

Delphi Corporation

Fuel consumption, pollution, power, engine wear, cold starts and cleanup of the combustion chambers

In order to prove the efficiency of ASTA 3000 Engine Treatment, we asked Delphi Corporation, the world leading supplier of vehicle parts, to carry out tests in several fields before and after treatment.



Headquartered in Troy, Michigan (USA), Delphi Corporation was a subsidiary of the General Motors group before becoming independent. The Company has extensive technical expertise in a broad range of product lines and strong systems integration skills, which enable it to provide comprehensive, systems-based solutions to vehicle manufacturers (VMs).

Delphi Corporation is present on each of the 5 continents; it has approximately 192,000 employees and operates 179 wholly-owned manufacturing sites, 42 joint-ventures, 53 customer centres and sales offices, and 32 technical centres in 41 countries. Delphi Corporation sells its products to major VMs around the world: General Motors, Volkswagen, Fiat, Renault, Peugeot, BMW, Mercedes, Audi, Toyota, Daewoo, Porsche, Ferrari, and more...

The tests to check the effectiveness of ASTA 3000 Engine Treatment were carried out in the Delphi Luxembourg Technical Centre. This 27,000m² laboratory facility and its experienced international workforce supports companies and vehicle manufacturers with testing services necessary for new vehicles accreditations; these tests include emissions, noise and vibration, and electro-magnetic compatibility.



Results of the ASTA 3000 Engine Treatment tests show a significant reduction in fuel consumption, pollutant emissions and an improvement of the performance of the treated engines.

Tests also showed that ASTA 3000 Engine Treatment reduces engine wear, preserves oil quality, eases cold starts and cleans up the combustion chambers.

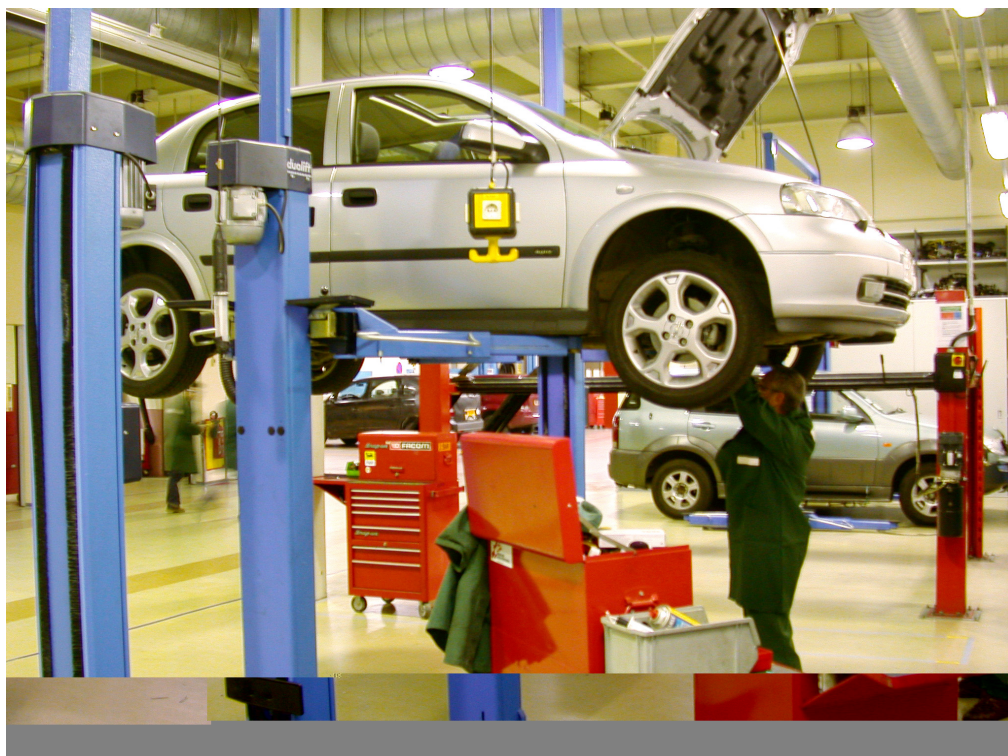
Date: March 17th 2003
For: Sofiane NENACH
ASTA Technologies
From: Jean-Yves CLOSE – TCL – Vehicle Emission Laboratory
Subject: Test report on **engine wear** before and after application of the engine treatment ASTA 3000
cc: B. Henrion

Purpose of the test:

Determine the efficiency of your engine treatment ASTA 3000 by measuring engine wear by analyzing engine oil before and after treatment.

Vehicle Selection:

One gasoline car and one diesel car chosen by you with different mileages and as representative as possible of different driving styles.



A handwritten signature in blue ink, consisting of a stylized 'J' followed by a horizontal line.

Test protocol:

- 1) Reception of the vehicle: check for potential leaks (exhaust, oil, cooling liquid, etc...), drain of the fuel tank in order to use a fuel of reference and oil change.
- 2) Driving: course carried out by you on roads and motorways under normal conditions of use of $\pm 3,000$ km. Fuel tank and driving compartment sealed by us.
- 3) Oil sampling.
- 4) Addition of ASTA 3000 Engine Treatment in the fuel tank and in the engine oil. Fuel tank and driving compartment sealed by us.
- 5) Driving: course carried out by you on roads and motorways under normal conditions of use of $\pm 1,500$ km.
- 6) Reception of the vehicle: check for potential leaks (exhaust, oil, cooling liquid, etc.) and oil change.
- 7) Driving: course carried out by you on roads and motorways under normal conditions of use of $\pm 3,000$ km. Fuel tank and driving compartment sealed by us.
- 8) Oil sampling.
- 9) Results analysis.

Test period:

3rd week of January 2003

Conclusion:**1) Aspect and viscosity:**

The results of oil analyses show that using ASTA 3000 Engine Treatment didn't modify the aspect nor the viscosity index of the engine oils used in the gasoline and diesel vehicles.

2) Oil pollution:

A. **Sodium and water.** Sodium and water come from glycol (cooling liquid). The presence of cooling liquid in oil reduces its flow and increases its acidity which causes an accelerated oxidation of engine parts, the source of "engine breakage". After treatment, sodium presence was reduced by 16.7% for the gasoline vehicle and by 46.7% for the diesel vehicle. The water content was reduced by 50% in both cases (gasoline and diesel vehicles). This shows an improved engine seal.



- B. **Fuel.** The presence of fuel in oil comes from a clogged powering circuit, an incomplete combustion, dirty valves, or poor compression. The fuel mixed with oil degrades oil quality by lowering its pressure and by causing a rupture of the lubricating film, which accelerates engine wear. After treatment, dilution (presence of fuel in oil) was reduced by 12% for the gasoline vehicle and by 75% for the diesel vehicle. This again shows the positive effects of ASTA 3000 Engine Treatment on the engine's seal integrity and performance.

These first results show that using ASTA 3000 Engine Treatment makes it possible to preserve oil qualities by decreasing its degradation.

3) Metal particles:

The presence of metal particles in oil comes from engine wear, the result of friction between mechanical elements. The analyses showed a reduction of metal particles by approximately 70% for the gasoline vehicle and by 40% for the diesel vehicle.

- A. **Aluminium.** A reduction of 25% (gasoline vehicle) of the presence of aluminium particles in oil shows a reduction of piston wear.
- B. **Iron.** A reduction of approximately 47% (gasoline vehicle) and 33% (diesel vehicle) of the presence of iron particles in oil shows a reduction of valve wear, camshaft, crankshaft, or pump oil wear.
- C. **Copper and lead.** The reduction of approximately 60% (gasoline vehicle) and 66% (diesel vehicle) of the presence of lead and copper particles in oil shows a reduction of big end bearings wear.

The results of these analyses show that the use of ASTA 3000 Engine Treatment optimizes lubrication and reduces engine wear.

Best regards,



Jean-Yves CLOSE

Jean-Yves.Close@delphi.com

Project Engineering Technician

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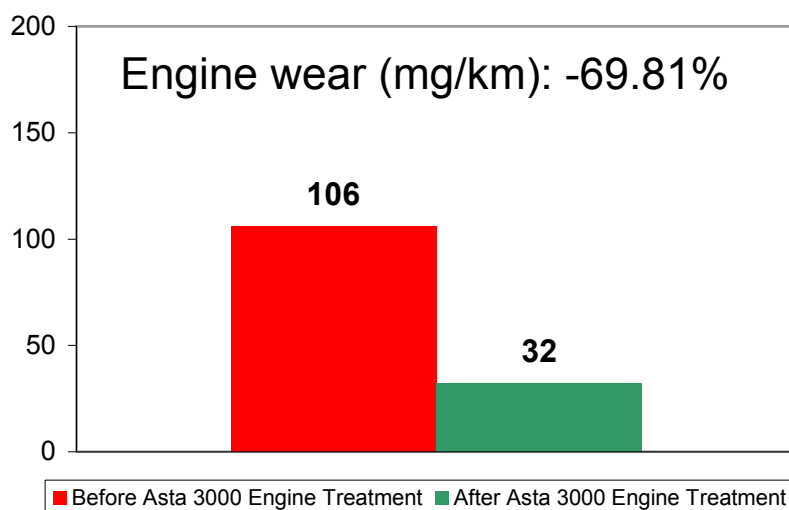
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Tests carried out on an Opel Omega gasoline 2000cc
First registration: 1989
Mileage: 225,744 Km

OIL PROPERTIES	Before ASTA 3000 Engine Treatment	After ASTA 3000 Engine Treatment
Aspect	Normal	Normal
Viscosity	13.1	13.0

OIL POLLUTION	Before ASTA 3000 Engine Treatment	After ASTA 3000 Engine Treatment
Silicone (mg/kg)	0	1
Sodium (mg/kg)	6	5
Carbon (%)	1.00	0.90
Dilution (%)	1.57	1.38
Water (%)	0.02	0.01

PARTICLES IN OIL	Before ASTA 3000 Engine Treatment	After ASTA 3000 Engine Treatment
Aluminium (mg/kg)	4	3
Chrome (mg/kg)	1	1
Iron (mg/kg)	17	9
Copper (mg/kg)	5	2
Lead (mg/kg)	78	16
Molybdenum (mg/kg)	1	1
Total	106	32

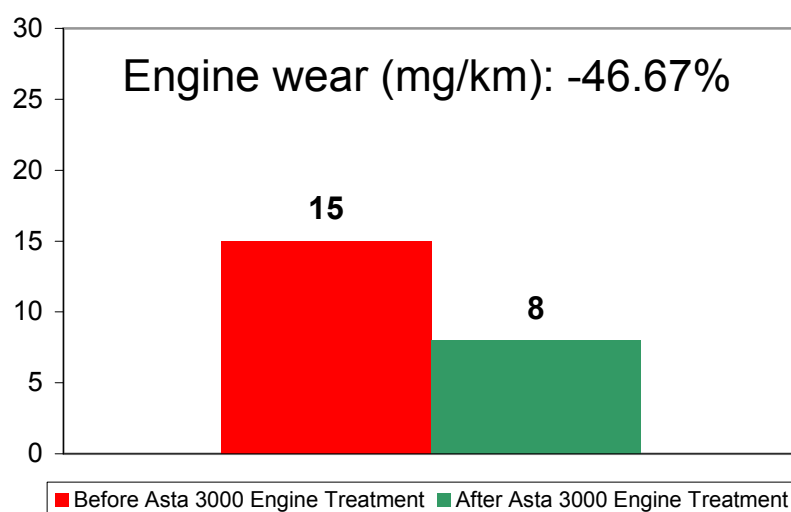


Tests carried out on a Volvo 460TD diesel 1870cc
First registration: 1995
Mileage: 150,655 Km

OIL PROPERTIES	Before ASTA 3000 Engine Treatment	After ASTA 3000 Engine Treatment
Aspect	Normal	Normal
Viscosity	12.8	12.8

OIL POLLUTION	Before ASTA 3000 Engine Treatment	After ASTA 3000 Engine Treatment
Silicone (mg/kg)	0	0
Sodium (mg/kg)	15	8
Carbon (%)	1.20	1.00
Dilution (%)	0.36	0.09
Water (%)	0.02	0.01

PARTICLES IN OIL	Before ASTA 3000 Engine Treatment	After ASTA 3000 Engine Treatment
Aluminium (mg/kg)	1	1
Chrome (mg/kg)	0	0
Iron (mg/kg)	9	5
Copper (mg/kg)	3	1
Lead (mg/kg)	2	1
Molybdenum (mg/kg)	0	0
Total	15	8



Date: April 17th 2003
For: Sofiane NENACH
ASTA Technologies
From: Jean-Yves CLOSE – TCL – Vehicle Emission Laboratory
Object: Test report on **cold starts** before and after application of the engine treatment ASTA 3000
cc: B. Henrion

Purpose of the test:

Determine the efficiency of your engine treatment ASTA 3000 by measuring electrical consumption during cold start before and after treatment.

Vehicle Selection:

One gasoline car and one diesel car chosen by you with different mileages and as representative as possible of different driving styles.

Test protocol:

- 1) Reception of the vehicle: check for potential leaks (exhaust, oil, cooling liquid, etc...), drain of the fuel tank in order to use a fuel of reference and oil change.
- 2) Cooling (0, -5, -10, -15°C) of the vehicles during the night.
- 3) Measure of the electrical consumption during start.
- 4) Addition of ASTA 3000 Engine Treatment in the fuel tank and in the engine oil. Fuel tank and driving compartment sealed by us.
- 5) Driving: course carried out by you on roads and motorways under normal conditions of use of $\pm 1,500$ km.
- 6) Reception of the vehicle: check for potential leaks (exhaust, oil, cooling liquid, etc.) and oil change.
- 7) Cooling (0, -5, -10, -15°C) of the vehicles during the night.
- 8) Measure of the electrical consumption during start.
- 9) Results analysis.



Climatic conditions and test period:

0, -5, -10 and -15°C

March - April 2003

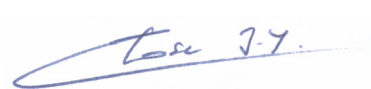
Instrumentation: Hot & Cold chamber



Conclusion:

Analysis of the results shows that ASTA 3000 engine treatment causes a decrease (by up to 25%) in electrical consumption required during cold starts. This decrease shows that friction inside the engine is reduced. Starts are therefore eased; there is less demand on the battery and the starter, and the engine wear is reduced.

Best regards,



Jean-Yves CLOSE

Jean-Yves.Close@delphi.com

Project Engineering Technician

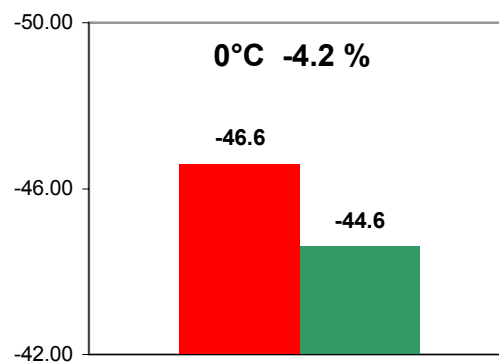
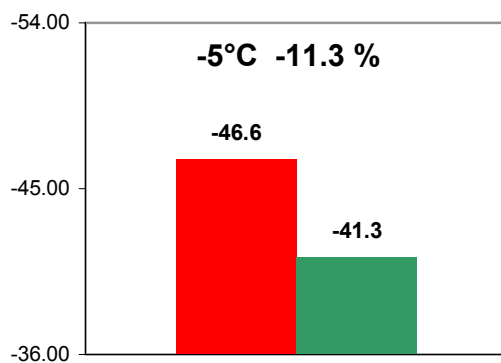
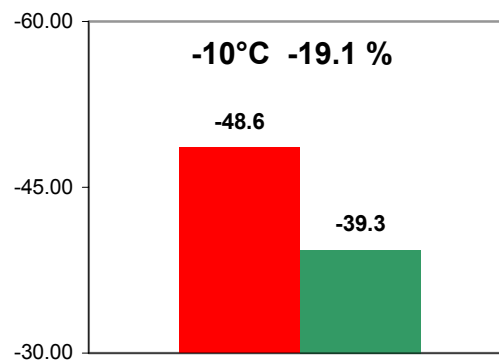
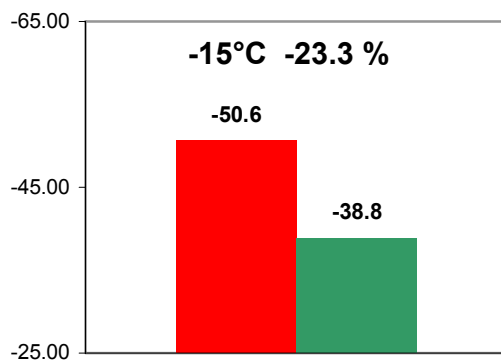
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Fax: +352 5018 3210

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Tests carried out on a LANCIA Delta diesel 1900cc
First registration: 1995
Mileage: 149,410 Km

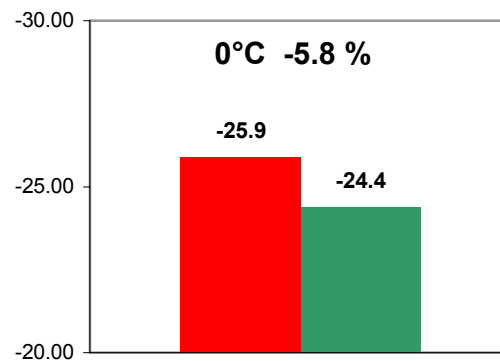
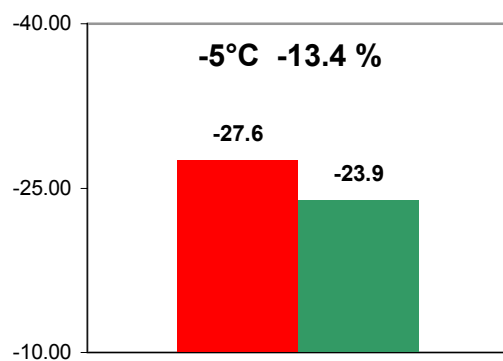
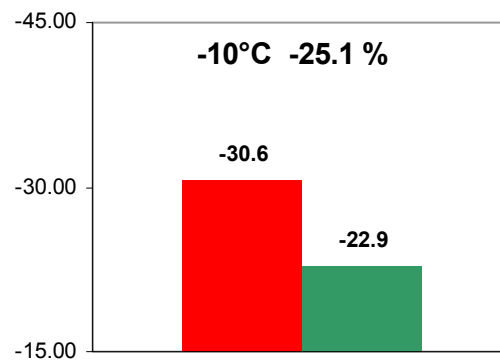
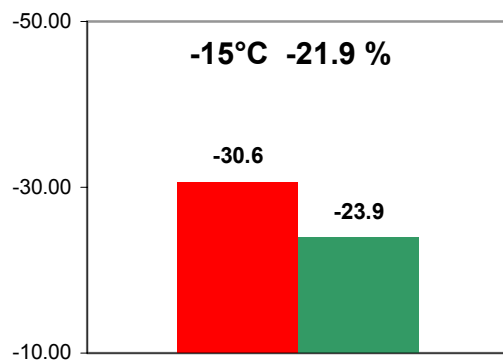
ELECTRICAL CONSUMPTION			
Temperature	Before ASTA 3000 Engine Treatment	After ASTA 3000 Engine Treatment	Results
0° C	46.6	44.6	- 4.2 %
- 5° C	46.6	41.3	- 11.3 %
-10° C	48.6	39.3	- 19.1 %
-15° C	50.6	38.8	- 23.3%



■ Before Asta 3000 Engine Treatment
 ■ After Asta 3000 Engine Treatment

Tests carried out on a RENAULT Twingo gasoline 1200cc
First registration: 1993
Mileage: 144,678 Km

ELECTRICAL CONSUMPTION			
Temperature	Before ASTA 3000 Engine Treatment	After ASTA 3000 Engine Treatment	Results
0° C	25.9	24.4	- 5.8 %
- 5° C	27.6	23.9	- 13.4 %
-10° C	30.6	22.9	- 25.1 %
-15° C	30.6	23.9	- 21.9 %



■ Before Asta 3000 Engine Treatment
 ■ After Asta 3000 Engine Treatment

Date: May 27th 2003
For: Sofiane NENACH
ASTA Technologies
From: Jean-Yves CLOSE – TCL – Vehicle Emission Laboratory
Subject: Test report on **pollution and fuel consumption** before and after application of the engine treatment ASTA 3000
cc: B. Henrion

Purpose of the test:

Determine the efficiency of your engine treatment ASTA 3000 by measuring the pollution level and the fuel consumption before and after treatment with your product.

Vehicles selection:

One gasoline car and one diesel car chosen by you with different mileages and as representative as possible of different driving styles.

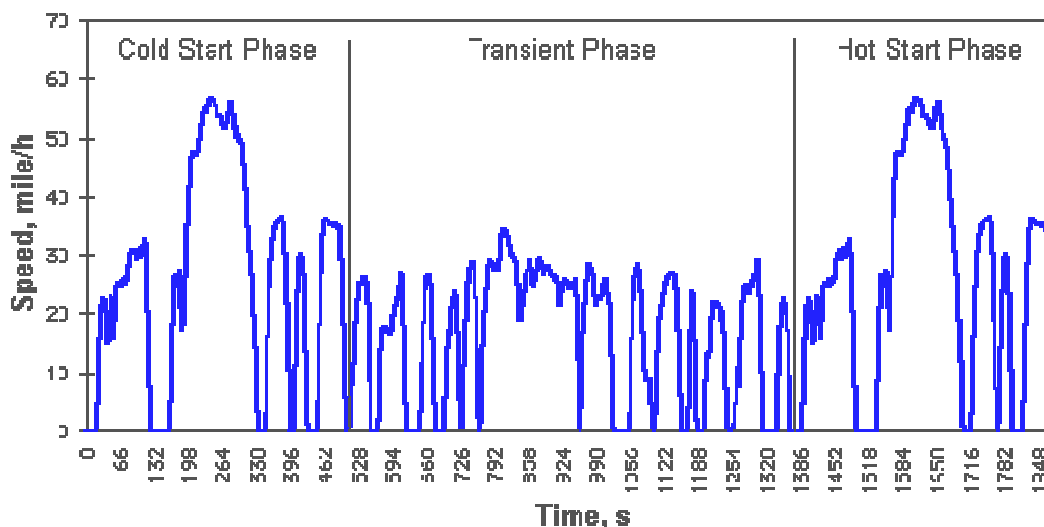


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Test protocol: EPA – Environmental Protection Agency

After discussion and with your agreement, we have modified the EPA III test (FTP 75) in order to meet as closely as possible typical driving conditions: normal use of the gearbox and extra load of the vehicle (4 persons + extra luggage).

- 1) Reception of the vehicle: check for potential leaks (exhaust, oil, cooling liquid, etc...), drain of the fuel tank in order to use a fuel of reference and oil change.
- 2) Blank run of the EPA III test* (FTP 75).
- 3) EPA III test* (FTP 75) with pollution and fuel consumption measurements.
- 4) Application of engine treatment ASTA 3000 into the fuel tank. Fuel tank and driving compartment sealed by us.
- 5) Course on roads and freeways in typical driving conditions.
- 6) Reception of the vehicle: check for potential leaks (exhaust, oil, cooling liquid, etc.) and oil change.
- 7) Blank run of the EPA III test* (FTP 75).
- 8) EPA III test* (FTP 75) with pollution and fuel consumption measurements.
- 9) Results analysis.



* This test protocol includes three phases: cold start, transient, and hot starts. This corresponds to typical travel conditions of a car in the streets of Los Angeles.

Climatic conditions and test period:

22°C and 40% of humidity

May – June 2003

Instrumentation:

- VEL facilities (TCL) – 500mm dual rolls dynamometer (Hoffmann)
- Exhaust gas analysers (HORIBA)

Conclusion:

Decrease of polluting emissions and/or fuel consumption can be observed in the enclosed results charts.

The results of the pollution tests are negatively impacted as the calculation method imposes a multiplication factor of 0.43 during the cold phase and of 0.57 for the warm phase.

Best Regards,

A handwritten signature in blue ink, appearing to read 'Close J.-Y.', is shown on a light blue background.

Jean-Yves CLOSE

Jean-Yves.Close@delphi.com

Project Engineering Technician

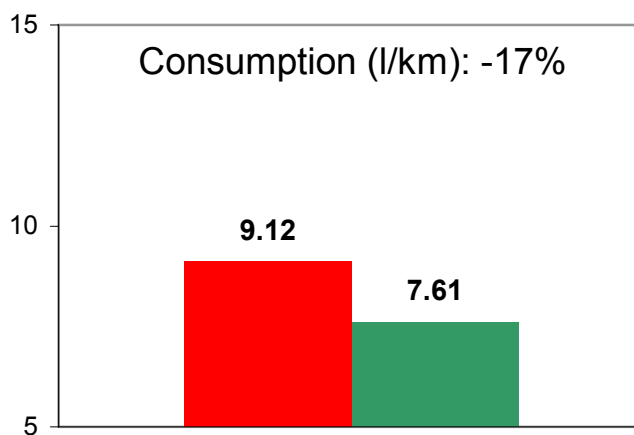
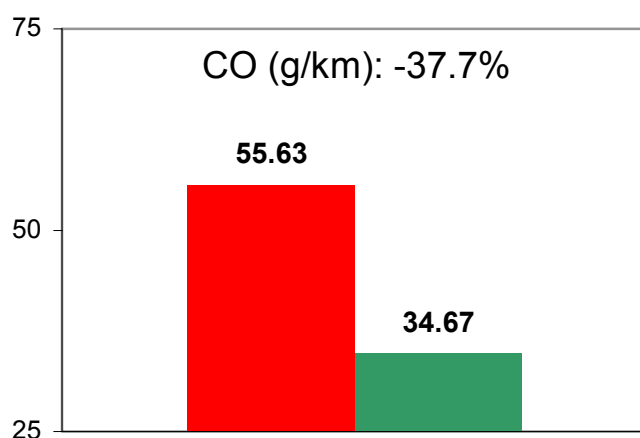
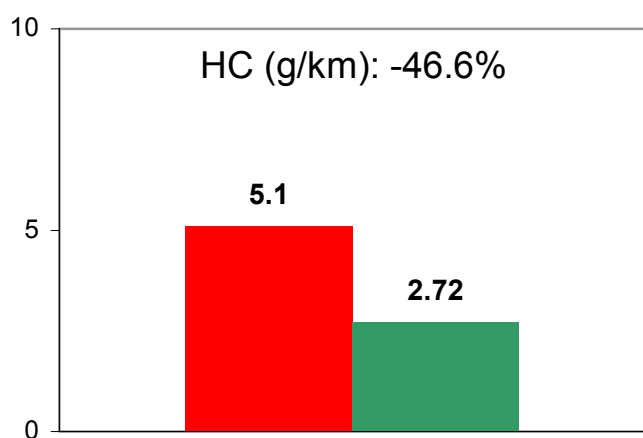
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Fax: +352 5018 3210

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Tests carried out on a Nissan Micra essence 1000cc
First registration: 1988

	Before ASTA 3000 Engine Treatment			After ASTA 3000 Engine Treatment			RESULTS
	EPA Test 1	EPA Test 2	Average	EPA Test 1	EPA Test 2	Average	
MILEAGE	98947	98966		100534	100563		+1616 km
HC (g/km)	4.16	6.04	5.10	3.74	1.70	2.72	- 46.6 %
CO (g/km)	54.26	57.00	55.63	46.60	22.73	34.67	- 37.7 %
CONSUM. (l/100km)	9.04	9.19	9.12	7.69	7.53	7.61	- 17 %



■ Before Asta 3000 Engine Treatment
 ■ After Asta 3000 Engine Treatment

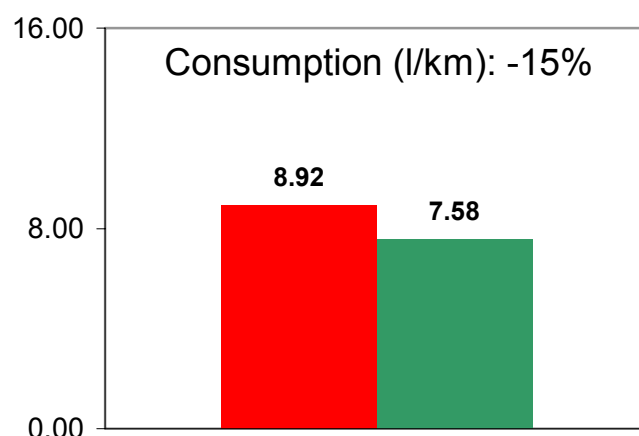
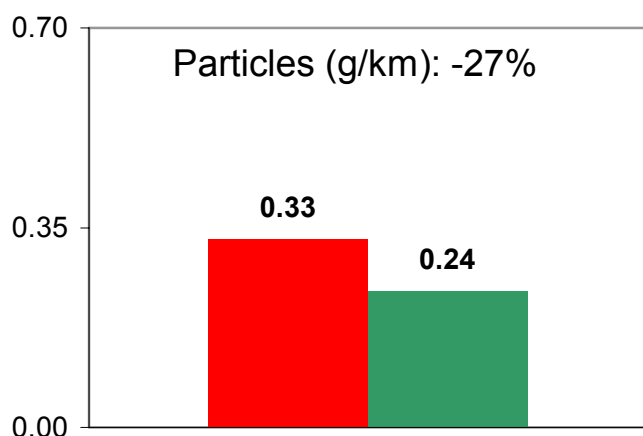
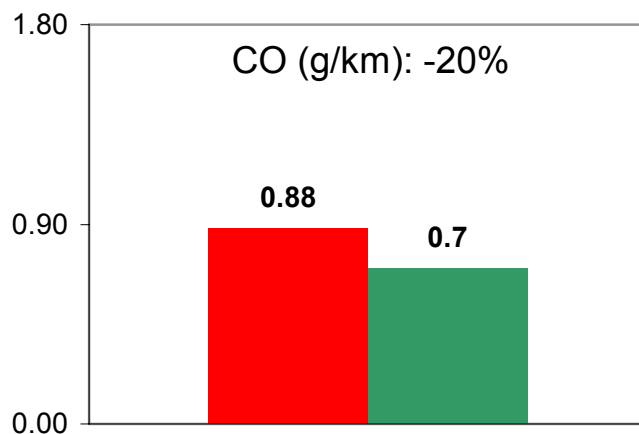
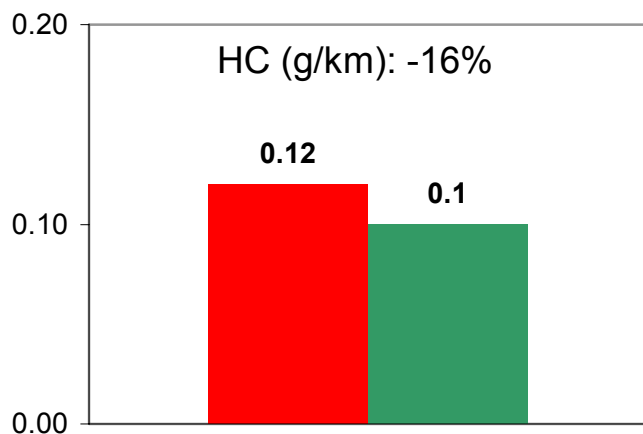
Hydrocarbon (HC; grams / km): unburned residues of combustion

Carbon monoxide (CO; grams / km): residues of an incomplete combustion (lack of oxygen)

Consumption (litres / km): car's average consumption during the test

Tests carried out on an OPEL Astra diesel 1700cc
First registration: 1992

	Before ASTA 3000 Engine Treatment			After ASTA 3000 Engine Treatment			RESULTS
	Test EPA 1	Test EPA 2	Moyenne	Test EPA 1	Test EPA 2	Moyenne	
MILEAGE	214616	214634		216220	216239		+1623 km
HC (g/km)	0.11	0.13	0.12	0.11	0.09	0.10	- 16 %
CO (g/km)	0.91	0.84	0.88	0.71	0.69	0.70	- 20 %
PARTICLES (g/km)	0.31	0.35	0.33	0.25	0.23	0.24	- 27 %
CONSUM. (l/100km)	8.99	8.85	8.92	7.44	7.72	7.58	- 15 %



■ Before Asta 3000 Engine Treatment
 ■ After Asta 3000 Engine Treatment

Hydrocarbon (HC; grams / km): unburned residues of combustion

Carbon monoxide (CO; grams / km): residues of an incomplete combustion (lack of oxygen)

Particles (grams / km): residues of combustion made up of CO and HC

Consumption (litres / km): car's average consumption during the test

Date: May 27th 2003
For: Sofiane NENACH
ASTA Technologies
From: Jean-Yves CLOSE – TCL – Vehicle Emission Laboratory
Subject: Test report on **power** before and after application of the engine treatment
ASTA 3000
cc: B. Henrion

Purpose of the test:

Determine the efficiency of your engine treatment ASTA 3000 by measuring the power before and after treatment with your product.

Vehicles selection:

One gasoline car and one diesel car chosen by you with different mileages and as representative as possible of different driving styles.

Test protocol: Power curve

- 1) Reception of the vehicle: check for potential leaks (exhaust, oil, cooling liquid, etc...), drain of the fuel tank in order to use a fuel of reference and oil change.
- 2) Heating of the vehicle during 10 minutes at 80 km/h (in 5th gear).
- 3) Power measurement at all engine's revolutions.
- 4) Application of engine treatment ASTA 3000 into the fuel tank and in engine oil.
Fuel tank and driving compartment sealed by us.
- 5) Course on roads and freeways in typical driving conditions.
- 6) Reception of the vehicle: check for potential leaks (exhaust, oil, cooling liquid, etc.) and oil change.
- 7) Heating of the vehicle during 10 minutes at 80 km/h (in 5th gear).
- 8) Power measurement at all engine's revolutions.
- 9) Results analysis.

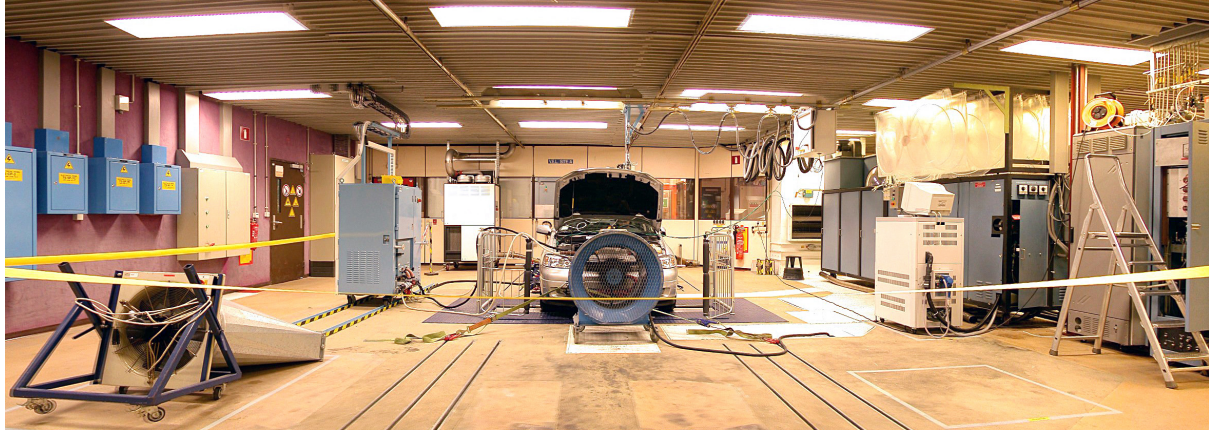


Climatic conditions and test period:

22°C and 40% of humidity

May – June 2003

Instrumentation: VEL facilities (TCL) – 48 inch single roll dynamometer (AVL)



Conclusion:

The first chart (diesel car) shows an increase of the maximal power up to 0.6 kW (0.8 CV) at 4600 rpm. Power at high revolutions is restored showing a better filling of the engine; this shows a cleaner engine. The fast fall of the vehicle power (whose engine is clogged) is stopped and the original power curve is restored.

In the second chart (gasoline car), you notice an increase of the power at all revolutions up to 2 KW (3 CV) at 5000 RPM.

Best Regards,

Handwritten signature of Jean-Yves Close.

Jean-Yves.Close@delphi.com

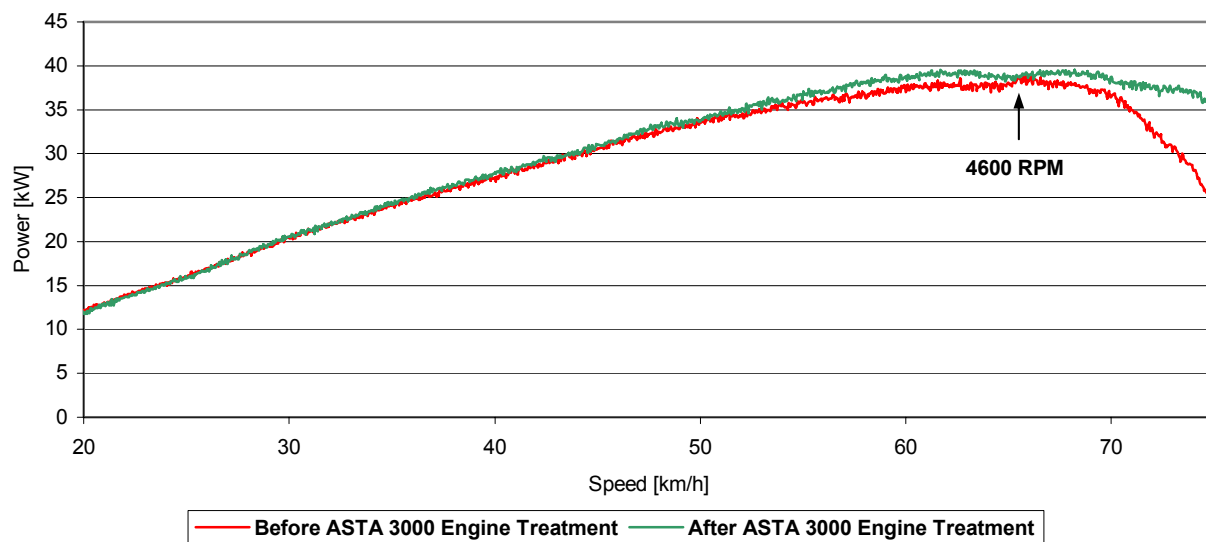
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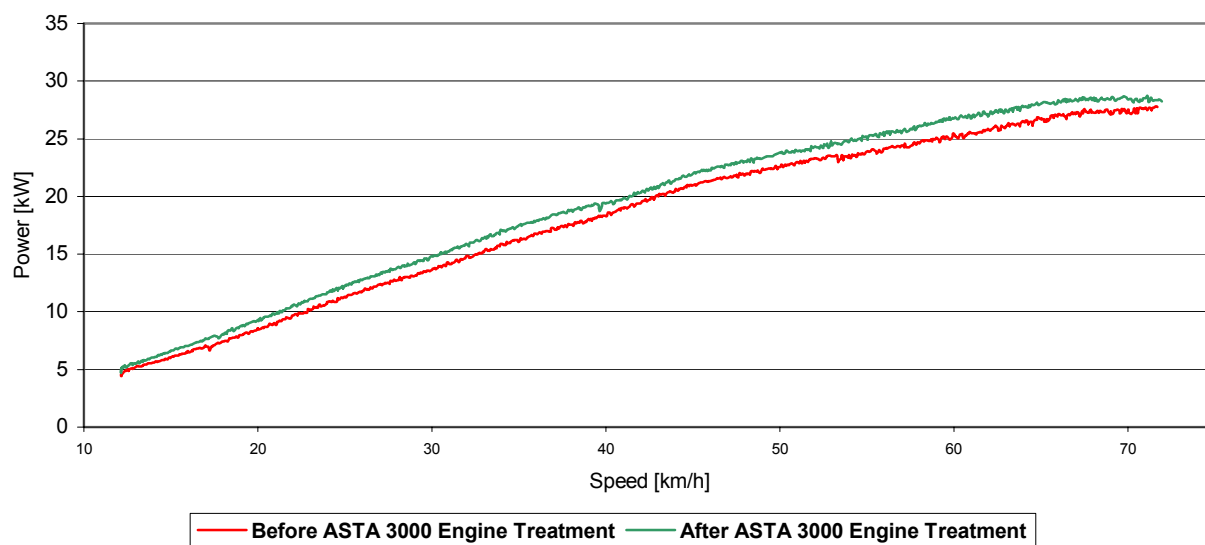
Fax: +352 5018 3210

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Power curve
Opel Astra 1700cc Diesel
First registration: 1992



Power curve
NISSAN Micra 1000cc Gasoline
First registration: 1988



Date: September 19th 2003
For: Sofiane NENACH
ASTA Technologies
From: Jean-Yves CLOSE – TCL – Vehicle Emission Laboratory
Subject: Test report on **carbon deposits** before and after application of the engine treatment ASTA 3000
cc: B. Henrion

Purpose of the test:

Determine the efficiency of your engine treatment ASTA 3000 by visualising combustion chambers before and after treatment.

Vehicles selection:

One gasoline car and one diesel car chosen by you with different mileages and as representative as possible of different driving styles.

Test protocol:

- 1) Reception of the vehicle: check for potential leaks (exhaust, oil, cooling liquid, etc...).
- 2) Spark plugs (gasoline version) or injectors (diesel version) dismantling.
- 3) Visualisation of the combustion chambers by means of a precision endoscope mounted with a video camera.
- 4) Application of engine treatment ASTA 3000 into the fuel tank and in engine oil. Fuel tank and driving compartment sealed by us.
- 5) Course on roads and freeways in typical driving conditions during 100 km.
- 6) Reception of the vehicle: check for potential leaks (exhaust, oil, cooling liquid, etc.).
- 7) Spark plugs (gasoline version) or injectors (diesel version) dismantling.
- 8) Visualisation of the combustion chambers by mean of a precision endoscope mounted with a video camera.
- 9) Results analysis.



Test period:

September 2003

Instrumentation:

Precision endoscope (Karl STORZ) and a video camera (AVL system)

Conclusion:

You can observe, for each vehicle, a cleanup of the combustion chambers. This cutback in clogging reduces friction and improves the engine's output thus leading to a decrease in fuel consumption and polluting emissions.



Combustion chamber before ASTA 3000 Engine Treatment



Combustion chamber after ASTA 3000 Engine Treatment

Best Regards,

A handwritten signature in blue ink, reading 'Close J-Y.'.

Jean-Yves.Close@delphi.com

Project Engineering Technician

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Fax : +352 5018 3210

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