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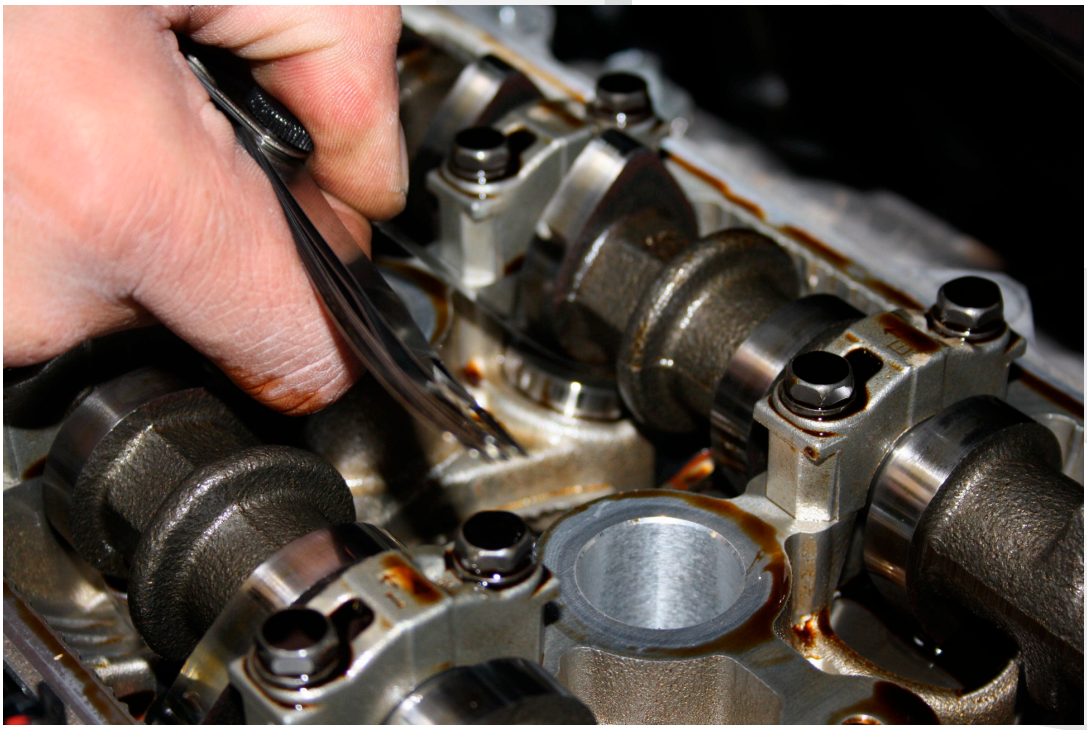
Lubricants for today's cars

Setting the Standard

for the

LPG industry



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JLM - Setting the Standard in the LPG industry.

GMS Europe B.V. has long been recognised as a leader in the LPG market.

From the company's founding in 1976 supplying & installing LPG systems, to today becoming Europe's leading LPG parts supplier into more than 30 countries, GMS has been involved in, and understands the automotive gas market like few others.

As pioneers in the market, GMS has always been involved in developing & discovering new products & ways to improve the industry.

One of these has been the development of the Valve Seat Recession (VSR) additive market.

Knowledge Leaders

Over 11 years ago, GMS took on this new phenomena, believing there was a valve seat recession issue & providing a solution for the market. Today, it is widely accepted that there is indeed a valve seat recession problem with some vehicles using LPG / Auto Gas. As a result of GMS' work there are now many copy products on the market, all claiming to have the expertise and knowledge about VSR.

For most of that 11 year period development of the VSR products stood still, no money being spent, no plans for investment, while the market – cars, engines & Gas systems were constantly evolving, so GMS decided to act.

Having developed the European market over many years GMS became established as the industry leaders not only in sales, but of knowledge, in the market. In 2009, GMS gathered together industry experts from various countries including leading Professors, Mechanical Engineers, Universities & Chemical Engineers specializing in this field, to develop new, improved VSR technology & testing.

The end result of this conglomeration being the JLM Valve Saver Fluid.

This development included road & laboratory testing, resulting in the setting of new standards other companies have only dreamt about.

Today there are many brands of 'Valve Saver' products on the market. One thing is clear, these competitors see an opportunity for sales, but do they have any knowledge or expertise in this field? All of them make claims that their product works, but until now no standard has been available to prove, or disprove if any actually work.

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Dispelling some of the myths

Many company's have made claims that their products actually work. The truth is, there has never* been any formal independent testing of their finished formulation to prove their claims.

New 'road tests' are now emerging, claiming TÜV certification, which simply means TÜV had checked the results. There is no comparison between a TÜV certification & a TÜV Standard. A Standard, same as what is used to compare product in a direct & equal comparison, has been developed so that Valve Saver products can be compared indentically, by one test, the results of which cannot be disputed.

In a road test there are too many variables like, fuels, driving condition, drivers & placebo effect, temperature etc, so two road tests can never be directly compared, and the results will always be questionable.

This is why JLM was the first to develop and implement both forms of testing.

There has been a lot of talk about VSR, what causes it, how to resolve it, even what testing methods are the best. Most of this 'talk' is more to do with marketing rather than dealing with the facts, saying things like , ' no vacuum when high speed driving on the Autobahn' is simply not true, either the people making these statements have never been on an Autobahn or have no real mechanical understanding.

The facts here is that there is vacuum available– I guess what they are alluding to is that when you are at full throttle there is low vacuum- but, for those who have driven Germanys Autobahn's, how long have you been able to drive with the accelerator hard on the floor?, Two minutes? Maybe three?, but not more, as there is simply too much traffic or speed restrictions. At constant high speed, vacuum is not a problem. We should remember that vacuum also operates the vehicles brakes, and, if not enough vacuum is produced, just how would a car stop at these high speeds after one or two brake applications?

Either way, these new tests & standards clearly show that JLM Valve Saver Fluid, together with the JLM Valve Saver kit solve the VSR problem – even at full throttle.

The JLM story so far

January 2010	– GMS Lubricants B.V. founded.
March 2010	– JLM Brand registered.
August 2010	– First to complete Independent Valve Seat Recession road testing.
September 2010	– JLM worldwide launch @ Automechanika Frankfurt.
January 2011	– JLM Valve Saver products available in more than 20 countries.
March 2011	– Awarded 'Best new Valve Saver – INPRO 2011.
May 2011	– First & only Valve Saver additive to achieve TÜV Certification.
September 2011	– JLM products now available in over 35 countries.

*As of January 2011

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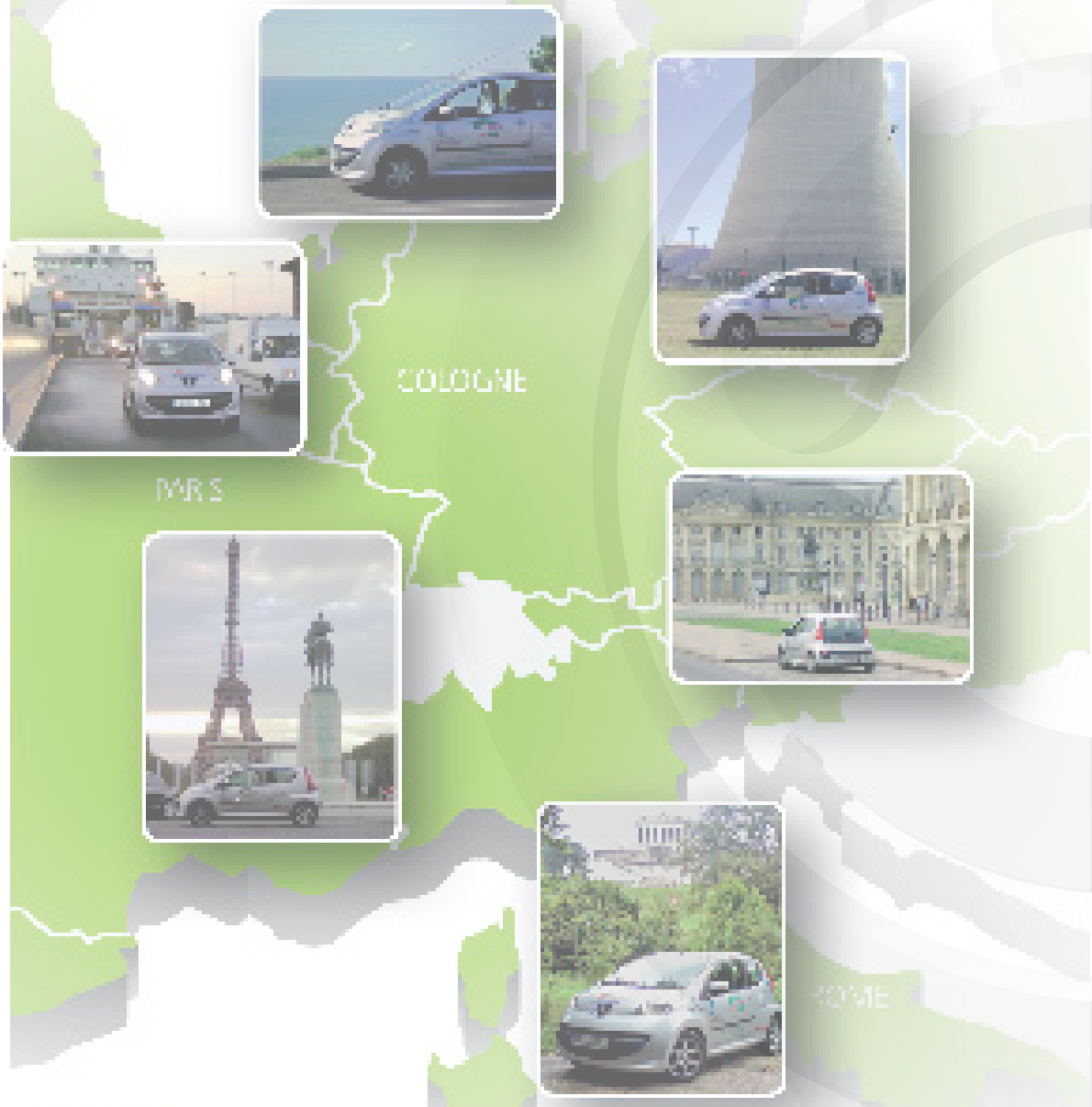
The First Test: Valve Wear Road Test - August 2010
HTWdS University, Saarland Germany

With the launch of the new JLM brand scheduled for September 2010 at Automechanika in Frankfurt, Germany, JLM engaged the services of one of Europe's leading automotive Universities, The University of Applied Sciences in Saarland Germany. Together with JLM, HTWdS developed the first part of a testing regime to prove that JLM Valve Saver Fluid & JLM Valve Saver Kit works, providing the gas industry and consumers with the knowledge & confidence in choosing a tested brand.



First was the road test, covering more than 22.000 Km, incorporating a complete examination of engine valve wear, using a 1.0 Liter engine with a liquid phase LPG system, as well as installing a JLM Valve Saver Kit with JLM Valve Saver Fluid for the second half on the test.

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Following is the test report

1. Summary

For a 10,000 km field test of JLM Valve Saver fuel additive a Peugeot 107 with an LPG liquid phase injection system was used. First the vehicle was first driven 12,500 km without a protective additive and the valve clearance was checked. During this unprotected period 6.10 +/-2µm/1,000 km was the average valve recession on the exhaust valves.

For engine optimisation for liquefied petroleum gas, the geometric compression ratio in the test vehicle was increased from 10.5:1 to 12:1. As a result of these measures, the wear on the valves will be equal or superior in comparison to the pre-determined reference value.

At the beginning of the road test, the valve clearance values were close to the lower tolerance limits. With intent the valve seats and valves were not reworked and/or ground. The additive was added by the JLM lubrication system. The specified consumption of the additive is 1ml Valve Saver fluid per one liter LPG. According to the JLM product information, this value will be achieved by setting the dosimeter to 12 drips per minute in engine idle mode.

Summary

The valve clearance was inspected during the test, at 0km, 2445km, 5886km and 10249km. There were slight differences in valve clearance in a range of up to 10µm, which matches the resolution of 10 µm of measuring equipment, but these were 0µm on average.

Based on the initial observed wear, the estimated valve wear without any additive would be 61 µm for 10,000km and should be reliably identified by the measuring equipment used.

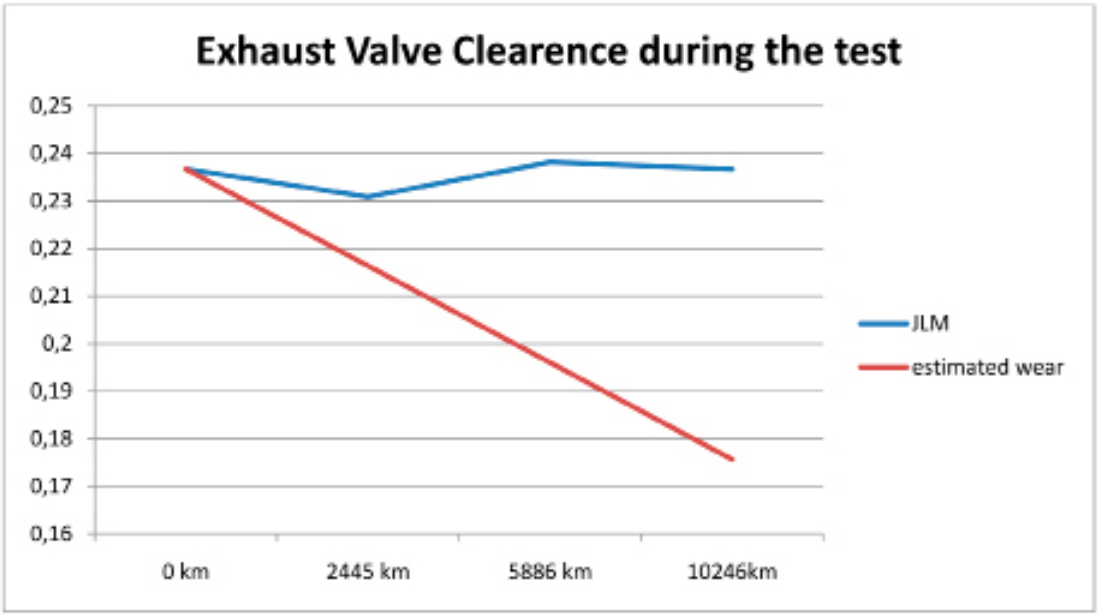

FIG 1: Averaged Valve clearance during the 10,000km (blue = protected exhaust valves; red = unprotected valves)

The last final valve clearance inspection was conducted at 10.249 km. The measured average valve recession was -0.4 µm/1,000 km over the entire test distance. With an accuracy of +/- 1µm/1,000km in mind the road test can be interpreted as a confirmation that the fuel additive basically stops the wear of the exhaust valves. This can be seen clearly form the comparison of the real (blue) and the estimated (red) curve.

2. Road test

2.1 Reference wear

Initially the Peugeot 107 with a 1.0 liter Toyota engine was driven for 12,500 km without an additive. A valve clearance inspection showed that the clearance for all the exhaust valves was already below the lower tolerance limit. The remaining clearance for the individual valves was between 65% and 90% of the lower limit. Normally under this condition an expensive replacement of the cylinder head or at least a readjustment of the valve clearance would be required. To check out whether the additive could stop an ongoing wear process and since the engine did not show any apparent irregularities in running characteristics, the test began with the described borderline valve clearance.

Based on the measured valve clearances, it was possible to estimate a wear rate relative to the manufacturer's default values. The 12 valve engine had sufficient clearances on the intake valves and was still within the manufacturer's tolerances. The six exhaust valves showed clear signs of wear and the valve clearance was outside tolerance on all the cylinders.

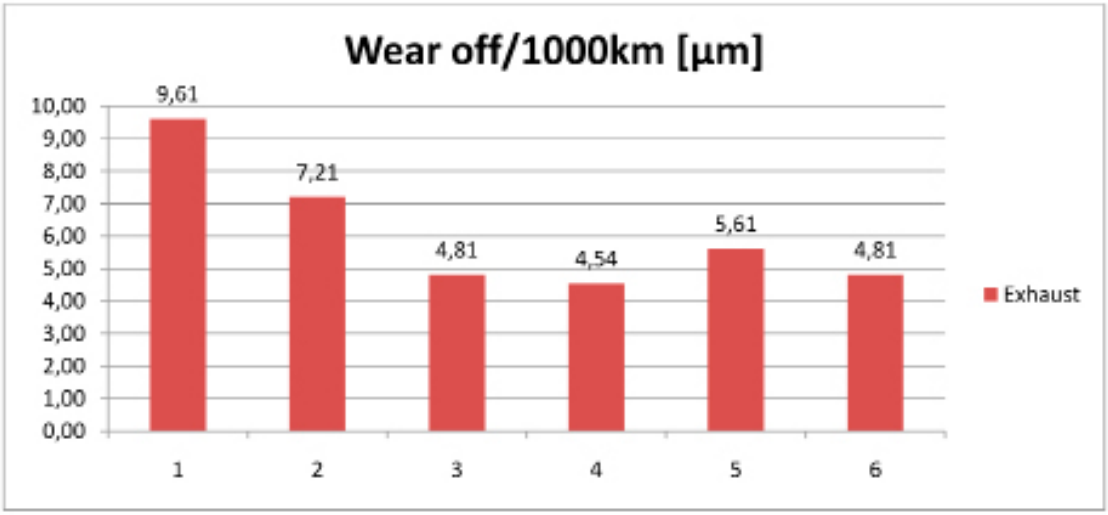

FIG 2: Wear off - Reference

Based on the manufacturer's nominal values, wear rates for the 6 valves would be between 4.54µm and 9.61µm per 1,000 kilometres. The average value is 6.10µm/1,000 km. In practice the different values are plausible, as there are clues to progressive wear behaviour. In theory too, the sealing surface finish quality and the valve timing that is altered by low clearance, will result in progressive behaviour.

2. Road test

2.2 The effect of the JLM Valve Saver Fluid & JLM Valve Saver Kit.

The same cylinder head was used for the test of the lubrication system. So there were different advanced levels of wear, allowing a possible relationship to be identified.

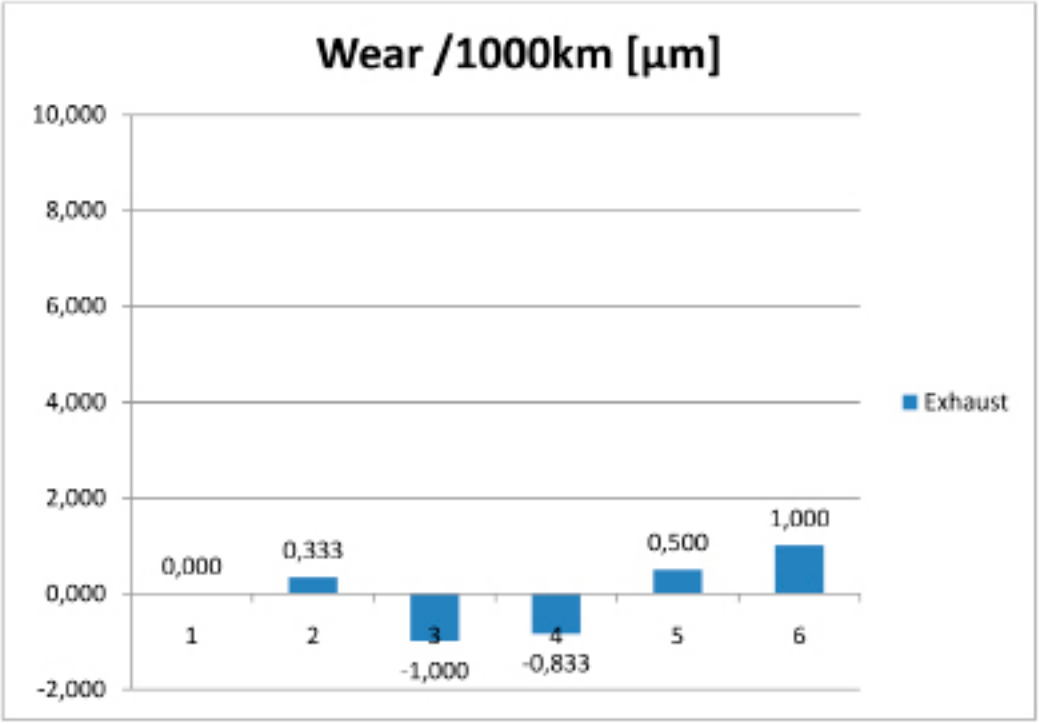

FIG 3: Wear per 1000 km with the JLM Valve Saver Fluid & Kit [µm]

The recorded wear rates were clearly lower than the estimated values for running without a protective additive. The slight differences between the valves relate to the measuring system's capability and do not differentiate between the additive effect for various wear levels.

In summary, it can be said that wear could not be identified on any of the valves on the same scale as it was when running without any additive. Wear below 10% of the reference value cannot be detected with the measuring equipment used, but a statistical evaluation of all six exhaust valves leads to the conclusion that wear on these valves does not exceed 10%.

3. Test documentation

3.1 Measuring process

Valve clearance is determined using a feeler gauge with a resolution of 10µm. In order minimise subjective influences, the measurements were taken by at least two inspectors/testers and mean values established.

	Inlet 0,145-0,235						Exhaust 0,275-0,365					
	Cylinder 1		Cylinder 2		Cylinder 3		Cylinder 1		Cylinder 2		Cylinder 3	
	1	2	3	4	5	6	7	8	9	10	11	12
0 km	0,170	0,175	0,185	0,195	0,185	0,165	0,190	0,220	0,250	0,255	0,245	0,260
2445 km	0,170	0,170	0,190	0,195	0,190	0,165	0,185	0,215	0,255	0,255	0,235	0,240
5886 km	0,175	0,170	0,190	0,203	0,190	0,170	0,187	0,223	0,260	0,263	0,243	0,253
10246km	0,170	0,170	0,190	0,197	0,190	0,163	0,190	0,217	0,260	0,263	0,240	0,250

FIG 4: Average Valve Clearance Measures [µm]

The following chart shows the results of the road test for the three inspectors, who did the valve clearance inspections.

	Inlet						Exhaust					
	Cylinder 1		Cylinder 2		Cylinder 3		Cylinder 1		Cylinder 2		Cylinder 3	
	1	2	3	4	5	6	7	8	9	10	11	12
Inspector 1	-0,010	0,000	-0,010	0,000	-0,010	0,000	0,000	0,000	-0,010	-0,010	0,010	0,010
Inspector 2	0,010	0,010	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,010
Inspector 3	0,000	0,005	-0,005	-0,005	-0,005	0,005	0,000	0,010	-0,020	-0,015	0,005	0,010

FIG 5: Valve wear by Valve and Inspector [µm]

A positive value represents a wear off effect and a negative value would be a growth of the clearance. There is no direct clue to a clearance growth or regeneration of the valves, which is not expected. A technical reason could be an abrasive effect of the camshaft or valve cups, but this neither expected on the test range.

This means that the negative values are a result of the failure rate of the used measuring system and should be averaged with the positive values. The average values for Inspector 1, 2 and 3 are -2.5 µm; +2.5µm and +1.3µm
(Editors note; This is due to a build up of the oxidation of the active ingredient on the valve / seat surfaces)

3. Test documentation

3.2 Additive dosages

The dosage system has a dosimeter, which should be set to 12 drips per minute. This setting should lead to a dosage of 1 ml per 1 liter LPG. On the first check of the drip rate, a difference was determined. So the drip rate was checked at every gas stop and the rest amount of the JLM reservoir and the actual drip rate was documented.

Some efforts were made to maintain the ideal setting, because there is a relation between the fluid temperature and the drip rate.

The alterations of the drip rate are cumulated over the complete road test distance. There is a large variation on the first sight, but on the long term the variation spreads around the line of the initial setting.

That leaves the conclusion that the system itself is not varying, but surrounding conditions have an impact on the behaviour of the system.

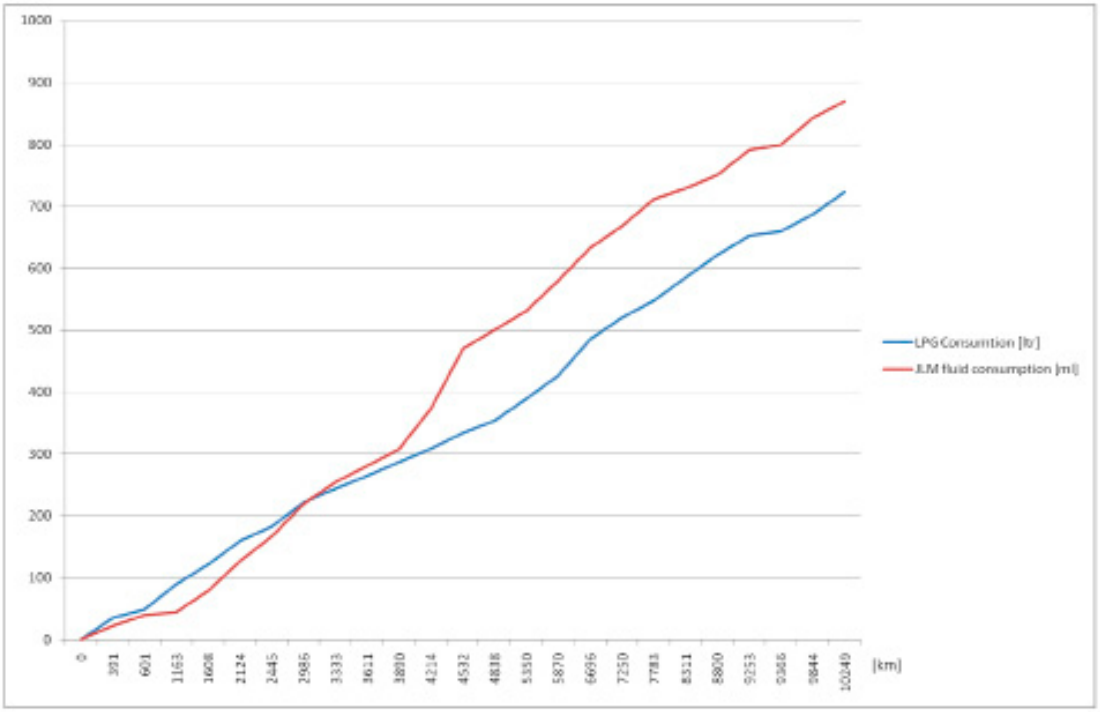

FIG 6 Dosage rate over test progress

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INPRO Award 2011

Gas Show Warsaw

Category: Best LPG Additive

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The Next Step

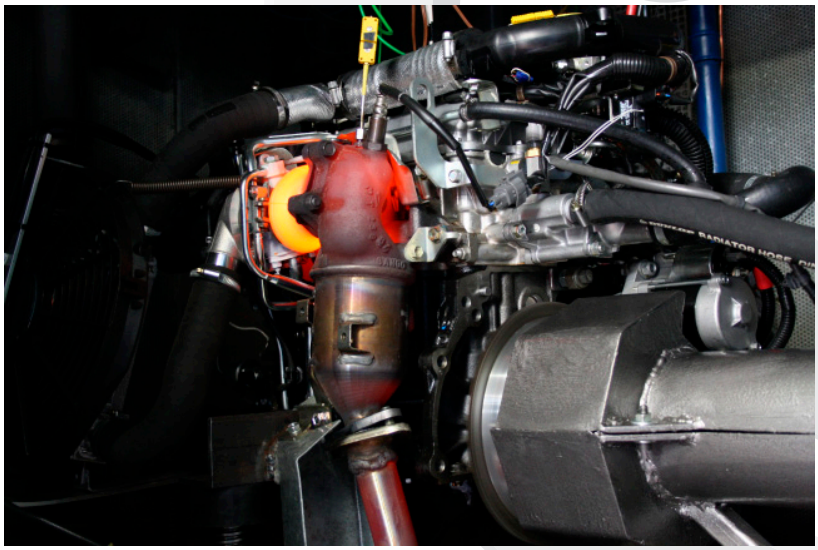
The completion of this first testing of the JLM Valve Saver Fluid provided conclusive proof that Valve Saver Fluid, and the JLM Valve Saver Kit really do work, so well in fact that the testing University was in disbelief at the results, and subsequently added other inspectors to verify their findings.

The test results certainly sparked a lot of conversation in the market, but more importantly for the installers, manufacturers & consumers of these products in the gas market, it provided certainty ,confidence and trust in the JLM brand is doing what it promises to do –valve seat recession reduction.

The first test was relatively short in duration mainly due to time constraints & being finished in time for the launch, but as long as the testing & measuring are consistent and accurate, then the duration is not so important if you can gain reliable statistics along the way to prove or disprove the product is having the desired effect.

Not content to rest on its findings, the team at GMS Lubricants had already decided that nothing less than a TÜV Standard for valve seat recession additives would be good enough to prove once and for all that the JLM Valve Saver Fluid is simply the best* on the market.

GMS began laying the foundations for developing the new TÜV Standard back in July 2010, where planning discussions began with HTW Saarland University, and TÜV Rheinland for the TÜV test definitions, methods, application and objectives.



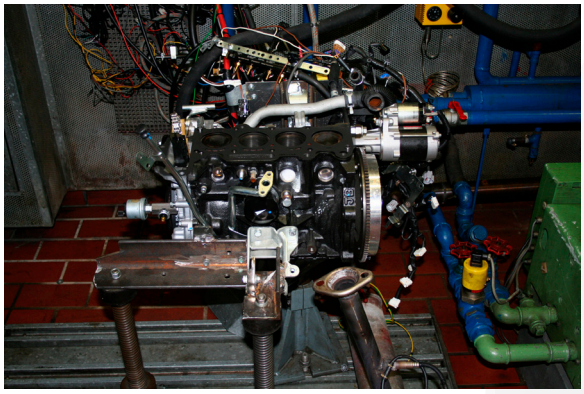
As this was a complete new TÜV standard being developed, great care was taken to ensure that this was not just another test. This has been achieved by ensuring the test methods, engine parameters, data and test cycles are correct and reproducible and the process' approved by TÜV so that any other company or brand can have exactly the same test carried out on their Valve Saver product. Again, this furthers the confidence in the market the brands carrying the TÜV Standards logo for Valve Seat Recession really do work.

*Awarded "Best Valve Saver Fluid"- 2011 INPRO Award.

Following is the official information from TÜV Rheinland Testing Standard

Evaluation of the capability of Valve recession protection products for the exchange valves of spark ignition engines.

This testing standard provides the possibility to determine the reduction of valve/valve seat recession of the exchange valve of a spark ignition engine by a recession protection product. A specific test engine with characteristic features (16 Valves, DOHC Turbo engine) was optimized for the testing method.



In the first step the reference wear will be determined while using liquefied petroleum gas.

In the second step, the valve seat recession protection product will be activated and the wear will be determined again and can be compared with the reference wear.

From these two tests a relative wear reduction by the tested product at the same surrounding conditions can be calculated as result.

For both phases, the engine will be driven in a special reproducible high duty driving cycle for 25 hours. The equipped measurement system will be evaluated by measurement system analysis to know the possible offsets that may be caused by the measuring offsets. By implicating the surrounding conditions and measurement system capability a factor for the wear reduction can be found.

This document is of German origin, some grammar may be incorrect.

Editors Note; This engine type was used deliberately, as it represents the engines on the road today and for tomorrow, and, it posed the highest degree of difficulty of providing accurate additive dosing using a vacuum operated unit in the harshest possible circumstances. This has been done to provide JLM customers with the confidence in knowing they are using the best, most awarded, only TUV approved valve saver products on the market.

Following is the TÜV test report.

TÜV Standard for Valve Seat Recession additives. ID. 01050

TÜV test Application

This test standard defines the methods for the assessment and evaluation of services and claims of products and processes with the intention of reducing wear on the inlet and / or exhaust valves of a gasoline engine.

The test engine is to be installed on an engine stand with the dynamometer. For use within specific test engine with valves that wear. This material and geometry must be designed so that wear is generated in the reference measurement can be clearly detected with the measuring equipment. Furthermore, the engine used should correspond to later applications. In particular, the concept of the injection and air inlets (Turbo motor) should be comparable and the valve mechanism should allow a determination of the wear.

Engine Requirements:

- Determination of the measurement capability of the reference wear should at least be 3-times the standard deviation of the measured values.
- DOHC Turbo construction without hydraulic adjusters.
- 4 valve per cylinder technology.
- If necessary. Installing the dispenser to be tested with suitable gas system (LPG vaporizer / liquid phase / CNG system).

Sensors:

- Environment:
  - Air Pressure
  - Temperature
  - Humidity
- Motor parameters:
  - Speed
  - Torque
  - Lambda
  - Exhaust gas temperature
  - Cooling water and oil temperature
  - Throttle position + LMM
  - Injection time (possibly original and alternative injector)
  - Cylinder pressure (for development)

Additional phases:

New cylinder head:
New cylinder head on standard fuel (usually gasoline RON Super 95) running around working surfaces to enter (especially valve sealing surface)

- 2h average load and speed

Warm-up when engine is cold:

2000 rpm at 50% load

- 30min (safe) or ECT + oil = 80 ° C (fast)

Travel wear for both phases:

Dynamic driving profile:
- 10 min drive profile in repetition
- Driving profile with predominantly Full Load (WOT) and idle shares (including transition ramps)
- Repetition min. 5 hours continuously
- Reference measurement 25h / 25h additive effect

2.4.2 Acceptable test procedures:

A - Additive Rating:
The test will be a suitable maximum load with sufficient valve wear down.
To ensure that the fuel additive is mixed in proportion to fuel. It can be an electronically controlled or vacuum controlled in which the proper function was detected and the consumption can then also be tested. Alternatively, dosage in the tank is possible.

B - Evaluation of metering systems and additive:
To evaluate a system in which the function is unknown, the system is installed according to manufacturer specifications can be applied.

In addition, the engine must be operated in a manner in which corresponds to the dynamic in-vehicle use. For this purpose an automated driving profile is to be used. Since this statement to the wear caused to a relative, there is not the right to use a travel profile, the average operation of the vehicle corresponds to which, as is usual with emission measurements (see NEDC). Here it is also possible to accelerate the wear behavior in the experiment to be able produce clear results framework to be able. It is important that the full load phase short idling and to use coasting in between, as is the case or even in traffic-related speed changes can result in shifting.

The reference measurement is of course identical driving profile carried out and compared.

2.5 valve clearance determination

Measuring points:

Cylinder head intake.

Measurement 1: Present state valve clearance and valve position.

Reference wear trip 25 hours.

Measurement 2: Reference wear measurement every 5 hours.

Wear additive efficacy trip 25 hours.

Measurement 3: Additive effect measurement every 5 hours.

Option A: feeler:

- 20µm steps
- 10h , measure the cold engine
- All valves measured (8 intake, 8 exhaust)
- 3 qualified auditors
- Cam position define (run-tolerance)

Option B: valve position measuring device

- 10h, measure the cold engine
- All valves measured (8 intake, 8 exhaust)
- 3 qualified auditors
- All valves 90 ° (four orientations) or turning center to train

Error Band:
Depending on the methods of measurement error band is possible to determine, and for the presentation of results. When using the feeler gauge measurement, the examiner Sigma from the deviations of the mean individual value is used. The valve position, valve orientations, the deviations of the mean value used.

3. Documentation

3.1 Results description information

It is essential for the test engine results, that the description of the following information must be included:

- Design (DOHC prescribed, number of valves, cylinder number, capacity)
- Valves, valve clearance (mean value + tolerance width)
- Air suction / aspiration
- Standard fuel injection system (Injector position)
- Alternative fuel system

3.3 Tested product

The tested product must be clearly described and agreed to bring the market to be with.

3.3 Measurement capability

The used measuring equipment measurement system analysis one must be subjected to the measurement results at 10-fold repetition of each other to determine the standard deviation. Sigma value in this report must be specified, while the actual measurement procedure described does not need

3.4 Valves

The valve clearances for all valves must be documented including measurements for the following:

- Input measurement
- Reference wear measurement (every 5 hours / total 25 hours)
- Effectiveness measurement (every 5 hours / total 25 hours)

3.5 Fuel consumption data / additive

Documented consumption of fuel and the additive will be in the actual measurements (25 hours + 25 hours) 06.03 ambient and engine data For resolution history data, the following sensor data must be documented:

- Intake air temperature, pressure, humidity
- Exhaust gas temperature (near outlet max. 100mm)
- Torque dynamometer
- IST-speed performance brake

3.6 Reduction in wear

Valve wear values calculated from the inlet and outlet are separated by one. From each valve wear, an averaged wear per phase in microns / h and reported to be calculated.

Test procedure