

## TEST REPORT

### No. D4-TPT 351-051-86

D4 - TPT Page 1	D4 - TPT Page 2 (cont.)																																																																								
<p>Commissioned by: Petrolon (UK) Ltd. through: 140 Leicester Road Richard Chambers Wigstone Dahlienweg 14 Leicester LE8 1DY 8011 Heimstetten</p> <p>Nature of test: Tests on a private car to investigate the effects of an addition to the motor, gearbox and differential oils.</p> <p>Product trade name: [REDACTED]</p> <p><u>1. Purpose of the tests</u></p> <p>According to the customer's instructions, the effect of "[REDACTED]" when added to normally available engine and gear oils with regard to the reduction of frictional losses as well as related changes in fuel consumption and exhaust gas emissions should be established.</p> <p><u>2. Test vehicle</u></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 25%;">Manufacturer</td> <td style="width: 25%;">Ford (Germany)</td> <td style="width: 25%;">Model name.</td> <td style="width: 25%;">Granada 2.3</td> </tr> <tr> <td>Type</td> <td>GU</td> <td>Chassis No.</td> <td>GAGFUG 39020</td> </tr> <tr> <td>First registered</td> <td>27.02.80</td> <td>Max. engine power:</td> <td>79/5000 kW/min<sup>-1</sup></td> </tr> </table> <p><u>3. Tests conducted</u></p> <p>3.1 Check of the idling setting of the engine 3.2 Fuel consumption measurement - DIN 70030 (ECE-R 15/04 Annex 9) 3.3 Coast-down on the dynamometer 3.4 Exhaust gas measurement - ECE-Regulation 15/04</p> <p><u>4. Measuring equipment and test devices</u></p> <p>4.1 Motor tester from Robert Bosch, Compact Test - motor tester MOT 500 - ignition oscilloscope MOT 400 - report printer PDR 100 - pressure and vacuum tester ETT 007.01</p>	Manufacturer	Ford (Germany)	Model name.	Granada 2.3	Type	GU	Chassis No.	GAGFUG 39020	First registered	27.02.80	Max. engine power:	79/5000 kW/min <sup>-1</sup>	<p>differential: 1.30 l Castrol Hypoy 90 + 0.50 l [REDACTED] (blue pack)</p> <p>After a running-in period of about 2750 km, all tests listed under (3) above were repeated.</p> <p>To avoid as far as possible external factors influencing the test series, as far as possible the tests were conducted with the same engine settings, with adjustments being made as necessary. Also, new oil and air filters and new spark plugs were fitted, and the engine idling speed was set back before the start of the second series of tests from 900 min<sup>-1</sup> to 800 min<sup>-1</sup>. For the duration of the tests the bonnet was plumbed, and the oil filler holes were sealed with sealing paint.</p> <p>After about 1500 km of the running-in period had elapsed, about 0.6 l of motor oil was needed to top up; after the further 1250 km a further 0.3 l was required. The seals were on both occasions found to be undamaged.</p> <p>In spite of extensive elimination of factors which could have led to a distortion of the test results, the figures in (6) below include the inevitable spread resulting from the practical tolerances present in the test drives and their measurement. The figures in (6) can therefore, because of the lack of complete statistical certainty involved, not be taken as absolute. However, the possible spread in the measurements is smaller than the computed changes which were established during the second series of tests.</p>																																																												
Manufacturer	Ford (Germany)	Model name.	Granada 2.3																																																																						
Type	GU	Chassis No.	GAGFUG 39020																																																																						
First registered	27.02.80	Max. engine power:	79/5000 kW/min <sup>-1</sup>																																																																						
Page 2	Page 3																																																																								
<p>4.2 Dynamometer from Schenck, Type 500/GS 60</p> <p>Prod.No. LNB 0729,LEB 1417 diameter of rollers 502mm max. power 60 kW max. speed 200 km/h</p> <p>4.3 Exhaust gas analyser: Horiba, CVS-61-2 Analysors: MEXA 8420 Typ AIA 23 (AS), FIA 52, CLA 53, MPA 21</p> <p>4.4 CO measuring device: ULTRAMAT 13P with NDIR analysors</p> <p><u>5. Procedures carried out on the test vehicle</u></p> <p>To establish the original values, all the tests listed under (3) above were first carried out with the original oils still in the vehicle. The engine settings at idle were found to be in accordance to the manufacturer's specifications (Motor Data). Following this, the engine, gear-box and differential oils were replaced with oils to which [REDACTED] was added according to the manufacturer's instructions:</p> <p>engine oil: 3.50 l Valvoline All Climate 10 W40 + 0.75 l [REDACTED] (red pack, 750 ml for 4-stroke engines, 1.6 - 3.5 l)</p> <p>gear-box: 1.50 l Castrol EP 80 + 0.50 l [REDACTED] (blue pack, 500 ml for gearbox and differential treatment)</p>	<p><u>6. Test results</u></p> <table style="width: 100%; border: none;"> <thead> <tr> <th></th> <th style="text-align: center;">base values (normal oil) (+ [REDACTED])</th> <th style="text-align: center;">'after' values (+ [REDACTED])</th> <th style="text-align: center;">change (%)</th> </tr> </thead> <tbody> <tr> <td>Speedo reading, km</td> <td style="text-align: center;">46950</td> <td style="text-align: center;">49700</td> <td></td> </tr> <tr> <td colspan="4"><u>Idling settings of the engine</u></td> </tr> <tr> <td>- idle speed (min<sup>-1</sup>)</td> <td style="text-align: center;">820</td> <td style="text-align: center;">800</td> <td></td> </tr> <tr> <td>- motor oil temperature (°C)</td> <td style="text-align: center;">93</td> <td style="text-align: center;">94</td> <td></td> </tr> <tr> <td>- CO-concentration (Vol %)</td> <td style="text-align: center;">1.6</td> <td style="text-align: center;">1.53</td> <td></td> </tr> <tr> <td colspan="4"><u>Fuel consumption (l/100 km)</u></td> </tr> <tr> <td>- city cycle</td> <td style="text-align: center;">13.91</td> <td style="text-align: center;">13.22</td> <td style="text-align: center;">-4.96</td> </tr> <tr> <td>- 90 km/h</td> <td style="text-align: center;">7.82</td> <td style="text-align: center;">7.41</td> <td style="text-align: center;">-5.24</td> </tr> <tr> <td>- 120 km/h</td> <td style="text-align: center;">9.91</td> <td style="text-align: center;">9.54</td> <td style="text-align: center;">-3.73</td> </tr> <tr> <td>- average (DIN 70030)</td> <td style="text-align: center;">10.6</td> <td style="text-align: center;">10.1</td> <td style="text-align: center;">-4.7</td> </tr> <tr> <td colspan="4"><u>Time to coast down on the test rig from V = 100km/h to v = 20km/h (average from 2 measurements)</u></td> </tr> <tr> <td></td> <td style="text-align: center;">45.93</td> <td style="text-align: center;">54.70</td> <td style="text-align: center;">+ 19.1</td> </tr> <tr> <td colspan="4"><u>Exhaust values in the ECE-Test (average from 2 measurements)</u></td> </tr> <tr> <td>- CO (g/test)</td> <td style="text-align: center;">41.72</td> <td style="text-align: center;">48.40</td> <td style="text-align: center;">+ 16.0</td> </tr> <tr> <td>- HC (g/test)</td> <td style="text-align: center;">12.78</td> <td style="text-align: center;">12.31</td> <td style="text-align: center;">-3.7</td> </tr> <tr> <td>- NO<sub>x</sub> (g/test)</td> <td style="text-align: center;">7.79</td> <td style="text-align: center;">6.25</td> <td style="text-align: center;">-19.8</td> </tr> <tr> <td>- HC + NO<sub>x</sub> (g/test)</td> <td style="text-align: center;">20.57</td> <td style="text-align: center;">18.55</td> <td style="text-align: center;">-9.8</td> </tr> </tbody> </table>		base values (normal oil) (+ [REDACTED])	'after' values (+ [REDACTED])	change (%)	Speedo reading, km	46950	49700		<u>Idling settings of the engine</u>				- idle speed (min <sup>-1</sup> )	820	800		- motor oil temperature (°C)	93	94		- CO-concentration (Vol %)	1.6	1.53		<u>Fuel consumption (l/100 km)</u>				- city cycle	13.91	13.22	-4.96	- 90 km/h	7.82	7.41	-5.24	- 120 km/h	9.91	9.54	-3.73	- average (DIN 70030)	10.6	10.1	-4.7	<u>Time to coast down on the test rig from V = 100km/h to v = 20km/h (average from 2 measurements)</u>					45.93	54.70	+ 19.1	<u>Exhaust values in the ECE-Test (average from 2 measurements)</u>				- CO (g/test)	41.72	48.40	+ 16.0	- HC (g/test)	12.78	12.31	-3.7	- NO <sub>x</sub> (g/test)	7.79	6.25	-19.8	- HC + NO <sub>x</sub> (g/test)	20.57	18.55	-9.8
	base values (normal oil) (+ [REDACTED])	'after' values (+ [REDACTED])	change (%)																																																																						
Speedo reading, km	46950	49700																																																																							
<u>Idling settings of the engine</u>																																																																									
- idle speed (min <sup>-1</sup> )	820	800																																																																							
- motor oil temperature (°C)	93	94																																																																							
- CO-concentration (Vol %)	1.6	1.53																																																																							
<u>Fuel consumption (l/100 km)</u>																																																																									
- city cycle	13.91	13.22	-4.96																																																																						
- 90 km/h	7.82	7.41	-5.24																																																																						
- 120 km/h	9.91	9.54	-3.73																																																																						
- average (DIN 70030)	10.6	10.1	-4.7																																																																						
<u>Time to coast down on the test rig from V = 100km/h to v = 20km/h (average from 2 measurements)</u>																																																																									
	45.93	54.70	+ 19.1																																																																						
<u>Exhaust values in the ECE-Test (average from 2 measurements)</u>																																																																									
- CO (g/test)	41.72	48.40	+ 16.0																																																																						
- HC (g/test)	12.78	12.31	-3.7																																																																						
- NO <sub>x</sub> (g/test)	7.79	6.25	-19.8																																																																						
- HC + NO <sub>x</sub> (g/test)	20.57	18.55	-9.8																																																																						

Test Report No. 351-051-86  
Petrolon (UK) Ltd. Leicester Road  
Wigstone Leicester LE8 1DY

D4 - TPT

Page 4

## 7. Summary of Results

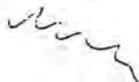
The reduction of the frictional losses in the test vehicle are evidenced most clearly by the considerably longer coast-down time (19.1%) on the test rig. They gave an improvement in fuel consumption of 4.7% in the ECE mix. The changes in the exhaust gas emissions come less from the use of [REDACTED] than from the vehicle and/or motor settings. They fall more or less within the scatter area expected in such measurements. However, the reduction in nitrous oxides emissions can be attributed - at least by inference - to the lower frictional losses in the engine through the use of [REDACTED].

There were further tests made, beyond the main scope of this report, which brought no negative results; among these were for example an investigation for possible fluorine or other acidic combinations in the [REDACTED]-treated engine and gear-box oils, and in the exhaust gases, which could have been undesirable for the environment or for the vehicle.

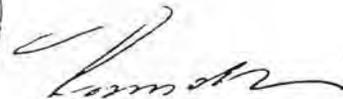
When the spark-plugs were changed before each series of tests, the compression of the cylinders was measured. While the peripheral measurements - such as the battery voltage - were not made, which would have allowed an unrestricted confirmation of the readings taken, the improvement measured - about 7.5 psi per cylinder - infers an improvement in the sealing of the cylinders.

In summary, it is confirmed that the tests described above under sections 3 - 6 showed a measureable reduction in the frictional losses of the test vehicle through the addition of [REDACTED] to the engine, gear-box and back axle oils. No negative effects resulted from the treatment.

This test report consists of pages 1 - 4 and may only be reproduced in its entirety.



Director of the Exhaust Test Centre  
Dipl.-Ing. H.P. Neppel



Responsible Officer  
Dipl. Ing. E. Rauschmair

München,  
D4-TPT04 ra/pf



Test Report No. 351-006-87

D4 - TPT

Page 4

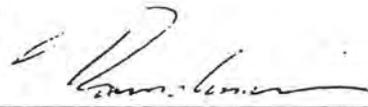
### 7. Summary of Results

In the tests as described under 3 to 6 above, an increase in maximum power, as measured at the rear wheels of the test vehicle, of 5.3% was established resulting from the addition of " " to the normal oils in the engine, gearbox and back axle. By keeping the peripheral conditions constant during the tests it was ensured that this increased power was achieved only by the reduction in frictional losses due to the treatment with " ".

This test report consists of pages 1-4, and may only be reproduced in its entirety.



Director of the Exhaust Test Centre  
Dipl.-Ing. H.P. Neppel



Responsible Officer  
Dipl.Ing. E. Rauschmair

ROAD TRANSPORT DIVISION,  
München, 26. 02. 87  
D4-TPT ra/pf