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**From 05-03-2015**

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## 1. The scope of TS

The scope of TS is aviation fuel, which is the mixture of hydrocarbon compounds, derived from conservative and secondary processes of the crude petroleum and suitable amounts of antiknock, dyeing, antioxidant and antistatic additives.

## 2. The application of TS

The aviation fuel is applied to power aircrafts with piston engines.

## 3. Division and designation

The division – does not apply
Designation – Aviation fuel 115/145.

## 4. Requirements and research
## 4.1 General requirements

The Producer is obliged to add to the aviation fuel dyeing and antiknock additives. There may be used also other additives specified in this TS. The Producer is obliged to publish the name and quantity of the added additives in quality certificate issued by him. The aviation fuel shall be produced in accordance with the explicitly settled technology.

### 4.1.1. Antiknock additives

Tetraethyl lead shall be present and added in the form of an antiknock mixture containing not less than 61% (m/m) of tetraethyl lead and the same amount of ethylene dibromide to provide two atoms of bromine per atom of lead. As the antiknock additive there is used the ethyl liquid TEL-B from Innospec / Alcor company.
The total quantity of the additive shall be matched so that the lead content in the fuel shall not exceed 1,28 g Pb/l of the fuel.

### 4.1.2. Dyeing additives

The aviation fuel shall contain the identifying additive dyeing into purple (blue in amount of 0,713 mg/l and red in amount of 0,502 mg/l).

### 4.1.3. Antioxidant additives

Antioxidant additives prevent from formulating gums and other oxidizing products, as well as knocking out the lead compounds. The content of the additives expressed in mass of the active element shall not exceed 12,0 mg/L of the fuel.
There is used BHT as the oxidizing additive (2,6 – ditertiary butyl-4-methylphenol).

### 4.1.4. Antistatic additives

Antistatic additives are used for fuel in the quantity which assures obtaining conductivity according to the requirements in the table of detailed requirements, i. e. in the range of 50 ÷ 450 pS/m. There is applicable STADIS 450 as the antistatic additive, the concentration of the additive in fuel shall not exceed 3,0 mg/liter.

### 4.1.5. Stability

The aviation fuel meets the requirements of TS within two years from the date of production on condition of proper storing.

### 4.1.6. Pakowanie, przechowywanie i transport

The aviation fuel 115/145 is supplied in specific tank trucks, isotanks and steel drums allowed to transport aviation fuel.
The package in which the fuel will be transported must be checked if it is clean, dry and unharmed.
In case of tanks, on each packaging unit, in shipping documents shall be placed permanently designation including:

- The name of the fuel
- The quantity of the fuel in package
- The date of production and the number of charge
- Warning of fire hazard and Health and Safety at work
- The code of supply contract, if required

The fuel shall be stored in packages protecting the fuel from the access of air, humidity and mechanical contamination. In places protected from direct influence of sunbeams, heating (the underground containers with limited air exchange). This restriction is made to limit both the losses associated with evaporation and losses of the lightest components, what will cause the change of two key parameters of the fuel: reid vapour pressure and fractional composition.
On the tanks there shall be placed the informational table with identification number of hazards according to ADR and identification number of material UN.
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1203

### 4.2 Detailed requirements
### 4.2.1. Research

**For each portion of aviation fuel (after finishing the composing) shall be made following analyses in accordance with the table of detailed requirements:**
- Appearance
- Colour,
- Fractional composition
- Density at 15°C,
- Reid vapour pressure at37,8°C,
- Freezing point
- Electrical conductivity
- Motor Octane Number

- LOM Lean rating – aviation metod,
- Existent gum
- Oxidation stability at 100°C, through 16 hours
- Sulphur content
- Lead content
- Specific energy
- Corrosion on copper
- Water reaction
- Iodine number
- Aromatic hydrocarbons content
- Acidity
- Determination of oxidation resistance – by induction period method

The determination of Performance Number shall be done quarterly.

Standards and requirements for above determinants are specified in the table of detailed requirements.

### 4.2.2.Visual examination of appearance

The product shall be poured into glass barrel made of colourless glass with diameter from 40 mm to 50 mm, and next shall be visually examined in the light traversing through appearance of product.
The research shall be made at 20 ±5°C. The fuel meets the requirements if while the research the fuel is transparent liquid free from solid matter, turbidity and water.

### 4.2.3. Sampling

5 liter sample should be taken from the tank after the blending process is over, this sample will have full analyse in accordance to the "manual sampling" instruction (QI/7.5/01/IN/51)

### 4.2.4. Table of detailed requirements for aviation fuel 115/145

| Nr | Property | Unit | Limits | Test method |
|---|---|---|---|---|
| 1 | Density at 15°C | $kg/m^3$ | Report | ASTM D 4052<br>ASTM D 1298 |
| 2 | Colour | - | Purple | ASTM D 2392 |
| 3 | Appearance | - | Clear, bright and visually free from solid matter and undissolved water at ambient temperature | pt.4.2.2.<br>WT-15/OBR PR/PD/104<br><br>ASTM D 4176 |

| | | | | |
|---|---|---|---|---|
| 4 | Antiknock rating<br>- Motor Octane Number (MON)<br>- LOM Lean rating – aviation method<br>- Performance number * | -<br>-<br>- | -<br>Min. 115<br>Min. 145 | ASTM D2700<br>ASTM D 909 |
| 5 | Fractional composition :<br>- Initial boiling point | $^0$C | Report | ASTM D 86 |
| | - 10% vol. | $^0$C | Max 75 | |
| | - 40% vol. | $^0$C | Min 75 | |
| | - 50% vol. | $^0$C | Max 105 | |
| | - 90% vol. | $^0$C | Max 135 | |
| | - Final boiling point | $^0$C | Max 170 | |
| | - Productivity | % (v/v) | Min 97 | |
| | - Residue | % (v/v) | Max 1,5 | |
| | - Loss | % (v/v) | Max 1,5 | |
| | Sum of 10% vol.+50% evaporated temperatures | $^0$C | Min 135 | |
| 6 | Sulphur content | % (m/m) | Max 0,05 | ASTM D 2622<br>ASTM D 1266<br>ASTM D 5453 |
| 7 | Lead content | g Pb/l | Max 1,28 | ASTM D 5059<br>ASTM D 3341 |
| 8 | Specific energy | MJ/kg | Min 44,0 | ASTM D 4529<br>ASTM D 3338 |
| 9 | Freezing point | $^0$C | Max -60 | ASTM D 2386<br>ASTM D 7153 |
| 10 | Corrosion on copper, 2h at temp. 100 °C | Corrosion level | Max 1 | ASTM D 130 |
| 11 | Existent gum | mg/100 ml | Max 3 | ASTM D 381 |
| 12 | Water reaction<br>- Volume change | ml | Max 2 | ASTM D 1094 |
| 13 | Electrical conductivity at 20°C | pS/m | 50 ÷ 450 | ASTM D2624 |
| 14 | Reid vapour pressure at 37,8 °C | kPa | 38,5 ÷ 49 | ASTM D 5190<br>ASTM D 5191 |
| 15 | Iodine number | g $J_2$/100g | Max 2,0 | PN-82/C-04068 |
| 16 | Acidity | mg KOH/ 100cm$^3$ | Max 0,3 | PN-85/C-04066 |

| | | | | |
|---|---|---|---|---|
| 17 | Aromatic hydrocarbons content | % m/m | Min 5 | ASTM D 1319<br>PN EN 15553 |
| 18 | Determination of oxidation resistance – by induction period method | h. | Min 12 | PN ISO 7536 |
| 19 | Oxidant stability at t= 100 $^{0}$C, 16 h<br>- Potential gum<br>Sediment content | mg/100 ml<br>mg/100 ml | Max 6<br>Max 2 | ASTM D 873 |

* The determination of Performance Number shall be done quarterly.

THE END
ADDITIONAL INFO.

The Institution responsible for formulating TS:
OBR J.S.C.