THE ANALYSIS AND ASSESSMENT OF THE IMPACT OF THE LENGTHENING THE MILEAGE ON THE CHANGES OF SOME CHARACTERISTICS OF OIL ENGINE

M. Szubartowski, M. Sójka, P. Bukowski

University of Technology and Life Sciences
Department of Machine Maintenance
S. Kaliskiego 7 Street,85-789 Bydgoszcz, Poland
e-mail: kem@utp.edu.pl

Abstract

In an exploitation process engine there are physic-chemical changes of oil, which make impurities oil have a different characteristic. It is mainly connected with the element systems and greasy materials that react between themselves. The changes are constant and they mirror their new exploiting character. Deteriorating characteristics of oil influence its usefulness in a using process.

The aim of the thesis is to show the results of exploitation research of engine oil that is used in transportation, basically by the Public Transport Company. The research mainly focuses on engine oil exploited in the buses of a public transport. They are of the following type: MAN NL, MAN NG, JELCZ 181 MG. O They have multi-seasonal oil like TEDEX, DIESEL, TRUCK SHPD SAE:15 W-40. The subject of the research are the processes that occur in engine oil while its exploitation.

On the basis of the research, it was possible to specify the nature of the engine oil aging processes as well as the impact of the exploiting conditions on a temporal state of the main parameters that characterize the suitability of the engine oil. It has been proved that there is a lack of suitable and reliable methods of diagnosing and controlling the engine oil state while its exploitation. The following thesis is the first step to make the attempt to lengthen the distance in kilometers traveled of engine oil and determine the limit states of the crucial parameters on the basis of a real index.

Keywords: *kinematic viscosity, basic number, ignition temperature, concentration of the use products*

1. Introduction

A proper function of friction knots in the engine such as a cylinder sleeve - pistol/rings and slide bearing - tenon decides on a technical efficiency of an engine and it is dependent on the value of oil and the amount of pollution that gets to oil from the engine. In an exploitation process there are physic-chemical changes of oil, which make impurities oil have a different characteristic. It is mainly connected with the element systems and greasy materials that react between themselves. The changes are constant and they mirror their new exploiting character. Deteriorating characteristics of oil influence its usefulness in a using process.

The specificity of polluting engine oil lies in pollution that constantly gathers inside, as greasy systems are of a closed circulation. The intensity of polluting engine oil depends on:

- a technical state and the conditions of exploiting an engine,
- the type and state of a filtering system,
- the type of oil and the frequency of fueling it,
- the type of petrol.

The advance in the technology of producing based oil and purifying supplements made production of multi-seasonal oil possible. As a matter of facts, it lets winter oil be more sticky in lower temperatures, while the summer one is more sticky in higher temperatures.

The greatest impact on the value of engine oil can be ascribed to the car engine manufacturers, due to the fact that new engines are more efficient and fulfill new ecological standards as well as

quality requirements.

The basic physic-chemical and use characteristics are measured in laboratories by standard methods. Nowadays, there is a wide variety of research possibilities, among which the newest one is a Bookfield method that concerns a new criteria of estimating oil pumping with two new parameters – gelling index and gelling temperature.

In Poland, at the moment, there is no independent control of engine oil quality.

2. The aim of thesis

The aim of the thesis is to indicate the influence of lengthening the distance in kilometers traveled of engine oil together with some of its characteristic features.

3. The object and subject of the research

The research mainly focuses on engine oil exploited in the buses of a public transport. They are of the following type: MAN NL, MAN NG, JELCZ 181 MG.

There are 215 vehicles used in the local Public Transport Company. They have multi-seasonal oil like TEDEX, DIESEL, TRUCK SHPD SAE:15 W-40.

The subject of the research are the processes that occur in engine oil while its exploitation.

4. Research methodology

There were few makes of buses that were taken into consideration while choosing the proper ones. There were MAN NL, MAN NG, JELCZ M181MB. For the research they tested 6:

- MAN NL, side number 3514, the year of production:2000, the distance in kilometers traveled after an engine repair-412000 km (while starting the research),
- MAN NL, side number 3516, the year of production: 2000, the distance in kilometers traveled after an engine repair-8000 km (while starting the research),
- MAN NG, side number 3546, the year of production: 20001, the distance in kilometers traveled after an engine repair-391000 km (while starting the research),
- MAN NG, side number 3548, the year of production: 2001, the distance in kilometers traveled after an engine repair-302000 (while starting the research),
- MAN NG, side number 3546, the year of production: 2001, the distance in kilometers traveled after an engine repair-323000 km (while starting the research),
- JELCZ M181 MB, side number 3546, the year of production: 1996, the distance in kilometers traveled after an engine repair-323000 km (while starting the research).

The samples of oil were taken straight from the engine oil bowl through the inlet with the use of a medical syringe and a hose. The following mileage, where the oil should be taken, was indicated:

- zero state (fresh oil),
- after the distance in kilometers traveled up to the zero state of 10000 km,
- after the distance in kilometers traveled from the exchange 15000 km,
- after the distance in kilometers traveled from the exchange 20000 km,
- after the distance in kilometers traveled from the exchange over 20000 km every 2500≠250 km.

To conclude, MAN NL, MAN NG and JELCZ M181 MB buses need to have the oil and filters exchanged after 20000 km.

The samples were taken gradually in order to measure kinematic viscosity, ignition temperature, the concentration of tribiological knots use and basic number of examined engine oil.

The later research focuses on indicating grease, kinematic viscosity, concentration of use products and the acid number of oil.

5. The model of calculating the limit parameter states

The research results of concentration of the use products of tribiological knots have been

shown in a chart form.

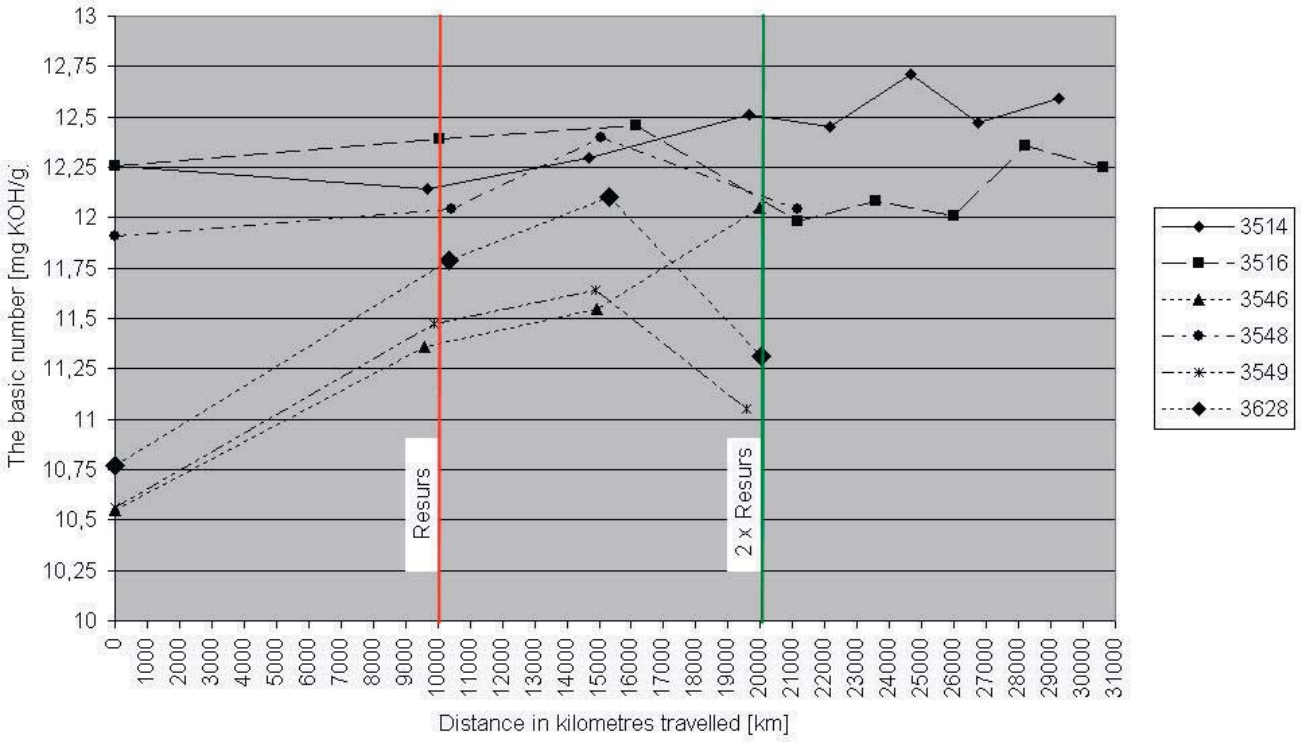

Fig. 1. The change of the full basic number according to the distance in kilometers traveled a bus

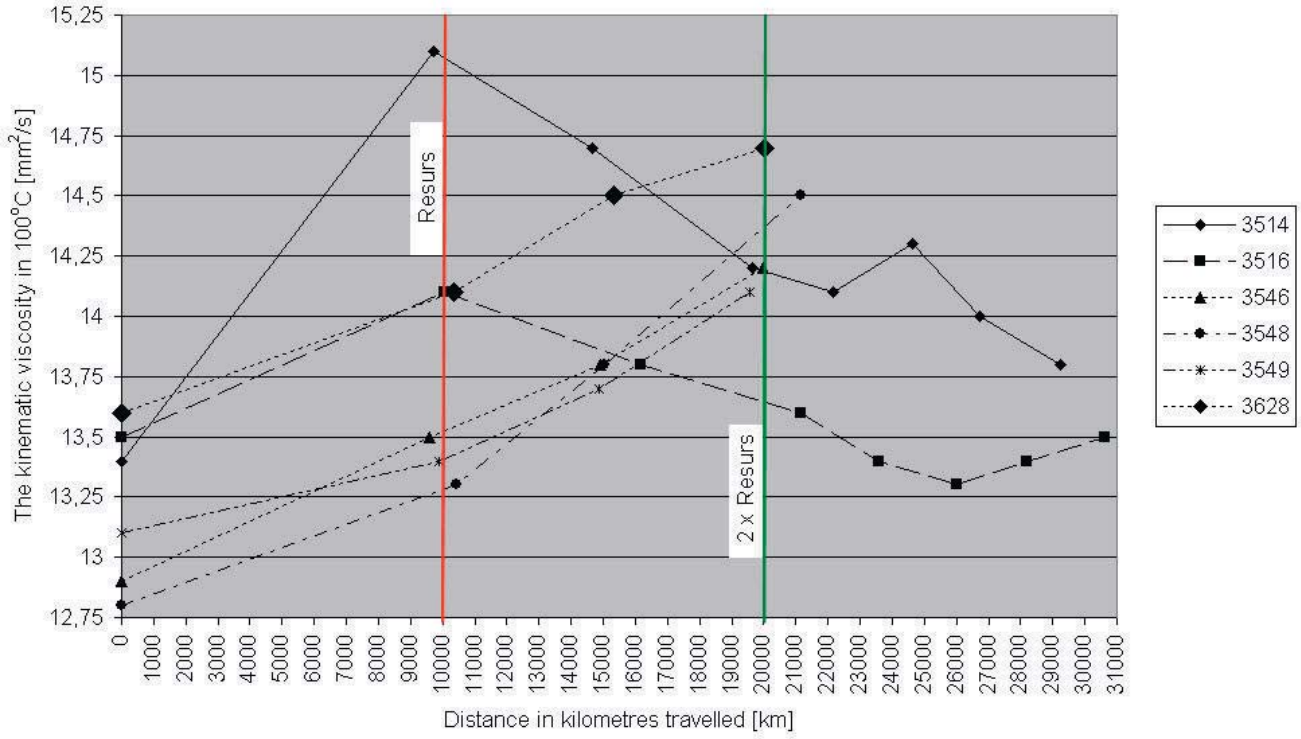

Fig. 2. The change of kinematic viscosity of oil according to the distance in kilometers traveled a bus

6. The analysis of the results and conclusion

Fig. 1 presents the change of the value of the full basic number depending on the distance in kilometers traveled of the examined buses. The high level (over 10 mg KOH/g) of an alkali reserve shows a constant ability of neutralizing acidic products that enter the engine oil in the process of burning petrol and air mixture.

Fig. 2 presents the change of kinematic viscosity of the examined oil depending on the distance

in kilometers traveled of the vehicles from the previous oil exchange. Together with the increase of the mileage, the kinematic viscosity has gradually rise. Bus 3514 has had its kinematic viscosity higher than the other ones from the moment of oil exchange till 10000 km.

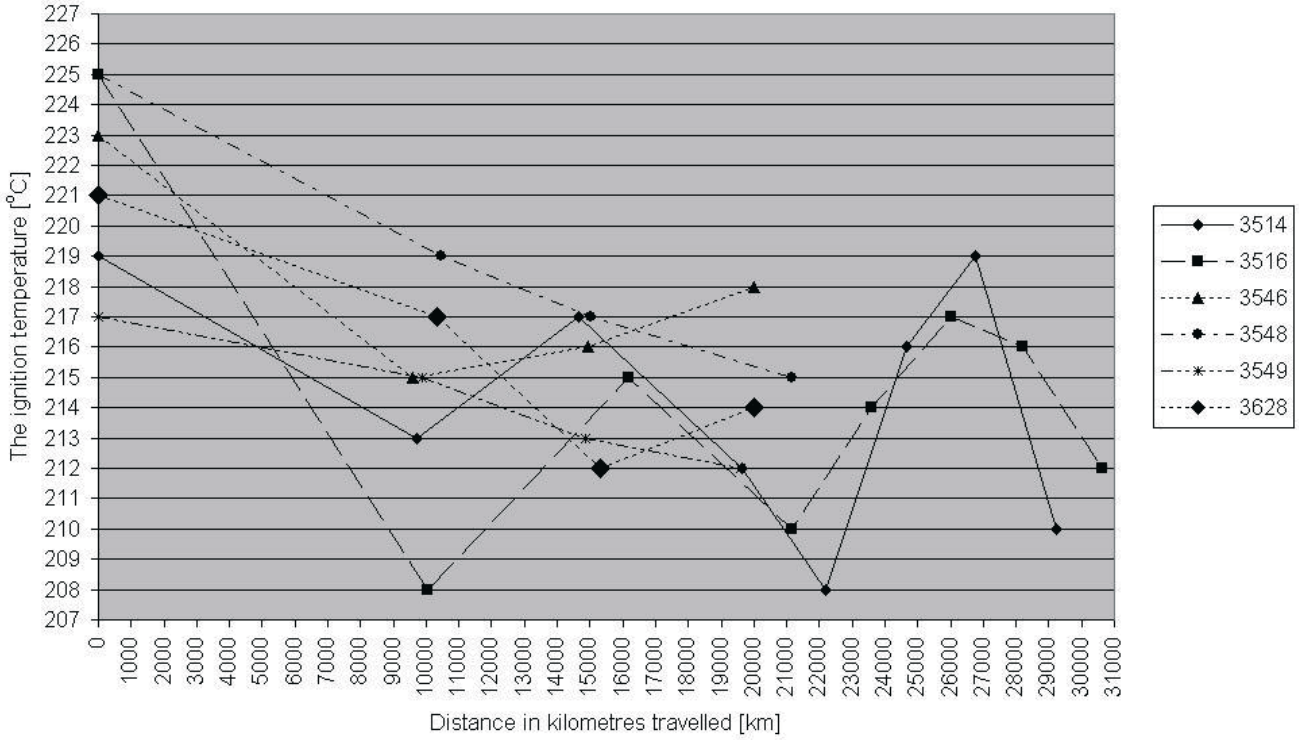

Fig. 3. The change of ignition temperature in oil samples according to the distance in kilometers traveled a bus

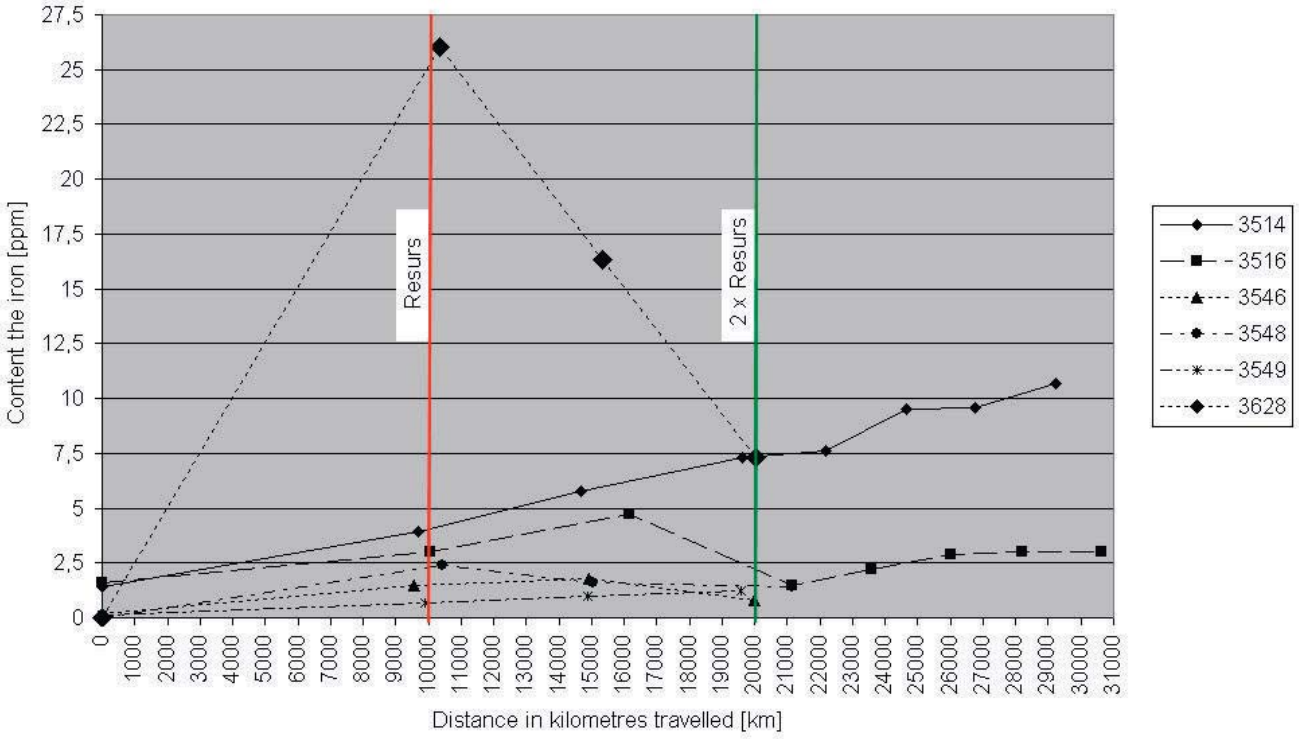

Fig. 4. The change of iron content in oil samples according to the distance in kilometers traveled a bus

The change of the values of the ignition temperature is drawn in Fig. 3. The ignition temperature of oil slightly decreases up to the distance in kilometers traveled of about 10000 km. In another range, from 10000 to 20000, the value of the ignition temperature stabilizes.

Fig. 4, 5, 6, 7, and 8 present the relationship between the concentration of metallic elements in examined oil and its distance in kilometers traveled after the change. In the examined samples there is no radical change of concentration of metallic elements, which can stand for the lack of exceeded use phenomenon. Bus number 3628 is the only one where the increase of all the elements is clear when the mileage reaches 10000 km. Concentration of elements, however, decreases after exceeding the kilometers limit.

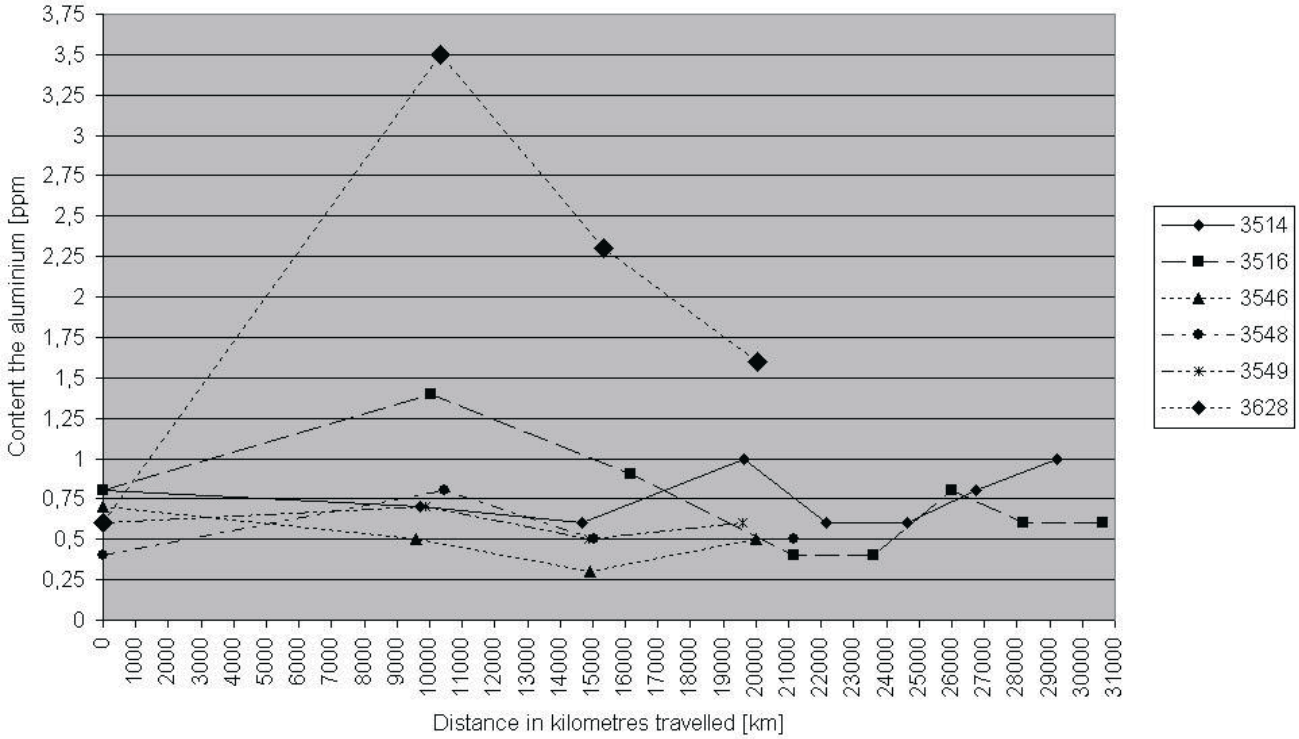

Fig. 5. The change of aluminium content in oil samples according to the distance in kilometers traveled a bus

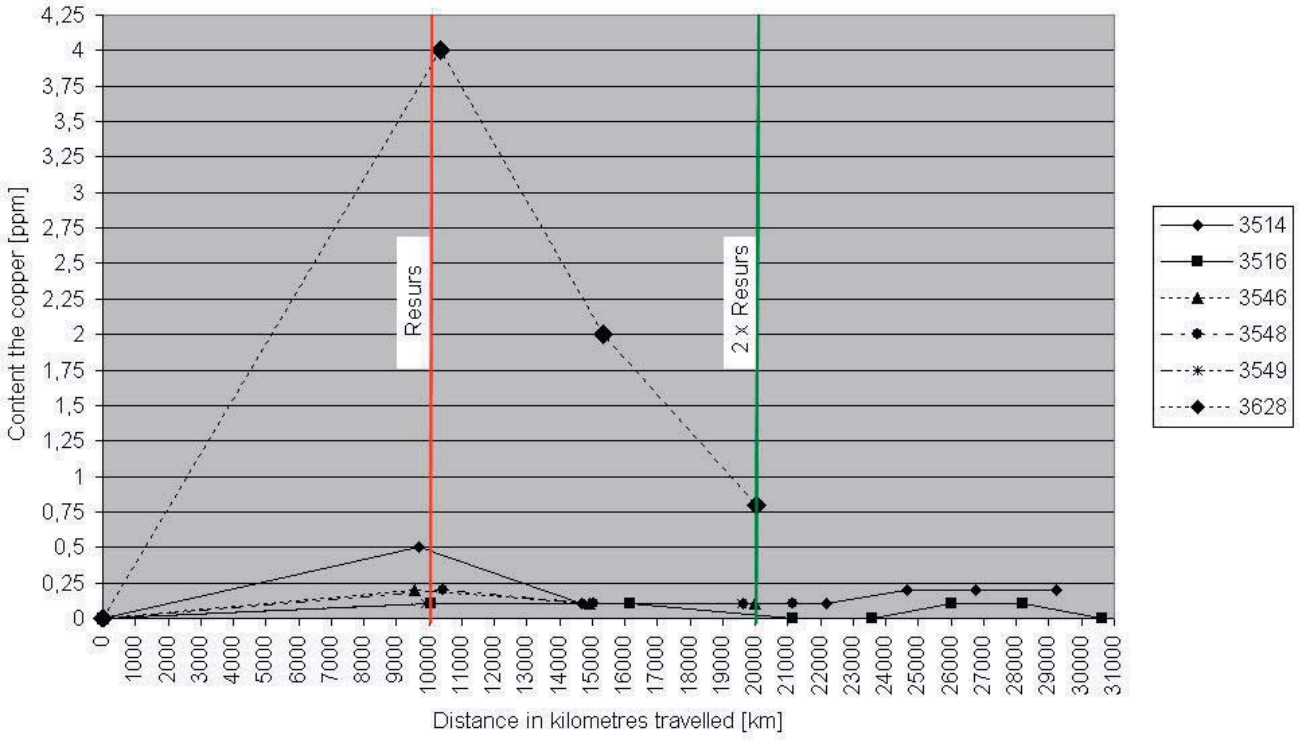

Fig. 6. The change of copper content in oil samples according to the distance in kilometers traveled a bus

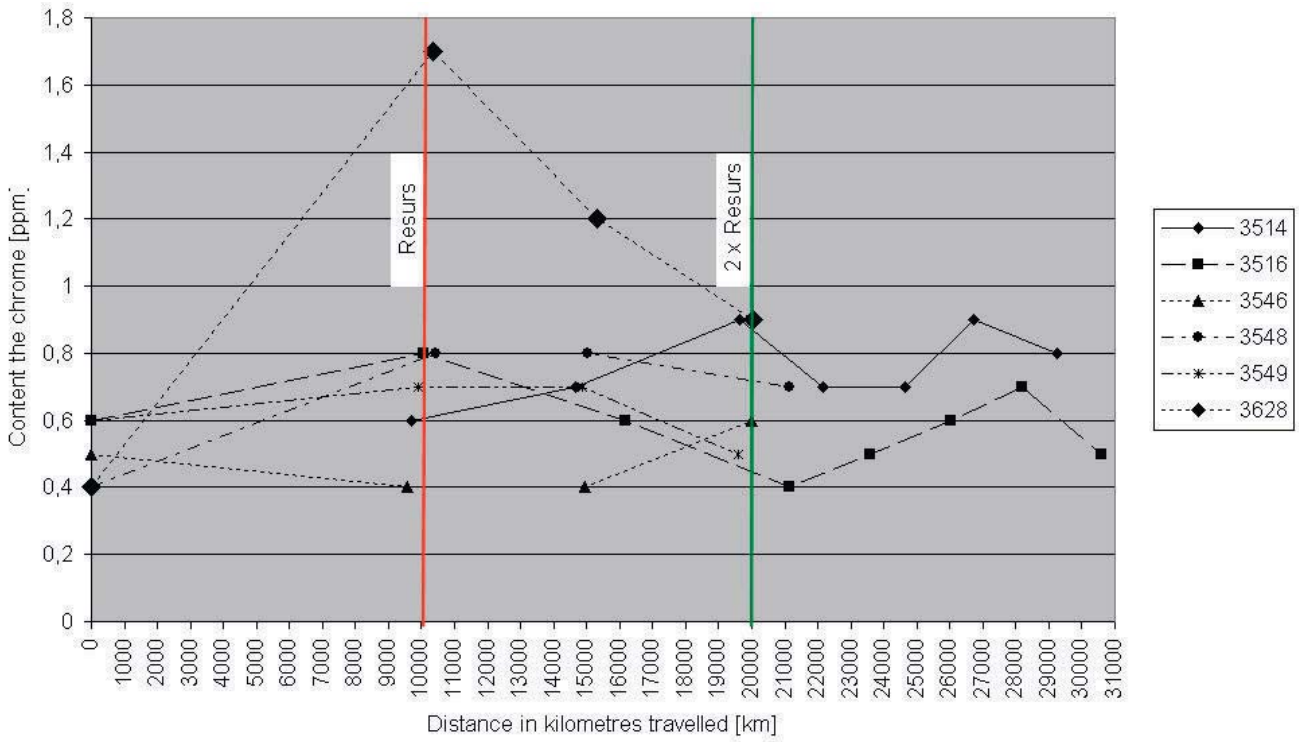

Fig. 7. The change of chrome content in oil samples according to the distance in kilometers traveled a bus

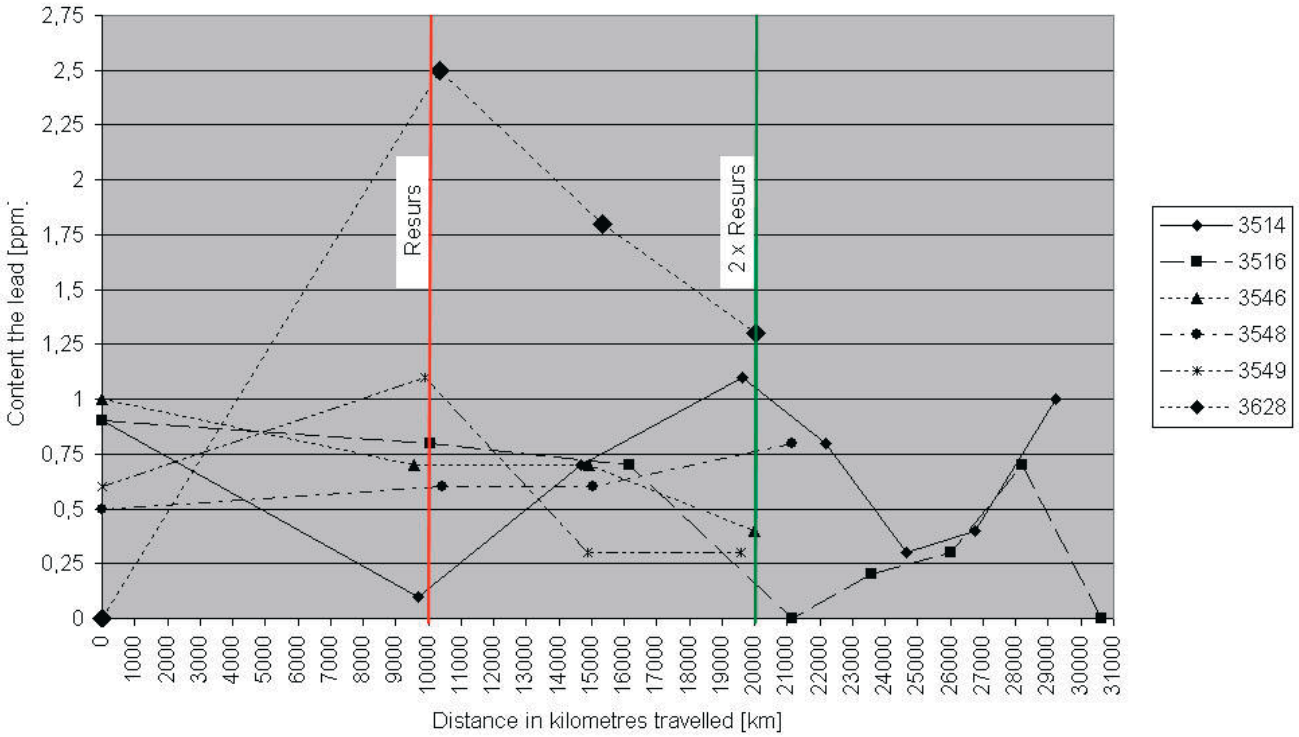

Fig. 8. The change of lead content in oil samples according to the distance in kilometers traveled a bus

7. Conclusion

The examination of exploiting engine oil used in the buses of the local Public Transport Company enabled to draw the following statements:

1. There is a close link between the change of physic-chemical characteristics of examined oil and a distance in kilometers traveled. It has been proved that the basic physic-chemical features do not change when there is a top-up.

2. The results prove the aim of increasing oil delivery in engines. Forecasting the horizon of a temporary diagnosis of the existing values of the parameters that signify the state of use will enable to specify the limit state of oil.
3. The usage of product concentration in oil delivers the diagnostic information.
4. A systematic checkout of the most important parameters helps to signify the limit states, where oil stops functioning in internal combustion engine.
5. Lengthening the period between exchanging the oil enables to lessen the costs of exploiting technical objects such as buses.
6. Research that has been run in the thesis can be a clue in making decisions concerning the process of proving the suitability of technical objects, which is public transport.
7. It is necessary to follow the research of lengthening the period between oil exchange if taking the samples is forecasted to indicate the limit states. Further research should be taken to find rapid changes of significant parameter values.

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