

Бр. 2077/1
30. 10. 2018 год.
БЕОГРАД



Test Report
on exhaust emission of *Comet Fuel Saving Systems (CS)*
which contains a *Fitch Fuel Catalyst*

1. BASIC DATA ON THE DEVICE:

Input test parameters:

- Date of measurement: **22. & 23.10.2018.**
- Recorded temperature during measurement: **19,4 – 21,2°C**
- Device model: **Fitch Fuel Catalyst F75HDG**
- Serial number of the device that has been tested: **028963**

2. BASIC INFORMATION ABOUT THE METHOD AND DEVICES FOR TESTING:

The method used during the test was testing the devices on a test bench with an internal combustion engine (a diesel engine with "Common rail" injection) that has been using diesel EN 590 as a fuel.

Devices used for testing:

- Test bench with internal combustion engine (Common-rail CEC DW 10 B), dynamometer (Schenck W230), hardware for data acquisition (Texas Instruments), Pressure sensor in suction collector (Bosch N-21J), cogwheel encoder shaft (Hedss) with power supply (Iskra), computer for controlling motor controller and program (PC + VEMS V3.6).
- Opacimeter ID No. 2254.
- Exhaust gas engine emission measuring device with active ignition (which enables the measurement of CO, CO₂, HC, O₂ engine operating temperature, torque and calculation of combustion factor (λ factor)), ID no. 3874.
- Exhaust gas analyser, ID No. 2887

3. EXAMINATION CRITERIA

Criteria according to which the test results are defined:

1. **COMMISSION DIRECTIVE 1999/100/EC**
2. **ISO 15550:2016 (EN)**, Internal combustion engines — Determination and method for the measurement of engine power — General requirements
3. **SRPS ISO 3046-1:2015**, Piston engines with internal combustion - Performance characteristics - Part 1: Declaration of power, fuel consumption and lubricating oils and test methods - Additional requirements for general purpose motors (identical with **ISO 3046-1:2002** Reciprocating internal combustion engines -- Performance Declarations of power, fuel and lubricating oil consumptions, and test methods -- Additional requirements for engines for general use)
4. **SRPS EN ISO 3675:2007**, Crude oil and liquid petroleum products
5. Rules on opacimeters ("Official Gazette of RS", No. 15/2015)
6. Rules on criteria ("Official Gazette of RS ", No. 3/2018)
7. Rulebook on types of criteria that are subject to legal control ("Official Gazette of RS ", No. 13/2018)
8. Metrological Guidance for the Inspection of Gas Analysers ("Bulletin of the Federal Institute for Measures and Precious Metals" No. 4/89), in conjunction with Article 26 of the Rulebook on Measures ("Official Gazette of RS " No. 3/18)

9. Rules on criteria ("Official Gazette of RS ", No. 3/2018), Attachment 12, MI-010 OIML R-99-1&2 Edition 2008(E) Part 2 t.8.2, t.8.3 i Annex B

4. TEST RESULTS:

Measured values of gases:

Control measurements of combustion products were made before and after use of the device. In both cases, the engine was loaded at 50% of the power, which is most closely related to the exploitation conditions, with the optimum operating temperature of the drive unit.

Dilution factor for diesel calculated according to the Directive 1999/100/EC:

$$DF = \frac{13,4}{C_{CO_2} + (C_{HC} + C_{CO})10^{-4}}$$

<i>Fuel: diesel EN 590</i>	Before installation of CS	After installation of CS
O ₂	5,7	5,2
CO	0,01	0,00
CO ₂	2,1	2,0
t*	128,88	134,57
λ**	0,97	1,04
NO _x	245	212

t* - the temperature of the outgoing gases, λ** - combustion factor

Measured particle values:

With device	00% k=0.000 m ⁻¹ ***
Without device	01% k=0.048 m ⁻¹ ***

*** Middle value for the last 6 measurements.

- The content of oxygen decreased by 9.7%
- Increase in exhaust gas temperature by 12.9%

Figures 1a and 1b give a comparison of the results of the measurement of the particle presence:

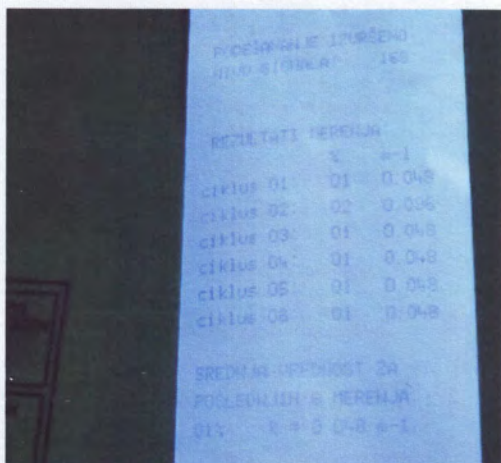


Figure 1a. (without device)

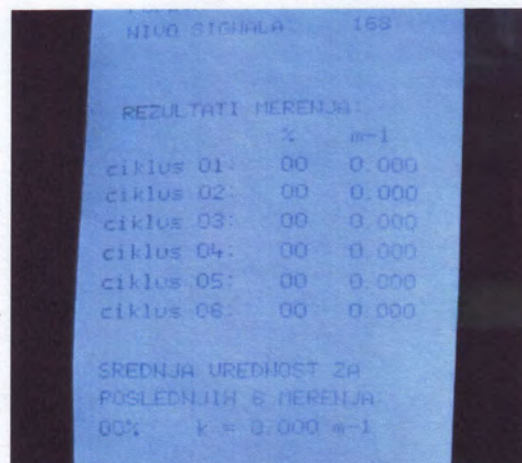
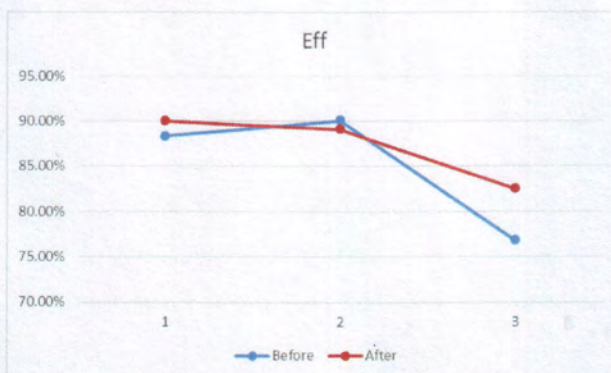
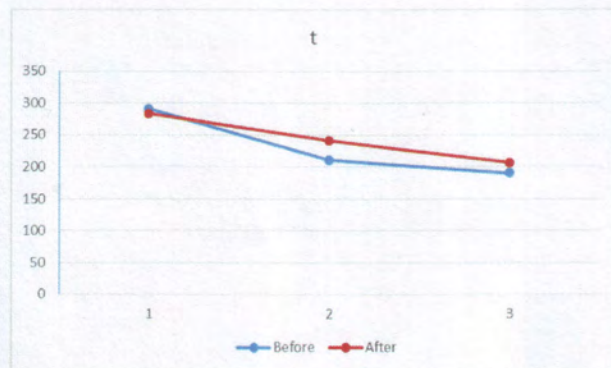
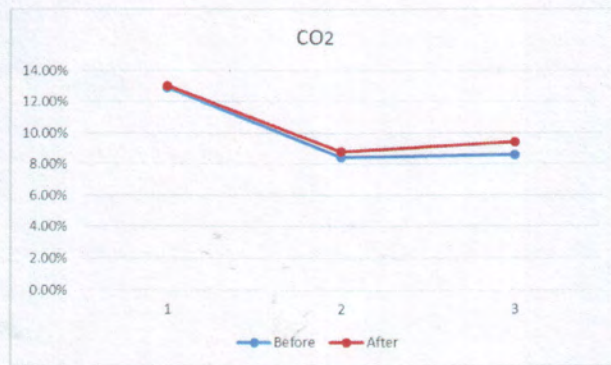
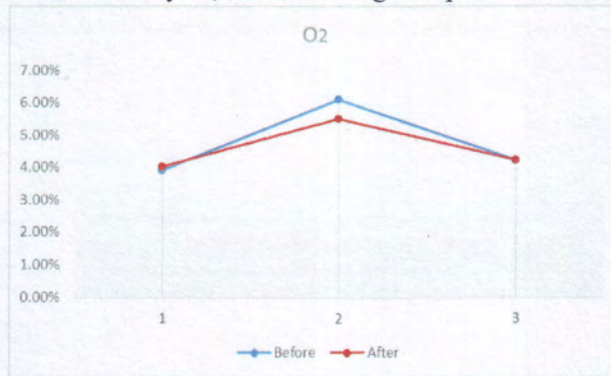


Figure 1b. (with device)

Following the mathematical analysis, the following comparative data has been established:



The standard deviation parameter shows how much data deviates from the mean. It has been established that the parameters **have a greater deviation in cases before using the device** than in cases **after the use of the device**.

5. CONCLUSION:

Taking into account the above stated attitudes and results, as well as insight into the activities and the process of realization of the test itself, it can be concluded that **the difference achieved with the use of Comet Fuel Saving Systems, which contains the catalyst "Fitch Fuel Catalyst", and according to the parameterization defined by the directive 1999/100 / EC, has led to fuel savings.** The reduced O₂ in the combustion product by 8.77%, increased temperature by 4.15%, as well as the increased saturation of the mixture, gives us data on **the reduction of fuel consumption by about 8.4%**. Considering the conditions in which the survey was conducted, we can safely claim that the stated percentage in real operating conditions could increase by 1-2 percentage points. Also, the tests showed significantly less variation during the operation of the drive aggregate, which in real terms of exploitation would mean **the prolongation of the exploitation** of other parts and circuits of the drive system.

Also, as a result of the test, it has been confirmed that the device is also acceptable from the environmental aspect, since the installation of the same smoke and the presence of undesired combustion products, the total emissions of harmful gases is reduced **by approximately 17%**, as well as the presence of particles in combustion products. Namely, the testing showed that the number of solid particles in the exhaust emission **is insignificant**, which is especially significant from the environmental viewpoint, which can be achieved by the installation of this device.

Comet Fuel Saving Systems, which includes the **Fitch Fuel Catalyst (F75HDG) catalyst** and an insight into the accompanying technical documentation, as well as the associated certificates, can confirm the following:

1. Comet Fuel Saving Systems, which contains the "Fitch Fuel Catalyst" catalyst, **ensures and completely meets** the criteria defined in the European Directive **1999/100 / EC**.
2. Comet Fuel Saving Systems, which contains the Fitch Fuel Catalyst, **is fully compliant** with the requirements given in **ISO 15550: 2016 (EN)**.
3. Comet Fuel Saving Systems, which incorporates the catalyst "Fitch Fuel Catalyst", **is fully compliant** with the requirements given in the standard **SRPS ISO 3046-1: 2015 (ISO 3046-1: 2002)**.
4. Comet Fuel Saving Systems, which incorporates the catalyst "Fitch Fuel Catalyst", **is fully compliant** with the requirements given in the standard **SRPS EN ISO 3675: 2007**.

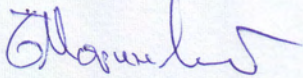
In accordance with the above, **this Testing Report** of Comet Fuel Saving Systems, which contains "Fitch Fuel Catalyst" catalyst, represents the **APPROVAL OF CONFORMITY** with the criteria / requirements in the following normative documents -standards:

1. **European Directive 1999/100/EC**
2. **(EN) ISO 15550:2016**
3. **SRPS ISO 3046-1:2015 (identical with ISO 3046-1:2002)**
4. **SRPS EN ISO 3675:2007**

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In Belgrade, 29/10/2018

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