ABSTRACT

The object of this paper is the evaluation of the reliability of vehicles based on a results' analysis of the technical control procedure between 1987 and 2000 in the Vehicles’ Technical Inspection Center (KTEO) of Patras.

First, we present a short reference on the legislation concerning the technical inspection of Vehicles in Greece.

Second, we analyze statistically the results of the technical control of reliability of all kind of vehicles, which have been inspected by KTEO of Patras. The aim was to determine the chronological evolution of the percentage of the inspected vehicles with serious technical problems.

We also examine the frequency of appearance of serious reliability problems in every inspected system of the vehicle in order to predict the systems with the most reliability problems.

In the end we present the findings of the statistical analysis along with some thoughts about the improvement of the technical inspection procedure of vehicles in cooperation with the University of Patras.

KEYWORDS

Technical inspection of vehicle, reliability of vehicles

1. INTRODUCTION

Accidents and vehicle pollution are two acute social problems that demand today our immediate attention. The technical inspection of vehicles -along with other aligning measures- is a decisive tool in their prevention.

The frequent technical inspection was adopted in 1983 in Greece. It is compulsory and it is carried out in the Vehicles’ Technical Inspection Centers (KTEO). The technical inspection took place initially in the KTEOs in Athens (Cholargos), Thessalonica, Patras and Heraklion and gradually all over the country.

2. TECHNICAL INSPECTION OF VEHICLES

Every car and small truck (full weight < 3,5 tons) is inspected technically four years after the issue of their first license and every two years ever since. Big trucks (full weight > 3,5 tons), buses and all other public vehicles undergo technical inspection on annual basis.

The technical inspection includes the following systems, illustrated in the Technical Inspection Card.

Equipment. We control the identification and the equipment with all necessary elements and devices of the vehicle.

Lamps. We inspect the existence of the lamps, their function and adjustment as prescribed in the Code of Road Traffic (CRT).
Steering system. Here we control the condition, function and the side declination of all components of the steering system.

Brake system. We inspect the brake percentage and the one-sided course with brake and stop with the assistance of break meters, as well as all relevant data about the components and parts of the system, both for hydraulic and air breaks.

Tires. We control their eligibility in terms of the dimension and the general condition.

Frame. We check the condition of the frame, the car body, the suspension system with the help of lash meters as well as the transmission system.

Fire protection. The existence of the appropriate fire extinguishers and anything else that affects the fire protection of the vehicle is being controlled.

Pollution/Exhaust fumes. We check CO & HC or fume emissions in vehicles that use benzine and diesel respectively, and also the noise level if considered above average.

Public transportation. We inspect all subsystems and the equipment that should carry all public transportation vehicles.

Hazardous matter transportation. We control the documents and the equipment that must have all vehicles for transportation of hazardous materials.

All other defects. Under code 002 we register all defects that don’t fall in all previous categories.

The technical inspection examines all specific checkpoints mentioned in the Technical Inspection Card. The defects or damages are divided into secondary, serious and dangerous.

A vehicle is granted the ‘pass’ status even if it has secondary defects.

In the contrary, detecting a serious defect obliges the vehicle owner to repair it immediately and resubmit the vehicle for inspection after 20-30 days.

A dangerous defect leads to license and plates withdrawal till this defect is repaired. In short, a car with or without secondary defects is considered “pass” while with serious defects temporarily “not pass”.

The evaluation of the technical inspection of vehicles’ reliability is based on the results of controls carried out in the KTEO of Patras.

KTEO of Patras started operating inspections initially on public vehicles and buses in 1985. In 1986 KTEO of Patras designed and implemented a program for the exhaustive technical inspection of all vehicles in the Prefecture of Achaia. The program was concluded in 1987.

It has five inspection ramps, two ramps for cars and small trucks, one for big trucks and buses, one universal and one ramp for special inspections.

Its primary mission is the conduct of frequent technical inspection of the vehicles in the Prefecture of Achaia. Apart from that, KTEO of Patras issues the Exhaust Fumes Control Card for all inspected vehicles, controls the numerous imported vehicles before their classification, certifies vehicles with antismog technology, inspects vehicles for educational purposes, and measures the noise level. It also conducts the special inspection of imported buses, the special truck modification inspection, inspections out of schedule, assessments etc.

3. ANALYSIS OF THE TECHNICAL CONTROL STATISTICS

KTEO of Patras inspects annually about 25500 vehicles in total; 16000 taxis, 800 small trucks (<3.5 tons), 4700 trucks (>3.5 tons) and 1500 buses. The statistical data of those inspections provide the basis to determine the percentage of faulty vehicles in each category and its change over time so as to assess the influence of the technical inspection procedure.

Figure 1 depicts the inspection results for four characteristic years: 1987, when the all vehicles were examined for the first time, 1992, a year where a lot of old vehicles have been redrawn, 1998 and 2000 which illustrate the current situation. The diagrams show the percentages of vehicles that passed and failed for each year, in total and for each of the five categories (vehicles for private use, vehicles for public use, small trucks, big trucks and buses).

![Figure 1: Overall pass-fail percentages (1987 – 2000)](image)
Studying these diagrams we can deduce the following conclusions:

a. In 1987 a high percentage of vehicles failed overall (36.10%), ranging from 27.25% (vehicles for private use) to 50.80% (big trucks). This fact confirms the necessity of the technical inspection procedure.

b. Further about 1987 it is noteworthy that more than half of the big trucks (50.80%) had serious damages or defects (Figure 2). These trucks would be free to drive, constituting a serious threat for traffic safety if there wasn’t for the technical inspection.

c. Between 1987 and 1992 we note a significant decrease in the fail percentage (1987:36.1% 1992:13.8%) overall and in all categories (Figures 3 to 6) owing to three factors: (i) the positive impact of the 6-year technical inspection and (ii) the shift in mentality of car owners as far as preventive control and maintenance is concerned and (iii) the remarkable
renewal of vehicles for private use mainly resulting from an act favoring the withdrawal of old vehicles.

d. The further decrease of failed vehicles from 13.8% (1992) to 8.06% in 1998 and 7.37% in 2000 confirms the above statements, considering that a normal car in Achaia has been inspected 7 times while a truck or bus 14 times. Additionally, it has been observed that the large majority of car owners maintain and repair their vehicle before submitting it to KTEO for inspection.

4. FREQUENCY OF APPEARANCE OF SERIOUS DEFECTS AND DAMAGES

The following diagrams (figures 7 to 11) illustrate the distribution of the serious defects and damages in each inspected system for each vehicle category as these are registered in the Technical Inspection Car Card (figure 12). The data derives from year 2000. The distribution of defects and damages was pretty much the same the previous years.

These diagrams reveal the following:

- a. The Technical Inspection in vehicles for private use detected most serious damages and defects in the “pollution” (33,45%) and “frame” (33,02%) followed by the break (15,17%) and steering system (8,27%) – figure 7.

- b. Similarly, vehicles for public use had serious defects mostly in the “frame” system (35,85%) and “pollution” (28,30%), followed by “public transportation” (11,32%) and “steering system” (7,55%) – figure 8.

- c. Serious damages in small trucks again were detected primarily in the “frame” system (40,04%) and “pollution” (20,12%), a figure significantly lower than vehicles for private use. They were followed by the break (15,98%) and steering system (9,13%) (figure 9).
Defect categories

1. Equipment
2. Lamps
3. Steering system
4. Brake system
5. Tires
6. Frame
7. Fire protection
8. Pollution
9. Public transportation
10. All other defects

Figure 10: Big trucks with serious defects (2000)

The main defect area in big trucks were the frame (36.02%) and break system (29.98%), followed by distance from “equipment” (9.68%) and “steering system” (7.04%), figure 10. It is noteworthy the tiny percentage (1.49%) of defects in “pollution” unlike small trucks.

Figure 11: Buses with serious defects (2000)

Buses (figure 11) have serious damages mainly in the brake system (38.89%), followed by frame” (22.22%), “steering system” (13.89%). Again here insignificants problems in “pollution”.

5. CONCLUSION

In conclusion, a big percentage of critical vehicles in all categories presented serious damages or defects in the frame system. The break system was the most problematic area in big trucks and buses. Regular defects appeared in the pollution/exhaust fumes system of light vehicles (private, public vehicles and small trucks), followed by steering system, equipment and other defects with smaller percentages.

The data and the analysis of the Technical Inspection results yield

a) the positive impact of KTEOs in the improvement of the reliability of vehicles and thus the road safety and environmental protection.

b) The most frequent damages were detected in essential vehicle systems, which determine decisively road safety and pollution, a fact that cries out for measures for further decrease of their frequency of appearance.

c) In this direction emerges the need to upgrade and improve the KTEO with means such as: engagement of trained personnel, replacement of the present inspection equipment, full scale utilization of computer and the enactment of a reliable and transparent inspection system. In this perspective the cooperation with the University of Patras would be very welcome mainly through the utilization of the existent ramp for special inspections, measurements, certification of different vehicle systems.