EUROPEAN COMMITTEE
UNDER THE GOVERNMENT OF
THE REPUBLIC LITHUANIA

ANALYSIS OF THE NEED EVALUATION OF PARK RENOVATION OF MOBILE TANKS TRANSPORTING PETROL (TANK TRUCKS AND RAIL TANKS) ACCORDING TO THE REQUIREMENTS OF DIRECTIVE 94/63/EC

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Final report summary

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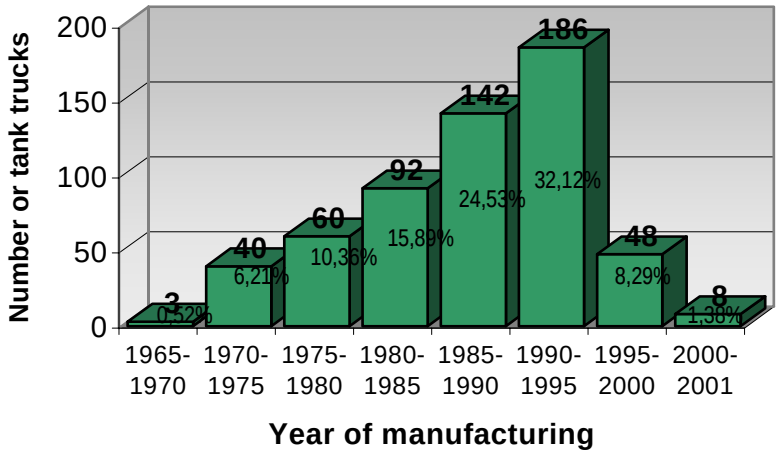
Implementation of the requirements of the directive 94/63/EC and the normative document LAND 35-2000 is related to practical tasks to reduce ambient air pollution with volatile organic components (VOC) emission from petrol during its loading and transportation.

The objective of this study is to evaluate the state of the park of mobile tanks (tank trucks and rail tanks), which transport petrol in Lithuania according to requirements of LAND 35-2000, to analyse peculiarities of petrol transporting economic activity and detect the need to renew this park and describe possible outcomes of implementation of these requirements on mobile tanks.

During research a number of operating mobile tanks in Lithuania, their regional distribution, petrol transporters – the owners of these tanks, statistical and technical data of the tanks, the quantities of transported petrol and the accordance level of these tanks to LAND 35-2000 requirements and the characteristics of economic activity were determined. Necessary information was received from the interviews (by questionnaires to the petrol transporters), the Statistical department, the State tax inspectorate and the Service of technical supervision. It was determined that:

- ***Petrol is transported by 260 various capacity tank trucks in Lithuania.***
- ***127 tank trucks (48,9%), which transport 78% of total transported petrol in Lithuania, meet the directives requirements, 133 tank trucks (51,1%) do not meet the directives requirements. These mobile tanks transport about 20-22% (132 000 t) of total transported petrol quantity. These numbers were obtained after summarising and extrapolating parameters of respondents' transportation quantities and evaluation of their tanks state.***
- ***80% of tanks trucks manufactured until 1989 are used for the local needs of enterprises or small petrol stations. Some of them do not transport any petrol, because they are used to transport diesel fuel.***

The diagram presented below illustrates the age and quantity of registered tank trucks in Lithuania.



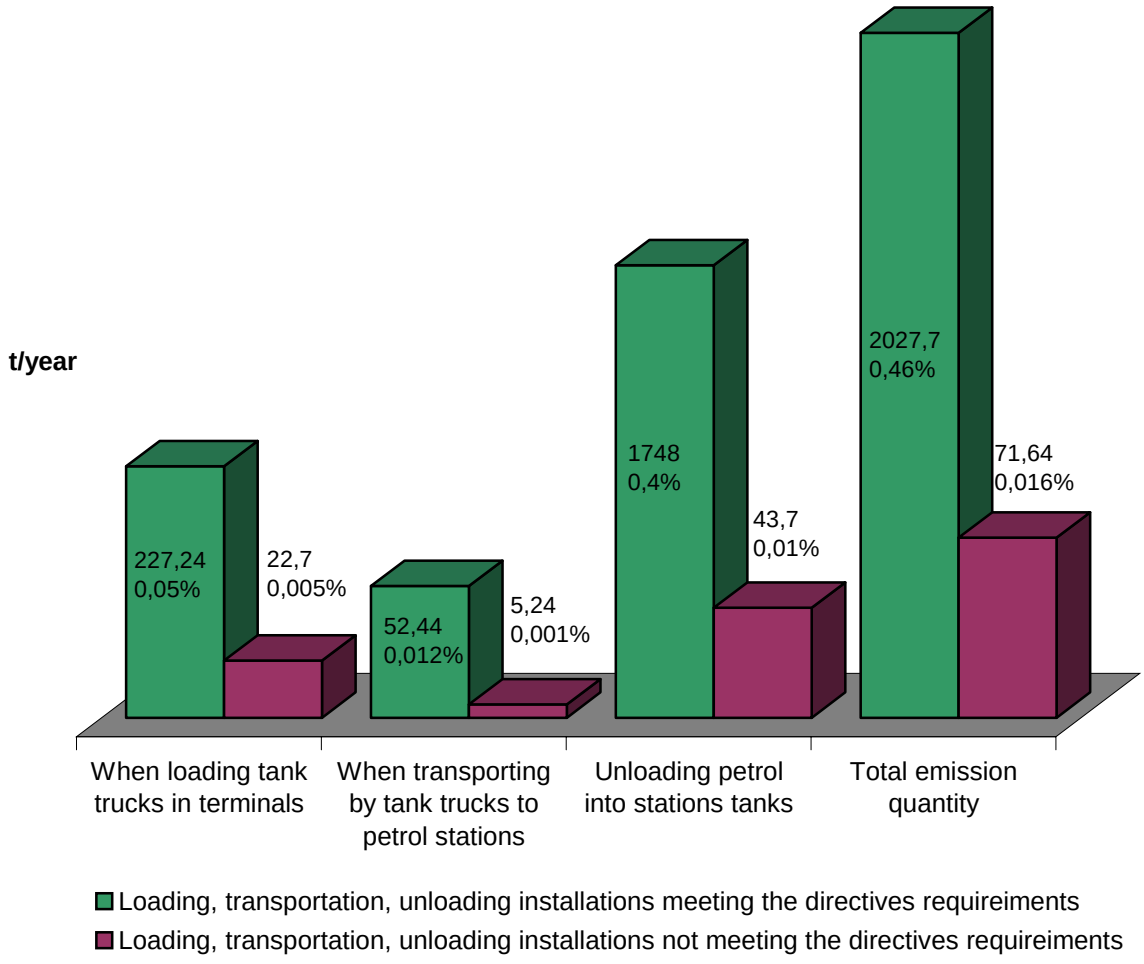
The analysis has shown, that top loading tank trucks not having vapour return and petrol quantity measuring systems (the petrol quantity is measured in the station through an opened hatch). Besides, petrol-unloading hoses are not applied for the tight petrol unloads to the service stations tanks. The tank trucks partly meeting the requirements are frequently earlier tank trucks, manufactured in the West countries, lacking, for example either the vapour returning system or the petrol level measuring equipment. However they have a possibility of both top and bottom loading. They could be updated to the level, which meets directive requirements, because they don't require large investments. There is no reason to update earlier tank trucks manufactured in Russian or in Russian Commonwealth, because of the costs being about 5…8 times larger than the price of tank trucks themselves. Any petrol carrier would not be able to make these

investments – they would use old-type low-tech tank trucks. Then the latter would be discarded or used to carry diesel fuel, stove or other fuel.

The majority (about 80 ... 90%) of tank trucks, which do not meet the directive requirements, are small capacity old-type Russian and other CIS countries' tank trucks. Usually they are used for small petrol stations service or for local needs (for example, Defence Ministry).

For assessing environmental damage and losses of transported petrol by tank trucks of VOC emissions were analytically calculated for all operating tanks and tank trucks, which do not meet directive requirements.

General quantities of VOC emission while loading, transporting and unloading tank trucks in petrol stations are presented in the diagram below. VOC emission quantities are calculated according to LAND 31-99-M-11 methodology for the total petrol quantity sold in Lithuanian petrol stations (437000 t). Calculations were done for both installations meeting the not meeting the requirements and in the whole petrol supply chain from the terminal to a petrol station.



When using installations which meet the requirements of directive 94/63/EC and normative document LAND 35-2000, the total emission quantity would be reduced to 71,64 t or by 28 times. These results will be obtained when whole petrol supply system and implementation will meet the directive requirements.

It is calculated, that:

- ***437 000 tones of petrol were sold in Lithuanian service stations in 2000. 600 000 tons were transported by tank trucks. 132 000 tons of petrol were transported with tank trucks which do not meet directives requirements.***
- ***In 2000 due to the tank trucks that do not meet requirements, VOC emission to the atmosphere was:***
    a. ***while loading mobile tanks (tank trucks) – 0,052% = 68,2 t;***
    b. ***while transporting to petrol stations – 0,012% = 15,7 t;***
    c. ***while unloading in petrol stations – 0,4% = 52,4 t;***
    d. ***total petrol supply losses in Lithuania because of VOC emission from tank trucks which do not meet requirements make up 0,464% or 608 t of petrol.***
- ***After the analysis of the total annual petrol quantity transported in Lithuania (600 000 t), despite the fact that good tanks were also used, petrol losses are:***

$$N_B = 2027,7 \text{ t.}$$

- ***In terms of money (if petrol price is 2 500 LTL/t) losses amount to 5 069 200 LTL;***
- ***Losses of VOC emission from tank trucks which do not meet the requirements are 1 520 000 LTL.***

When using the installations that meet the directives requirements, the annual petrol vaporisation would be 71,64 t or 0,016% of the total petrol sold in petrol stations (in money terms losses make about 179 100 LTL) (for total annually transported petrol– 600 000 t – VOC emission would amount to 96 t (in money terms losses would be 240 000 LTL)).

After implementing the requirements of LAND 35-2000 and assessing VOC emission quantities 4 890 150 ... 6 730 000 LTL could be economised in both cases, while transporting petrol from the terminals to the petrol stations in Lithuania.

Carriers could avoid calculated losses by using updated tank trucks. For example, "Postumis" LTLd, which owns 6 tank trucks not meeting the directives requirements and uses 4 of them, deliver 32 000 t petrol per year. According to LAND 31-99 M - 11 methodology, when loading tank trucks in the terminals, the company loses 16,64 t of petrol and while transporting – it loses another 3,84 t (total about 20 t). These money losses amount to 50 000 LTL. With these resources a small tank trucks could be modernised, but smaller carriers, who transport about 500 ... 2 000 t of petrol per year will be able to save only 1 000 ... 4 000 LTL per year. With this money any modernisation could not be performed, thus in this way petrol carriers would not have any material interest.

Having fulfilled the requirements, their object to survive in this business could be reasonable only in the case, if there is a possibility of the credit on easy terms for the required modernisation. In addition, they will have to maintain the competitive delivery price while increasing transportation amounts.

Evaluating transportation quantities of tank trucks which do not meet the requirements and the ones which do meet, it was determined, that the intensity of modern tank trucks usability could be enlarged by 1.5 – 1.8 times, so total quantity of petrol could be delivered by Lithuanian transporters by means of available new tank trucks, which meet the directives requirements. From this point of view, there is no reason to renew the old tank trucks park – these processes will be naturally solved by competitive and market laws.

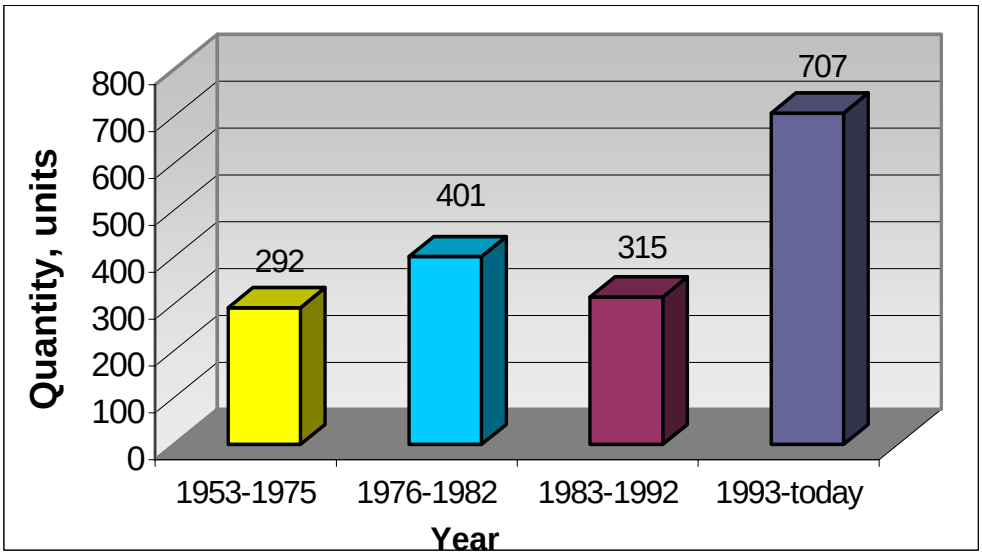
The economic activity of Lithuanian enterprises that possess rail tanks for petrol transportation, have been determined. These are "Mazeikiu nafta" and "Lietuvos gelezinkeliai" joint stock companies, which possess and use 1715 rail tanks. The rail tanks flows, petrol and

VOC emission quantities and the profit of transportation services of "Lietuvos gelezinkeliai" have been determined.

Quantities of transported petrol in Lithuania, VOC emissions and losses are presented in the Table

Flows	To Lithuanian terminals	Transit	Exported via Lithuania	Imported
Transported, t/year	198063	153771	1175041	41338
Calculated petrol emission losses (t/year)	39	30	233	9
Money losses (LTL)	97500	75500	583000	22500

The technical tanks state was examined; the tanks were grouped by the usage period (year of manufacturing). About 80% of the tanks can carry petrol for 10-15 years.



The analysis has shown that the total rail tanks park do not meet LAND 35-2000 requirements. These tank trucks can be used in the future if either required technical improvements are done to satisfy LAND requirements or there is a possibility to apply the latter to the terminals loading equipment. The main tanks components, which do not meet the requirements, are the hatch, the internal unloading valve, the breather, no air suction valve for unloading, and unwarranted tightness of the hatch closure.

The analysis of delivered petrol quantities was made when examining usage of the rail tanks for the case if LAND 35-2000 requirements are applied for the specific part of tanks, e.g., for the tanks operating in Lithuania.

The proper quantity of tanks maintaining the flows was determined. This data were used to provide alternative propositions for the requirements implementation and motivating.

VOC emissions were calculated for loading, transporting and unloading rail tanks. Calculations were done according to the flows.

<u>It was determined that annual VOC emission losses when loading rail tanks are the following:</u>

N_p=1098,4 t/m, ***money loses*** **E_p = 2 746 000 LTL** (conditional wholesale petrol price– 2 500 LTL/t).

It makes 0.075 % of the total loaded petrol quantity (when loading in "Mazeikiu nafta").

Transportation annual losses are:

N_{tr} **=311.4 t/year;** E_{tr} **= 779000 LTL,**

It makes 0,02 % of the total transported petrol quantity in Lithuania.

Emission annual losses when unloading rail tanks in 5 local Lithuanian terminals are:

$N_{iš}$ **=15.33 t/year,** $E_{iš}$ ***= 38312 LTL .***

The annual losses when unloading tanks in "Klaipedos nafta" company:

$N_{išK}$ **= 25.5 t/year,** $E_{išK}$ **= 63750 LTL**

Annual losses when unloading tanks at the Poland border:

$N_{išL}$ ***= 13.93 t/year,*** $E_{išL}$ ***= 34825 LTL***

According to the calculations the unloading losses are not large, they exceed about 1,5 times allowable ones, thus requirements implementation may be delayed or not applied.

The emission of the loading and transportation is large enough, thus LAND 35-2000 requirements must be applied to it.

Total petrol losses, during petrol transportation by rail tanks are:

ΣN= 1493160 kg/year (1493,16 t/year).

It makes about 0,1% of the total transported petrol in Lithuania.

Total annual money losses, when petrol is transported by rail are:

$\sum E$**=1493,16· 2500= 3732900 LTL**

It is reasonable for reducing VOC emission to retrieve the amount annual losses of 3.73 mln. LTL, and to invest it to the introduction of the technical equipment. Considering to increasing petrol production and consumption these losses during 10-15 years may amount to 40 ... 60 mln. LTL.

It was determined that the emission money losses when transporting fall to a petrol buyer, i.e. intermediate terminal. However according to the contract of "Mazeikių nafta" and the terminal an allowable petrol quantity error in the tank is about ±0,8%, and the calculated transportation emission is 0,02%, thus neither the supplier nor a buyer take into consideration the latter seriously. From this point of view neither "Mazeikiu nafta" company, nor the terminals are interested to make decisions that satisfy the requirements of VOC restrictions because of too small losses.

The main technical and process faults of the rail tanks, causing not allowed emission are:

when laoding:

- opened hatches of the tanks;

when transporting:

- unreliability of breathers (improper characteristics);

- uncertainty of hatch closure tightness;

- quality of technical maintenance;

when unloading:

- hatch opening for measuring petrol parameters

- lack of necessary units for vapour returning system (if vapour is returned to the terminal with a VRU);

- opened hatch while unloading petrol (there are no suction valves to the air inlet while unloading the tank).

Possible alternative actions for measures meeting the requirements were determined after the analysis of LAND 35-2000 requirements to rail tanks, to the technical state of tanks and

loading equipment of the receiving terminal. Firstly, the emission problem of the loading and transporting the tank is to be solved, because calculated quantities of VOC emission are much larger than the allowable ones.

Putting the alternative decisions into the practice for the requirements implementations the special attention must be paid to the meeting the requirements of petrol vapour conservation and returning to the tank. Besides vapour returning to the tank can be required if are terminals with minimum turnover of 2000 t in Lithuania. They will have to store vapour and to return it by rail tanks to the other terminals having VRU.

It was determined that for some tank trucks and for all or some rail tanks specific measures should be applied and alternative actions must be taken to meet the requirements.

According to evaluated state of tank trucks and rail tanks and the conclusions made, main directions to meet the requirements were determined:

- ***Purchase of new mobile tanks;***
- ***Updated existing mobile tanks;***
- ***The continued process of adapting legal norms and the requirements;***
- ***The continued process of ignoring the requirements (for example, transporting petrol with old-type tank trucks);***
- ***Updating of the terminals and petrol stations together with mobile tanks;***
- ***Usage of the tanks not meeting the requirements up to the beginning of validity of the requirements or taking advantage on the exceptions provided in LAND 35-2000.***
- ***The continued process while applying loading equipment to the structure of mobile tanks.***

Alternative actions, related with the tanks, not meeting the requirements, are:

- ***Existing tank trucks are not updated but exploited. It is very doubtful that they will be used for other six years until full validity of the directives (i.e. up to 2008.01.01). Probably they will be worn and discarded. Some of them will be able to serve rural petrol stations with very low turnover less than 500 t;***
- ***The old-type tank trucks are fully updated by changing hatch structure by installing vapour collection system as well as petrol level measuring system, etc. Modernisation costs would account to 50 000 ... 100 000 LTL (it would exceed 5 ... 10 times the residual value of the tank). It is evident the carriers are unwilling to accept this way;***
- ***The partial update of the tank trucks, approaching them to the directive requirements. Older tank trucks of the western countries lacking only a small elements of equipment, e.g., vapour collecting pipe, can be updated partly. Modernisation costs would account to 15 000 ... 30 000 LTL, and this would be acceptable for some carriers;***
- ***The best way is to purchase relatively inexpensive second hand tank trucks, which meet the directives requirements. This way would be chosen by majority of respondents.***

"Mazeikiu nafta" is planning to purchase new loading equipment for rail tanks that soves the requirements problem, thus the alternative activities are related to it.

Alternative processes should foresee the requirement meeting when transporting and unloading.

According to the analysis and calculations, a few alternatives were suggested. The most acceptable cases would be related to the renewal of rail tanks by updating.

- ***The tanks are updated by changing the hatch structure, the device of unscrewing internal valve, installing the breathers and providing electronic measuring of the petrol level. The change of hatch structure or installation of connector is to ensure vapour returning and storing it until recuperation.***

- ***Performed partial rail tank modernisation, whose extent would depend on the terminal unloading equipment properties, and the activities, would be coordinated with the terminal owners. Unloading equipment must be also modernised.***

Tanks modernisation costs according to the latter version would be made of manufacturing and design costs that is its value for every tank amounts to 5000 LTL. There is a possibility to validate changes in Russian commonwealth communication system, thus there will be a need to perform related procedures and tasks. Relative costs of 100-tank group partial modernisation amount to 0,75 - 1 mln LTL.

General terminal costs while implementing the decisions of this modernisation version amount to 550-600 thousand LTL, with assumed trestle of 8 unloading points.

These versions could be more simplified and discounted, if the real emission during tanks unloading can be determined by applying the experimentally based research methodology.

Striving that both interested sides paid more attention to implementing the restrictions of VOC emission from rail tanks, the exemptions for financing, tax reduction must be foreseen, the term of the requirements implementation should be postponed. Implementation of the requirements for rail tanks could be postponed for 3-5 years taking into consideration the value of the cost needed for technical tools implementation, also technical features of rail transport, its integration in Russian Commonwealth and other factors. This period is required for preparing integrated actions program, required normative acts preparation, accumulating of financial resources or obtaining the funds according to the specific programs or business plans.

The main economical outcomes of implementing the directives requirements would be:

- Investments for necessary renovations of the mobile tanks and terminal installation;
- Possible increase in a petrol price;
- The exemptions for loans to cover these investments should be foreseen by the State and thus reduce the possible of petrol price rise.

Other outcomes in the scope of the maybe diminished because of a small number of enterprises in this business and a small size of services.

The quantity of intended investments and the possible growth of petrol price meeting the LAND 35-2000 requirements are calculated for every stage of mobile tanks loading, transporting, and unloading. The total quantity of petrol, which is transported from, “Mazeikiu nafta” company was used for calculations. It amounts to 1,37 mln. t/year by rail tanks and 0,46mln. t/year by tank trucks. The assumed price of petrol is 2500 LTL/t (cost price).

The costs of petrol loading renewal amount to 46 - 50 mln. LTL. The problem solving of transportation by rail tanks amount to about (8…9) mln. LTL (partial modernisation). Investments for unloading modernisations (terminals) amount to 2,25 mln. LTL. Investments for tank trucks park renovation (depending on modernisation level) amount about (9…39) mln. LTL.

Summarising the investments of all stages, (70…100 mln. LTL) 1 ltr. petrol price is expected to rise 0,03 LTL if transported by a rail tank and about (0,07…0,24) LTL, if transported by a tank truck. This price increase is calculated for the case if investors expect to retrieve implemented funds in 1-year period. Petrol price increase should be less in respect to the savings retrieved from VOC emission restrictions (from the tank trucks the savings amount to 4,9…6,7 mln. LTL and from the rail tanks the savings amount to 3,75 mln. LTL). The longer period of investment should be also applied.

Analysis of the social and environmental outcomes was done. It was determined that the requirements implementation can negatively affect the small carriers, who deliver 200 t/year, they will not survive. If the enterprise transports less than 2000 tons/year of petrol after investments of 10 - 15 thousand LTL, it will survive. The number of small carriers is not large, and about 10-20 people will lose the job. Besides, in the report other conditions were characterised which defuse social outcomes because of petrol transportation business changes after implementing the requirements. The outcomes for “Lietuvos geležinkeliai" were analysed. The requirements implementation may need international coordination (Latvia, Estonia, Russian

CIS, Poland) and petrol transporting business maintenance because of possible technical condition inadequacy problems.

The research study describes the implementation advantages of the environmental requirements for mobile tanks. Through the implementation of LAND 35-2000 directive regulations, it will be possible to reduce the amount of LOJ emission 20 times.

During the research, the opinion of petrol carriers on the implementation of LAND 35-2000 requirements was determined. Consultations were carried out with both the managers of large enterprises, holding modern tank trucks, and the owners of small or personal enterprises, using old-type tank trucks and cooperating with rail tank owners. The major carriers of petrol in tanks, possessing modern equipment, consented to the implementation of these requirements practically without reservation. In their opinion, this will equalize the carriage price, which is presently dumped by small carriers using tank trucks not corresponding to the requirements.

The implementation of these requirements by some large carriers, having and using old tank trucks, made in former USSR or Russia, could be postponed in order their users could accumulate more funds for the implementation of future changes related to the satisfaction of the requirements.

If the possibility were provided to modernize old tank trucks, some enterprises and private carriers would allot some LTL 10,000-15,000 for this purpose.

In the opinion of small carriers, the implementation of the directive requirements, is the disruption of small business, while they propose either to postpone the implementation for a longer period or supplement the LAND 35-2000 requirements with bigger concessions or norms taking into consideration the amounts, transported in a year as well as the place of transportation, i.e. either city or rural area, etc.

The petrol carriers in railway trucks, “Mazeikiu Nafta” and “Lietuvos Gelezinkeliai”, practically expressed the same opinion—it is not necessary to replace or modernize the tanks in order to satisfy the requirements, this should be performed by the owners of terminals who should adjust their facilities to presently exploited tanks. The problem of filling (at the terminal held by “Mazeikių Nafta”) will be solved after the acquisition of new and modern equipment.

Another reason for the reluctance of tanks renewal is that in railway tanks petrol is carried to the CIS, while this might cause some usage restrictions. Furthermore, it would be difficult to incorporate the modernization in the joint CIS railway system, and additional investments would be required for this purpose.

Basing on the research findings and the emphases made in the presented conclusions, to evaluate and renovate the fleet of petrol-carrying tank trucks in accordance with the directive 94/63EC and the requirements of the normative document LAND 35-2000, the following action plan is proposed:

1. The Order on the application of the directive 94/63/EC and the normative document LAND 35-2000 for current petrol storage, trans-shipment and transportation equipment, providing for possible reservations of the requirement implementation under Lithuanian conditions, will be prepared by the Lithuanian Republic Ministries of the Environment, Social Security and Labour, and Transport and Communications.
2. In order to coordinate the decisions taken, to include additionally into the work group for the implementation of the EU petrol storage, trans-shipment and transportation equipment, formed up by the Order No. 286 of the Lithuanian Republic Minister of the Environment as of 25 04 2000, the representatives of Mazeikiu Nafta, oil carriers and oil terminals.
3. The work group should prepare the plan of actions and measures for the requirement implementation, which shall include:

- government (issued by ministries) decrees, regulating the implementation of the requirements for tank trucks;
- the determination of inter-state actions required to coordinate the requirement implementation with state institutions and economic subjects of Latvia, Estonia, Poland, Belarus, Russia, the Ukraine, and Moldova.

- the provision of possibility to choose the technical measures (solutions) for the requirement implementation and share related actions;
- the preparation of technical-normative documentation for the requirement implementation;
- the preparation of additional documents for the LOJ emission amount evaluation and presentation of related recommendations;
- the establishment of the procedure of requirement implementation control and technical supervision;
- the establishment of the procedure of transferring the railway tank technical supervision to an independent institution;
- the establishment of the procedure of preparing documents, regulating the reconstruction of tank trucks in accordance with the requirements (in case of necessity);
- the determination of the volumes of railway tank technical reconstruction and well as the requirements for validation thereof.

This plan of actions and measures should be prepared with the participation of the managing representatives of the economic subjects concerned and should be based on real solution versions selected by the economic subjects.