

Test report

No. 04-1628-00-01

Examined object: Effect of Lambda System Cleaning Products
Client: R.U.F. GmbH

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Test report**About the effect of Lambda System Cleaning Products****No. 04-1628-00-01****0. Client**R.U.F. GmbH
Friedhofstr. 5
67127 Rödersheim-Gronau
Germany**1. Task Formulation**

The effects of the cleaning characteristic of fuel/oil additives should be examined on the operation with petrol and diesel engines.

2. Examined objects

The following system cleaning products were examined:

- **Lambda Tank Otto:** a cleaning additive for petrol engines for filling into the fuel tank
- **Lambda Tank Diesel:** a cleaning additive for diesel engines for filling into the fuel tank
- **Lambda Oil Primer:** a cleaning additive for the engine oil for use before oil change

3. Conducted tests/test results

All tests were accomplished as comparison tests, before and after the employment of the respective cleaner.

The following parameters were measured:

Diesel engine:

- Engine performance measured following the guideline 80/1269/EU in the version of 89/491/EU.
- Flue gas turbidity according the guideline 72/306/EU in the version of 97/20/EU.

Otto engine:

- Engine performance measured following the guideline 80/1269/EU in the

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3.1 Examinations on the vehicle with Otto engine:**Examined vehicle with Otto engine:**

Type	Automobile
Manufacturer	Ford
Trade Name	Fiesta
Type	GFJ
Vehicle Ident. No.	WFOBXXXGAFBLA60220
Licence Plate No.	LU-L 3757
Milage (km) (5 digits)	30,951 km (car has at least 130,951 km)
Registration date	23 November 1990
Engine power (acc. docs)	52 kW / 5,600 min ⁻¹
Composite preparation	Monopoint injection, regulated catalyst
Cylinder capacity	1,390 cm ³
Gear	5 manual gear change

Execution of the examinations on the tested vehicle with petrol engine**Used products at the Otto engine:**

Lambda Oil Primer
Lambda Tank Otto

- Measurements in the initial condition
- Addition of 500 ml Lambda Oil Primer into the engine oil
- Running in / Cleaning: 15 minutes engine operation with number of revs in idle state 900 – 2,000 min⁻¹ and lower load, 8 – 10 kW engine performance.
- Change of oil filter and oil with oil of viscosity class 5W-40
- Measurements after treatment with Lambda Oil Primer
- Addition of 500 ml Lambda Tank Otto into a fuel tank with ca. 25 litres petrol
- Running in / Cleaning: 15 km drive at an engine speed of 900 – 3,500 min⁻¹ and a velocity between 0 – 100 km/h.
- Measurements after treatment with Lambda Tank Otto.

For reproducibility each measurement / series of measurements was accomplished at least twice

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Test results Otto engine:**Effect of Lambda Oil Primer on the compression pressure of Otto engine**

	Compression pressure (bar)				Notes
	Cyl. 1	Cyl. 2	Cyl. 3	Cyl. 4	
Initial condition	9.75	9.00	8.75	10.25	Uneven compression pressure, deviations partly bigger than 1 bar
With Lambda Oil Primer	9.75	8.75	10.00	10.00	Substantial increase of compression pressure at cylinder 3.
Comparison before - after	-	-0.25*	+1.25	-0.25*	Increase of the compression pressure at cylinder 3 caused by effect on the piston rings/piston ring slots.

* The 0.25 bar deviation is within the measuring tolerance.

Effect of Lambda Tank Otto on the compression pressure of Otto engine

	Compression pressure (bar)				Notes
	Cyl. 1	Cyl. 2	Cyl. 3	Cyl. 4	
Initial condition	9.75	8.75	10.00	10.00	Uneven compression pressure, deviations partly bigger than 1 bar
With Lambda Tank Otto	11.00	11.00	11.5	11.00	Very good, even compression pressure.
Comparison before - after	+1.25	+2.25	+1.5	+1.00	Substantial increase of the compression pressure at all cylinders, caused by effect on the valves and / or piston rings.

Engine oil temperature at all compression pressure measurements: 92 – 96 °C.

Effect of Lambda Oil Primer on the engine performance

Initial condition: Between 4,300 – 5,500 min⁻¹ revs per minute, the full load curve of the engine shows a slump with irregular process, which might indicate existing disturbances in the air/fuel mixture, the gas change or the ignition.

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Effect of Lambda Tank Otto on the engine performance

The slump determined in the initial condition in the full load characteristic in the speed range 4,300 – 5,500 min⁻¹ was eliminated. The maximum power loss amounted 4.4 kW with 4,460 min⁻¹. After the employment of the Lambda Tank Otto, the full load curve is smooth and inconspicuous.

3.2 Examinations on the vehicle with an diesel engine**Examined vehicle with diesel engine:**

Type	Automobile
Manufacturer	Mazda
Trade Name	Mazda 323F
Type	BJ
Vehicle Ident. No.	JMZBJ14R201212399
Licence Plate No.	DGF-I 261
Milage (km)	107,413 km
Registration date	2 nd July 1999
Engine power (acc. docs)	66 kW / 4,000 min ⁻¹
Composite preparation	diesel direct-injection, exhaust gas turbo charger
Cylinder capacity	1,998 cm ³
Gear	5 manual gear change

Execution of the examinations on the tested vehicle with diesel engine**Used products at the diesel engine:****Lambda Tank Diesel**

- Measurements in the initial condition
- Addition of 500 ml Lambda Tank Diesel into a fuel tank with ca. 15 litres fuel
- Running in / Cleaning: 15 km drive at an engine speed of 900 – 3,000 min⁻¹ and a velocity between 0 – 110 km/h.
- Measurements after treatment with Lambda Tank Diesel.

For reproducibility each series of measurements was accomplished at least twice

Test results:**Effect of Lambda Tank Diesel on the flue gas turbidity**

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	Absorption coefficient K-value (m^{-1})				
	Tests with free acceleration			Tests under full load	
	K Average value	K maximum value	K minimum value	K average value at engine performance /engine speed 44 kW / 2000 min^{-1}	K average value at engine performance /engine speed 66.1 kW / 4,000 min^{-1}
Initial Condition	3.07	4.74	2.09	1.50	2.20
With Lambda Tank Diesel	0.99	1.16	0.89	0.39	0.64
Notes	Values from 8 individual measurements / condition			Average values from 2 stabilized values/engine speed	

The absorption coefficient indicated in the European Union type permission no. e1*97/27*0094*01 of the examined vehicle amounts to:

$$K = 1.25m^{-1}$$

The examined vehicle exhibits a remarkably high flue gas turbidity in the initial condition. By the effect of the Lambda Tank Diesel the flue gas turbidity was lowered around factor 3, both in free acceleration and under full load. The accepted cause of malfunction "coking of the injection nozzles" was eliminated.

Effect of the Lambda Tank Diesel on engine performance

In the context of the measuring tolerance no measurable changes in the full load curve of the engine could be recognized.

4. Summary

Operational disturbances at petrol and diesel engines can be eliminated by the cleaning efficiency of the here examined Lambda System Cleaning Products, if these are caused impurities / contamination / cokings / deposits in the scope of the valves, combustion chambers, piston head, piston rings, mixture preparation.

The products cannot work with disturbances caused by defective / incorrect parts.

Examinations of two further vehicles showed that the application of the products leads at perfectly functioning engines to no measurable improvements.

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5. Further tests

For the products: Lambda Tank Otto, Lambda Tank Diesel and Lambda Oil Primer the following test certificates are present:

- Compatibility with elastomer concerned materials: Report of the AUDI AG, Ingolstadt from 22 July 1999 over positively accomplished laboratory tests.
- To the adherence to the requirement from the 19. BIMSchV, §2(2): Prohibition of chlorine or bromine connections as fuel additive: positive laboratory report No 4W3835 from 31 August 2004, from Dr. Weßling Laboratorien GmbH, Walldorf.

6. Test equipment

- Rolls test stand Bosch FLA – 203
- Turbidity / Cloudiness meter AVL opaci meter 438
- Compression pressure meter MotoMeter
- Trivial testers and meters

7. General references

Investigations of the influences of the Lambda System Cleaning Products on the life span of the engine as well as the long-term durability of the obtained cleaning effects are not the subject of this appraisal.

8. Enclosures

Enclosure 1: Compression pressure diagrams Otto engine (1 page)

Enclosure 2: Performance curve and torque curve Otto engine (1 page)

9. Final conclusion

The test report comprises pages 1 – 8 including the under 8th specified enclosures 1 and 2 and may be multiplied and passed on only in the full wording.

The test report loses its validity on changes at the examined products or on changes of the legal bases.

Examination laboratory technology centre type examination institution of TÜV Pfalz Transportation GmbH accredited from the accreditation place of the motor vehicle federal office. Federal Republic of Germany according to DAR-Registration No.:

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Lambsheim, 31 August 2004-09-05

Dipl.-Ing. Tufan

Enclosure 1

**Compression pressure diagrams
Otto engine**

Initial condition With Lambda Oil Primer With Lambda Tank Otto

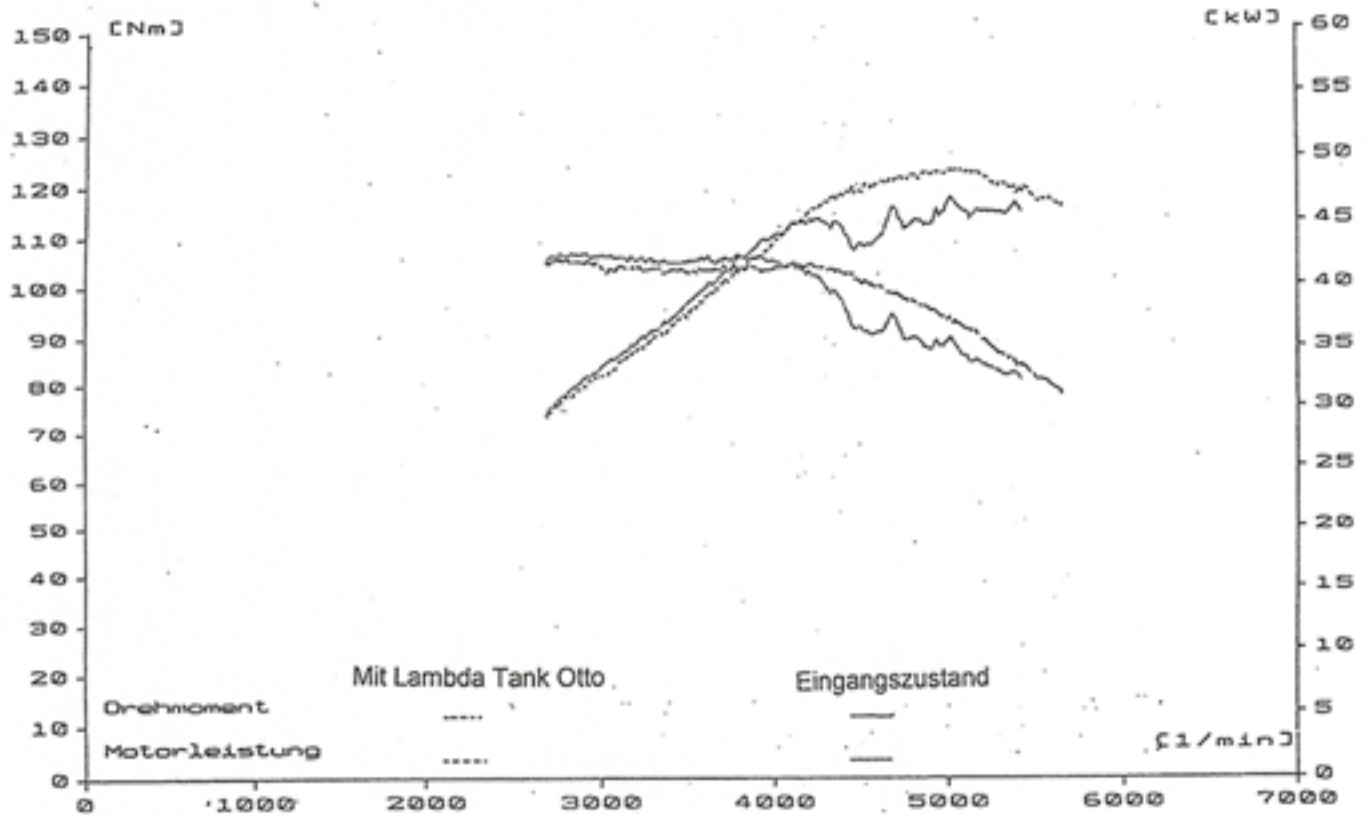
Enclosure 2

**Performance and torque curve
Otto engine**

Torque with Lambda Tank Otto Initial Condition
Engine performance ----- _____

Anlage 2

Leistungs- und Drehmomentkurve Ottomotor



Eingangszustand ———
Mit Lambda Tank Otto - - - - -

