DOI: https://doi.org/10.52651/sam.a.2023.1.5-12

# TRIBOTECHNICAL DIAGNOSTICS – MOTOR OIL (MO) CASTROL EDGE SAE 5W30 CHARACTERISTICS CONTROL ON ŠKODA OCTAVIA II

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**Abstract:** This work deals with tribotechnical diagnostics, more specifically checking the properties of the motor oil used in the Škoda Octavia II during regular use of the vehicle and after a certain number of kilometers. The work consists of a brief theoretical basis of measuring instruments, their operation as well as the theoretical basis of the measured liquid for the very beginning of the measurement. The practical part of this work will consist of measuring the properties of oil and monitoring its gradual degradation with the help of individual devices. Diagnostic measurements were performed in the diagnostics laboratory of the Department of Mechanical Engineering at the Armed Forces Academy of General Milan Rastislav Štefánik (hereinafter „AOS") in Liptovský Mikuláš.

**Keywords:** Motor oil; ACEA; API; SAE; VW 501 01; 505 00504.00; 507.00/MB-Approval 229.31/229.5; Kinematic viscosity.

## 1 INTRODUCTION

The measurement of motor oil properties was performed on a škoda octavia II vehicle. this vehicle is regularly used with a range of approximately 301,000 kilometers. it is a 1.6 liter engine (cayc) 77kw TDI [5-6]with direct injection common rail system. For this reason, the vehicle is used in the vast majority of cases for long-distance transport, mainly on the route Liptovský Mikuláš - Lučenec (153 km), Lučenec - Banská Bystrica - Lučenec (140 km), Lučenec - Zvolen (110 km). The motor oil in this vehicle is changed regularly at the intervals recommended by the manufacturer (castrol), i. interval 12,000 km or 2 years. [10] Approximately 11,000 km have been driven to the vehicle's current oil level, and at the time of writing, the original oil level has been agreed to be replaced along with further vehicle Maintenance. Measurements were performed at the department of mechanical engineering in the laboratory of tribodiagnostics AOS, using 3 measuring instruments. To measure the kinematic properties of Spectrovisc - Q3050, which will be provided in more detail in a separate chapter in this work. The Fluidscan Q1000 instrument was used to measure the oil content properties and the Ferrocheck 2000 series instrument was used to measure the ferrous particles contained in the oil. [4,5,11] Measurements were performed on these devices in accordance with the rules and safety principles associated with working on these devices. [1-3]

## 2 MEANS OF MEASUREMENT MO-CASTROL EDGE 5W-30 LL TITANIUM FST IN THE LABORATORY OF TRIBODIAGNOSTICS AOS

The measurements were carried out in the laboratory of tribodiagnostics at the Armed Forces Academy of General Milan Rastislav Štefánik (AOS) and at the workplace of the Department of Mechanical Engineering – workshop where the samples were taken. The laboratory is equipped with various means suitable for performing measurements. The instruments used in this work includes SpectroVisc Q3050, FluidScan Q1000 and SpectroCube, these instruments will be closer examined in later chapters of this work.

**Fig. 1** Tribodiagnostics Laboratory
Source: author.

SpectroVisc Q3050 model (fig.1 extends from 1 [cSt] to 680 [cSt] at 40°C; the functionality is the result of a new polished cell that provides the range and performance enhancements. The unit can calculate 100°C viscosity values with the input of the vi index. [14] The Fluidscan Q1000 series is infrared motor oil analyzer that provides a direct quantitative measurement of a lubricant's condition. The FluidScan is compliant with ASTM D7889 "Standard test method for field determination of in-service fluid properties using infrared spectroscopy. [15]

## 3 MOTOR OIL CASTROL EDGE 5W-30 LL TITANIUM FST

Castrol Edge LL Titanium motor oil is a synthetic motor oil with Titanium technology specially developed to meet the more demanding tests of motor oils from leading car manufacturers. It provides protection by the current complex

emission system throughout the extended exchange interval. The ACEA has included the C3 (catalyst & GPF / DPF compatible motor oils for gasoline & diesel engines) viscosity group SAE 5W-30, which means that it is suitable for use on high-speed direct-injection petrol and diesel engines (Common Rail) of passenger cars and vans.

The advantages of this oil are:

- Maximize short-term and long-term engine performance.
- Reducting deposits and maximizing engine response.
- Maintaining maximum performance even under high loads and pressures.
- Improves engine efficiency according to independent tests.
- Provides exceptional protection in a variety of driving styles and temperatures.

**Table 1** Manufacturer specified oil Castrol EDGE 5W-30 LL Titanium FST

| Name | Method | Units | Castrol EDGE 5W-30 |
|---|---|---|---|
| Density @ 15C, Relative | ASTM D4052 | g/ml | 0.851 |
| Viscosity, Kinematic 100C | ASTM D445 | mm²/s | 12.0 |
| Viscosity, CCS -30C | ASTM D5293 | mPa.s (cP) | 5800 |
| Viscosity, Kinematic 40C | ASTM D445 | mm²/s | 70 |
| Viscosity Index | ASTM D2270 | None | 169 |
| Pour Point | ASTM D97 | °C | -42 |
| Flash Point, PMCC | ASTM D93 | °C | 202 |
| Ash, Sulphated | ASTM D874 | % wt | 0.64 |

Source: author.

## 4 SPECTROVISC Q3000 SERIES MEASURING STATION

The SpectroVisc Q3000 Series viscometer is a portable device used to measure the kinematic viscosity of oils and other lubricating fluids. The Q3000 series viscometer is created in two versions, Q3000 and Q3050, which was used in the measurements in this work.

Package contents:

- Viscometer;
- Disposable pipettes;
- Disposable, non-abrasive cleaning protectors;
- Bottle of verification standard fluid for calibration and correction;
- Power cord (varies by region of purchase);
- AC adapter.

Sampling - we collect samples using a pipette. Both types, whether disposable or point-exchanged, are used in a similar way. After taking the sample, we place the pipette in the pouring tunnel and apply it at a suitable speed. [7, 8, 14]

## 5 MEASUREMENT OF SAMPLES

In the practical part of this work, we performed measurements on the SpectroVisc Q3000 instrument, examining changes in mileage and comparing changes between the test sample, which was taken from the measured object Škoda Octavia II 1.6 TDi **(**Facelift).

### 5.1 Criteria for Applicability and Evaluation of Motor Oil Parameters

- Appearance (comparison of clarity, gloss, odor and turbidity)**.** Determine whether or not it satisfies according to its own methodology (practical and professional experience). Do not allow turbidity - matt surface with light reflection.
- Kinematic viscosity (primary and basic property for the usability of motor oil in the vehicle engine) motor oil may only be operated within a viscosity range of ± 20 % of the reference sample and diesel engine manufacturer's data.
- Viscosity index Temperature dependence of oil fluidity. The degree of viscosity index determines the guarantee of sufficient lubrication under operating conditions.
- Sulphation products. Sulphates are products containing salts of sulfuric acid, sulphates. They cause the breakdown of the base oil components and additives in the motor oil. It is a negative parameter in motor oil.
- The glycol content (Ethylene Glycol-C2H6O2 or Propylene Glycol-C3H8O2) is not permitted in the motor oil. Glycol causes the additive to separate from the base oil in the motor oil and to cause overall viscosity and concentration of the motor oil.
- TBN - alkalinity number (parameter for the dispersion of acid sludge, its condition expresses the life of the oil). Do not allow the operation of motor oil when the TBN value is reduced by more than 50 % of the value of the reference sample and the motor oil manufacturer's data.

- Antioxidant content (durability and foaming, ...). Do not allow the operation of motor oil when the value of the antioxidant content is reduced by more than 50 % of the value of the reference sample and the motor oil manufacturer's data.
- Total motor oil additive. The motor oil must be usable in the working parts of the engine in all conditions. Adding Additives to the base oil improves the performance of motor oils, slows down their aging and degradation. Do not allow the operation of motor oil when the value of the total additive is reduced by more than 50 %.
- Water content affects the initiation of chemical reactions. The limit value of water content in motor oil is 0.5 % w / w / 5,000 ppm (concentrations of 0.1 - 0.3 % w / w / 1,000-3,000 ppm are already a risk factor).

### 5.2 Sampling from the Measured Object (Škoda Octavia II)

It is important that the engine is warm enough before sampling the engine of the vehicle. The main reason is the change in the viscosity of the oil when the oil becomes thinner due to the temperature, which ensures easier oil removal.

We performed the collection using:
- Compressor / syringe;
- Hose of suitable diameter;
- Technical gasoline;
- Container for storing the collected oil sample.

**Fig. 2** Sampling devices
Source: author.

**Fig. 3** Engine of Škoda Octavia
Source: author.

**Fig. 4** Sampling MO – Castrol Edge 5W -30
Source: author.

**Fig. 5** Sampling with syringe
Source: author.

### 5.3 Measurement of Reference and Test Oil Sample on Spectrovisc Q3000 Instrument

After starting the instrument and its initial cleaning before the start of the measurement, we prepared a suitable amount of cleaning agent (non-abrasive cloth), a pipette and a reference / test sample. The first measurements were performed on a reference oil sample. At the beginning of the measurement, we needed to find out the viscosity index given by the manufacturer, which in our case was 169 [index].

Subsequently, we selected the required amount of oil from the reference sample using a pipette and applied the volume of pipette to the instrument on the pad. [10,14,15]

**Fig. 6** Pipetting the sample
Source: author.

After analyzing the oil sample, we wrote down the values in a table (table 2,3). We performed this measurement three times. After performing the measurement on the reference sample, we performed the same measurements in the same number on the test sample of motor oil.

### 5.4 Evaluation of Motor Oil (MO) Properties of Sample NO.1-NO.3; 1. MEASUREMENT SERIES

SAE 5W-30 [**Castrol Edge LL Titanium FST 5W-30**], in Škoda Octavia, samples taken - 01.03.2022. [8] The results of individual measurements were recorded in Table 2.

**Table 2** Evaluation of vehicle sample measurements in the Tribodiagnostic Laboratory AOS

| Č. | Property | Unit | Reference sample - Castrol Edge 5W-30 | Test sample - Castrol Edge 5W-30 Measurement No.1 | Test sample - Castrol Edge 5W-30 Measurement No.2 | Test sample - Castrol Edge 5W-30 Measurement no.3 | Test sample - Castrol Edge 5W-30 Measurement average 1-3 |
|---|---|---|---|---|---|---|---|
| 1 | Kinematic viscosity at 40 ° C | [cSt] | +20% 78,32<br>65,27<br>-20% 52,21 | 73,9<br>+8,63/13,22% | 78,4<br>+13,13/20,12% | 74,2<br>+8,93/13,68% | 75,5<br>+10,23/15,67% |
| 2 | Kinematic viscosity 100 ° C | [cSt] | +20% 13,72<br>11,43<br>-20% 9,14 | 12,6<br>+1,17/10,24% | 13,2<br>+1,77/15,49% | 12,7<br>+1,27/11,11% | 12,83<br>+1,4/12,25% |
| 3 | Viscosity index | - | 169 | - | - | - | |

Source: author.

#### 5.4.1 Reference sample no. R AOS showed the status of:

March 2022 / measured 03. 03. 2022:

Kinematic viscosity at 40 ° C: COMPLIES [65.27 cSt. ± 20 %].

Kinematic viscosity at 100 ° C: COMPLIES [11.43 cSt. ± 20 %].

Water contamination 0 [ppm], additive 101 %, glycol content 0 %, degradation by sulphation 25,01 [abs / 0,1], probably by atmospheric O2, oxidation 16,15 [abs / 01], measured alkalinity number TBN 4, 1 [mg KOH / g].

#### 5.4.2 Used sample No. 1 MO Castrol Edge Titanium FST 5W-30

- COMPLIANT kinematic viscosity / 40 ° C: 75.5 [cSt], increase in MO viscosity is 10.23 [cSt] - increase in Mo viscosity by 15.67 [%]. The allowable tolerance is derived from a reference sample of 65.27 [cSt], ± 20 % (+ 20 % = 78.32; - 20 % = 52.21cSt), cf. Table no. 2.
- COMPLIANT kinematic viscosity / 100 %: 12.83 [cSt], increase in viscosity Mo is 1.40 [cSt] - increase in viscosity MO by +12.25 [%]. The allowable tolerance is derived from a reference sample of 11.43 [cSt], ± 20 % (+ 20 % = 13.72 [cSt]; -20 % = 9.14 [cSt]), cf. Table no. 2.
- Other parameters of the monitored properties, measured in the Laboratory of Tribodiagnostics AOS, are within the tolerances of the usability of the MoD, valid for the used MoD No. 1 (see table). [9]
- **Alkalinity number** [mg KOH / g] - **0,0** - if the value decreases by more than 50% of the value of the reference sample, MO operation is not permitted – **COMPLIES.**
- **Soot** [% w / t] - **0,61** - increase compared to the reference sample by 0,61 [% w / t], maximum value is up to 2 % w / t – **COMPLIES.**
- **Oxidation** [abs / 0,1] - **23,43**- increase compared to the reference sample by 4,83 abs / 0,1 - do not allow MO operation if the value of antioxidant content decreases by more than 50 % of the value of the reference sample – **COMPLIES**
- **Nitration - Nitritation** [abs / cm] - **62.22** - increase compared to the reference sample by 53.47 abs / cm.
- **Sulfation** [abs / 01] - **26,33** - process in MO causing decomposition of base oil components and additive by starter water is present in MO in proportion to the presence of water – **COMPLIES**.
- **Water content** [ppm] - **183** - reference sample was not contaminated with water - monitored and limit values of water content in MO are 0.1-0.3 % w / w / 1000-3000ppm – **SUITABLE.**
- **Glycols** [%] -**0,0**- value the same as in the reference sample / the presence of glycols in the MO is not allowed – **COMPLIES.**
- **Addivation** [%] - **75.33** - decrease compared to the reference sample by 26 [%] - do not allow MO
- operation if the value of the total additive is reduced by more than 50 % - **SUITABLE.**

**Table 3** Evaluation of vehicle sample measurements in the Tribodiagnostic Laboratory

| Č. | Property | Unit | Castrol Edge reference sample 5W-30 | Castrol Edge test sample 5W-30 Measurement No.1 | Castrol Edge test sample 5W-30 Measurement No.2 | Castrol Edge test sample 5W-30 Measurement No.3 | Castrol Edge test sample 5W-30 Measurement average |
|---|---|---|---|---|---|---|---|
| 1. | Additives | [%] | 101 | 79 | 75 | 72 | 75,3 |
| 2. | Glycols | [%] | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 |
| 3. | Nitritation | [abs/cm] | 6,2 | 20,7 | 20,8 | 20,7 | 20,73 |
| 4. | Oxidation | [abs/0,1] | 18,6 | 24,9 | 24,7 | 24,8 | 24,8 |
| 5. | Soot | [% wt] | 0,0 | 0,61 | 0,61 | 0,61 | 0,61 |
| 6. | Sulfation | [abs/0,1] | 25,0 | 26,4 | 26,3 | 26,3 | 26,33 |
| 7. | TBN | [mg KOH] | 4,1 | 0,0 | 0,0 | 0,0 | 0,0 |
| 8. | Water content | [ppm] | 0 | 160 | 194 | 196 | 183 |

Source: author.

## 6 TRIBODIAGNOSTIC CONTROL OF PROPERTIES ON SPECTRO CUBE, MO CASTROL EDGE LL TITANIUM FST; SAE 5W-30, VZ. NO.1

**SPECTRO CUBE ED XRF-X-ray** analyzer, measuring column with MO Castrol Edge SAE 5W-30 sample. The analyzer ensures reliable, easy and accurate analysis. It determines with very high accuracy what elements are in a given sample and in what concentration. When measuring the contained elements, those elements were detected which were contained in the lubricant during friction processes and wear of the contact surfaces of the combustion chamber. The main elements of the above wear are: $^{13}$Aluminium, $^{14}$Silicon, $^{15}$Phosphorus, $^{16}$Sulfur, $^{20}$Calcium, $^{29}$Copper, $^{30}$Zinc, $^{26}$Iron ... [4]

### 6.1 Measured parameters of the REFERENCE SAMPLE Castrol Edge SAE 5W-30

After evaluating the total content of elements in the reference oil, it is possible by using the table of elements to select those that interest us. The reference sample does not have any trace of ferroparticles since they are a product of abrasive effect of the friction parts in contact with each other such as piston and cylinder contact in the engine of vehicle.

So for the reference oil the main elements that interest us are occurrences of the elements used in production of the base motor oil and additives. Those elemts are Phosphorus, Sulfur, Calcium Zinc, Titanium and other trace elements.

Occurrence : $^{26}$Fe, $^{20}$Ca, $^{28}$Ni, $^{24}$Cr, $^{30}$Zn, $^{42}$Mo, $^{47}$Ag, $^{48}$Cd, $^{81}$Ti
Trace occurrence :$^{34}$ Se, $^{33}$As,$^{50}$ Sn, $^{51}$Sb, $^{24}$Cr, $^{25}$

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | Co | Kobalt | < 1,0 | - | ppm | 6 | $CH_2$ | Oil | - | - | ppm |
| 28 | Ni | Nikel | < 0,3 | - | ppm | 12 | Mg | Horčík | < 6,5 | - | ppm |
| 29 | Cu | Meď | < 0,2 | - | ppm | 13 | Al | Hliník | < 1,5 | - | ppm |
| 30 | Zn | Zinok | 860,0 | 0,8 | ppm | 14 | Si | Kremík | 1,3 | 0,1 | ppm |
| 33 | As | Arzén | 0,07 | 0,03 | ppm | 15 | P | Fosfor | 917,6 | 1,3 | ppm |
| 34 | Se | Selén | < 0,1 | - | ppm | 16 | S | Síra | 2501 | 1 | ppm |
| 35 | Br | Bróm | 0,40 | 0,02 | ppm | 17 | Cl | Chlór | 8,2 | 0,1 | ppm |
| 38 | Sr | Stroncium | 0,7 | 0,1 | ppm | 19 | K | Draslík | 2,6 | 0,3 | ppm |
| 40 | Zr | Zirkónium | < 0,2 | - | ppm | 20 | Ca | Vápnik | 1811 | 2 | ppm |
| 42 | Mo | Molybdén | 1,2 | 0,1 | ppm | 22 | Ti | Titán | 27,8 | 0,2 | ppm |
| 47 | Ag | Striebro | < 0,4 | - | ppm | 23 | V | Vanád | < 0,0 | - | ppm |
| 48 | Cd | Kadmium | < 0,6 | - | ppm | 24 | Cr | Chróm | < 0,3 | - | ppm |
| 50 | Sn | Cín | < 0,2 | - | ppm | 25 | Mn | Mangán | < 0,4 | - | ppm |
| 51 | Sb | Antimón | < 0,2 | - | ppm | 26 | Fe | Železo | < 0,4 | - | ppm |
| 53 | I | Jód | 4,8 | 1,8 | ppm | 27 | Co | Kobalt | < 1,0 | - | ppm |
| 56 | Ba | Bárium | < 0,3 | - | ppm | 28 | Ni | Nikel | < 0,3 | - | ppm |
| 74 | W | Wolfrám | < 0,1 | - | ppm | 29 | Cu | Meď | < 0,2 | - | ppm |
| 80 | Hg | Ortuť | < 0,2 | - | ppm | 30 | Zn | Zinok | 860,0 | 0,8 | ppm |
| 81 | Tl | Tálium | < 0,1 | - | ppm | 33 | As | Arzén | 0,07 | 0,03 | ppm |
| 82 | Pb | Olovo | < 0,3 | - | ppm | 34 | Se | Selén | < 0,1 | - | ppm |
| 83 | Bi | Bizmut | < 0,3 | - | ppm | 35 | Br | Bróm | 0,40 | 0,02 | ppm |

**Fig.7** Measured values of elements on the SPECTROCUBE device
Source: author.

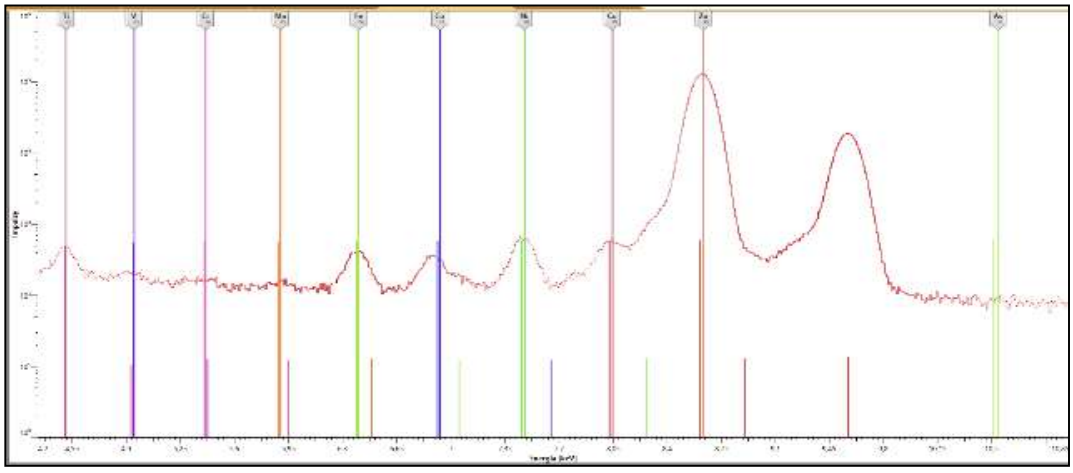

**Fig. 8** Measured values of elements on the SPECTROCUBE device
Source: author.

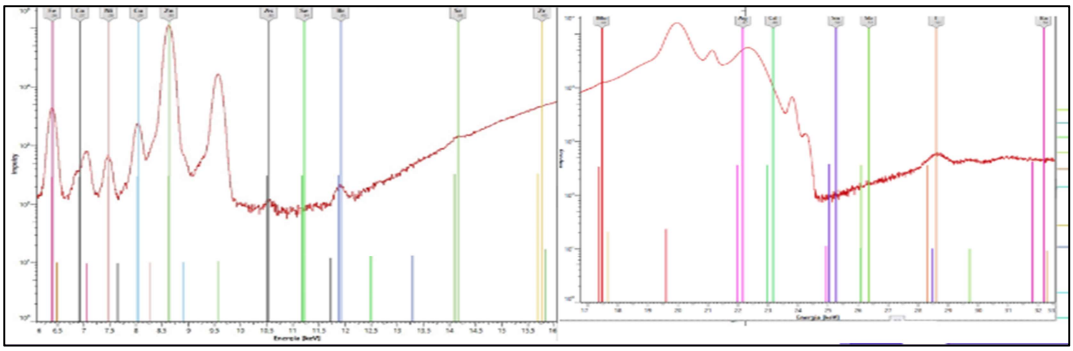

**Fig. 9** Graphic course of monitored elements
Source: author.

## 6.2 Measured parameters of USED SAMPLE Castrol Edge SAE 5W-30

Change of monitored parameters : $^{13}$Al –increase; $^{14}$Si - increase; $^{17}$Cl - increase; $^{29}$Cu - increase; $^{42}$Mo - increase;
Occurrence without change : $^{26}$Fe, $^{20}$Ca, $^{28}$Ni, $^{24}$Cr, $^{30}$Zn, $^{42}$Mo, $^{47}$Ag, $^{48}$Cd, $^{81}$Ti

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 12 | Mg | Horčík | < 6,3 | - | ppm | 27 | Co | Kobalt | < 1,0 | - | ppm |
| 13 | Al | Hliník | 47,0 | 0,7 | ppm | 28 | Ni | Nikel | < 0,3 | - | ppm |
| 14 | Si | Kremík | 26,0 | 0,5 | ppm | 29 | Cu | Meď | 17,2 | 0,2 | ppm |
| 15 | P | Fosfor | 793,7 | 1,2 | ppm | 30 | Zn | Zinok | 746,8 | 0,8 | ppm |
| 16 | S | Síra | 2086 | 1 | ppm | 33 | As | Arzén | 0,08 | 0,03 | ppm |
| 17 | Cl | Chlór | 13,4 | 0,1 | ppm | 34 | Se | Selén | < 0,1 | - | ppm |
| 19 | K | Draslík | 13,3 | 0,4 | ppm | 35 | Br | Bróm | 0,34 | 0,02 | ppm |
| 20 | Ca | Vápnik | 1733 | 2 | ppm | 38 | Sr | Stroncium | 0,62 | 0,05 | ppm |
| 22 | Ti | Titán | 22,6 | 0,2 | ppm | 40 | Zr | Zirkónium | < 0,2 | - | ppm |
| 23 | V | Vanád | < 0,0 | - | ppm | 42 | Mo | Molybdén | 2,6 | 0,1 | ppm |
| 24 | Cr | Chróm | 2,8 | 0,2 | ppm | 47 | Ag | Striebro | < 0,4 | - | ppm |
| 25 | Mn | Mangán | < 0,1 | - | ppm | 48 | Cd | Kadmium | < 0,5 | - | ppm |
| 26 | Fe | Železo | 79,7 | 0,5 | ppm | 50 | Sn | Cín | < 0,2 | - | ppm |
| 27 | Co | Kobalt | < 1,0 | - | ppm | 51 | Sb | Antimón | < 1,6 | - | ppm |
| 28 | Ni | Nikel | < 0,3 | - | ppm | 53 | I | Jód | 8,6 | 1,8 | ppm |
| 29 | Cu | Meď | 17,2 | 0,2 | ppm | 56 | Ba | Bárium | < 0,3 | - | ppm |
| 30 | Zn | Zinok | 746,8 | 0,8 | ppm | 74 | W | Wolfrám | < 0,1 | - | ppm |
| 33 | As | Arzén | 0,08 | 0,03 | ppm | 80 | Hg | Ortuť | < 0,2 | - | ppm |
| 34 | Se | Selén | < 0,1 | - | ppm | 81 | Tl | Tálium | < 0,2 | - | ppm |
| 35 | Br | Bróm | 0,34 | 0,02 | ppm | 82 | Pb | Olovo | 0,25 | 0,05 | ppm |
| | | | | | | 83 | Bi | Bizmut | < 0,3 | - | ppm |

**Fig. 10** Graphic course of monitored elements
Source: author.

In the used sample, the main monitored elements, are those that figure as the undesirable effect of mutual contact of friction surfaces or foreign substances. They are occurring in the system due to leak or age of the vehicle which is causing that vehicle's systems are not sealed properly. Other reasons for vehicle leakage could be weather conditions as well as the environment in which the vehicle is operated. In the partial conclusion of the observation of used sample of motor oil, we found that there was an increase elements that may appear as particles contained as a result of abrasive effect due to movement of surfaces of the engine. Elements found in the used sample were mainly aluminium, chrome, copper, ferrum and molybdenum. Occurrence of an element such as silicium could be caused by the already mentioned leakage of the lubrication system, into which gets silicon from the environment such as dust, that occurs during vehicle operation in the summer season. Depletion of elements that are characteristic of base oil components as well as additives like phosphorus, sulphur, calcium or Titanium could decrease due to operation of the vehicle in the long term interval that is causing motor oil to slowly decrease by negative effects like the presence of water, that accelerates the sulfation and nitritation, process of oxidation or gradual decrease of additivity due to age etc.

## 7 CONCLUSION

Measured values in the laboratory of tribodiagnostics from 1.3.2022 MO Castrol Edge LL Titanium FST SAE 5W-30 taken at the extended workplace of the Department of Mechanical Engineering from the measured object Škoda octavia II despite the number of kilometers driven (13,000 km) SUITABLE.

Tendency of increase or decrease of properties with respect to time as well as regular use of a motor vehicle. The overall sample No. 1 MO Castrol Edge LL Titanium FST SAE 5W-30 as well as the measured vehicle should be considered ADEQUATE and from the overall point of view, given the above measurements, we can say that the measured object is in GOOD CONDITION.

From the point of view of the recommendation for the future, it would be appropriate (and it will be) to continue to operate the vehicle only on long distances in order to avoid significant degradation of the MoD as well as consequent engine wear.

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