of pollution includes: leakage of petroleum products during draining and filling of tank trucks.

The third group of sources of pollution includes: leaks of oil products during repair and maintenance of technological equipment; emergency leaks as a result of leaks in the hydraulic system (tanks, pipelines, hoses).

Based on this, we can identify a number of solutions for efficient and safe operation of road tankers for the transportation of dangerous goods, which require scientific justification:

- research and reduction of emissions of steam-air mixture during refueling and draining of oil and oil products from tank trucks, increasing the density of oil pipeline hoses at the joints with the filler neck of the tank;
- study of the causes of leakage of oil products during the discharge from tank

trucks into tanks and the formation of proposals for their reduction;

– reduction of dynamic indicators of centrifugal lateral forces during transportation and prevention of occurrence of danger of overturning of tank trucks;

– development of effective methods of diagnostics of a design of tank trucks for the purpose of detection of corrosion wear of elements of a design, defects of welds.

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