



Report Date:	January 29, 2015
Name:	Liqui Moly Oil Additives Service
Objective:	Before and After Dyno and Data Monitoring Test Results
Test Vehicle:	2002 Mercedes-Benz C320 3.2L V6 Wagon Mileage: 139,606 KMS Transmission: Automatic
Test Dates:	January 21, 2015

Customer Requests:

Customer was looking for preventative maintenance service guidance due to the age and mileage of the car. We recommended and proceeded with the following preventative maintenance services:

1. Engine Flush before Oil Change with Liqui Moly *Pro-Line Engine Flush*.
2. Lube, Oil and Filter Service with Liqui Moly *Leichtlauf High Tech 5W40* Full Synthetic Motor Oil.
3. Engine Treatment with Liqui Moly *Cera Tec* and Liqui Moly *Motor Oil Saver*.
4. Cooling System Flush with *Pentosin NF* anti-freeze coolant.
5. Automatic Transmission Fluid and Filter Change with Liqui Moly *Top Tec ATF 1600*.
6. Replace gear oil with Liqui Moly *Fully Synthetic Gear Oil SAE 75W90*.
7. Brake Fluid Exchange with *Pentosin Super DOT4*.

As a procedure the car was put on our AWD chassis dyno for a baseline performance test including two drive cycle tests with city and highway simulation (*Attachment 1*).

After the services were completed, the car was put back on our AWD Chassis Dyno and repeated the performance test and drive cycle simulation for comparison (*Attachment 2*).

Test Results:

1. Maximum Engine HP and Torque has increased over the full RPM range between 5% and 17% (*Attachment 3*).
2. HP and Torque increase is confirmed as the **Air flow g/s** has clearly increased by the same load/throttle position. HP increase in Partial Load is between 4.4% and 10.2% (*Attachment 4*)

**Attachment 1**

Incoming Performance Test including Drive Train Losses Before Service.

Attachment 2

Repeated Incoming Performance Test After Service.

Attachment 3

Performance Test Comparison. Before and After Service.

Red – Before

Black – After

Attachment 4

Air Flow Grams/Second (g/s) Measurement Comparison Before and After Service.

Orange – Before

Green - After



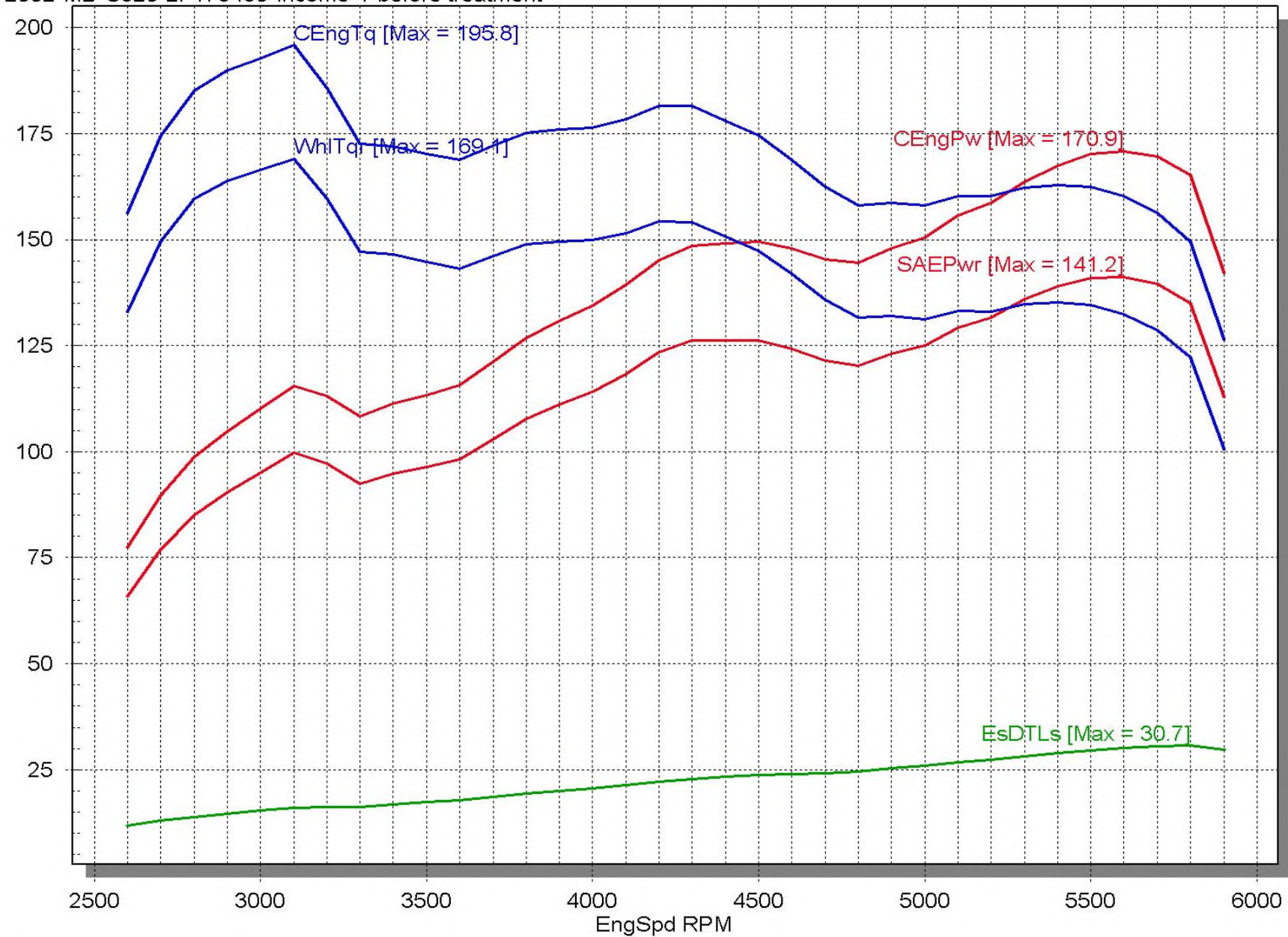
Corrected Brake Power vs. RPM

RSP-Motorsports Inc

2002-MB-C320-2F173465-Income-1-before treatment,

ATTACHMENT 1

2002-MB-C320-2F173465-Income-1-before treatment



Vehicle: 2002 Mercedes-Benz C320 3.2L Wagon

VIN: WBRH64J12F173465

Transmission :Automatic

Chassis:W203

Milage: 142,445 KM

Notice: Measured in 3rd gear ratio 1.49:1

Tire Pressure: 2.0 bar front, 2.2 bar rear

ATTACHMENT 1

INCOME BEFORE ENGINE TREATMENT

EngSpd RPM	CEngPw CHp	SAEPwr CHp	EsDTLs Hp	CEngTq Clb-ft	WhlTqr Clb-ft
2600	77.4	65.8	11.8	156.4	133
2700	89.6	76.9	12.9	174.3	149.6
2800	98.7	85.1	13.9	185.2	159.6
2900	104.8	90.5	14.7	189.9	163.8
3000	110.1	95	15.4	192.7	166.4
3100	115.6	99.8	16.1	195.8	169.1
3200	113.2	97.2	16.3	185.7	159.6
3300	108.4	92.4	16.3	172.5	147.1
3400	111.3	94.8	16.8	172	146.5
3500	113.4	96.4	17.3	170.2	144.6
3600	115.7	98.1	17.9	168.8	143.2
3700	121.2	103	18.6	172.1	146.1
3800	126.8	107.8	19.4	175.2	149
3900	130.7	111.1	20	176.1	149.6
4000	134.4	114.1	20.6	176.4	149.8
4100	139.3	118.3	21.4	178.4	151.5
4200	145.2	123.4	22.2	181.5	154.3
4300	148.6	126.2	22.8	181.5	154.1
4400	149.1	126.2	23.3	177.9	150.7
4500	149.5	126.3	23.7	174.5	147.4
4600	148	124.4	24	168.9	142
4700	145.3	121.5	24.2	162.4	135.7
4800	144.5	120.2	24.6	158.1	131.6
4900	148	123.1	25.3	158.7	132
5000	150.5	125	25.9	158.1	131.3
5100	155.6	129.3	26.7	160.3	133.2
5200	158.6	131.7	27.4	160.2	133
5300	163.7	136	28.2	162.2	134.8
5400	167.4	138.9	28.9	162.8	135.1
5500	170.2	141	29.6	162.5	134.7
5600	170.9	141.2	30.1	160.3	132.5
5700	169.6	139.5	30.5	156.2	128.5
5800	165.2	134.9	30.7	149.6	122.2
5900	142.1	112.9	29.6	126.5	100.5

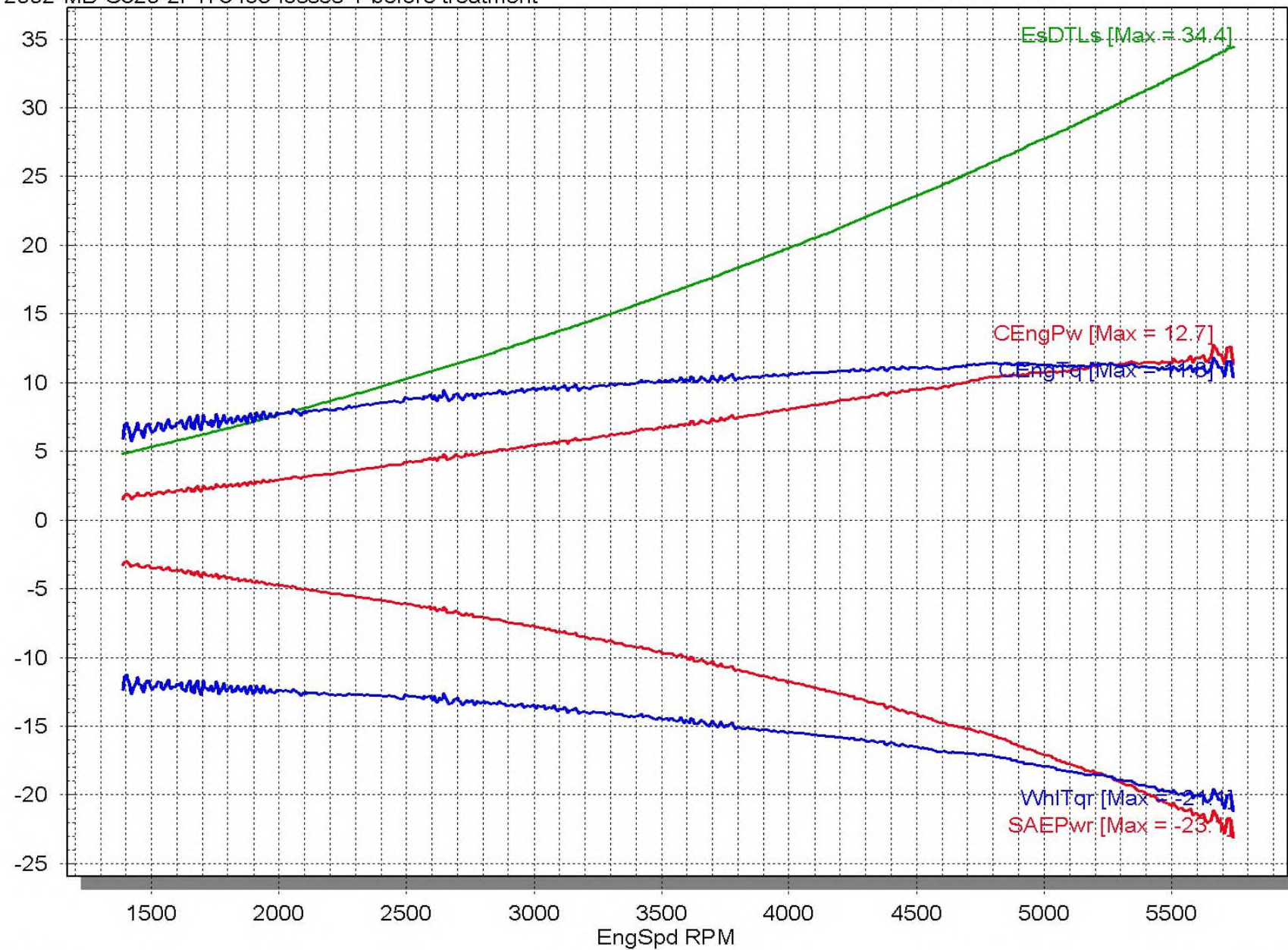
Corrected Brake Power vs. RPM

RSP-Motorsports Inc

2002-MB-C320-2F173465-losses-1-before treatment,

ATTACHMENT 1

2002-MB-C320-2F173465-losses-1-before treatment

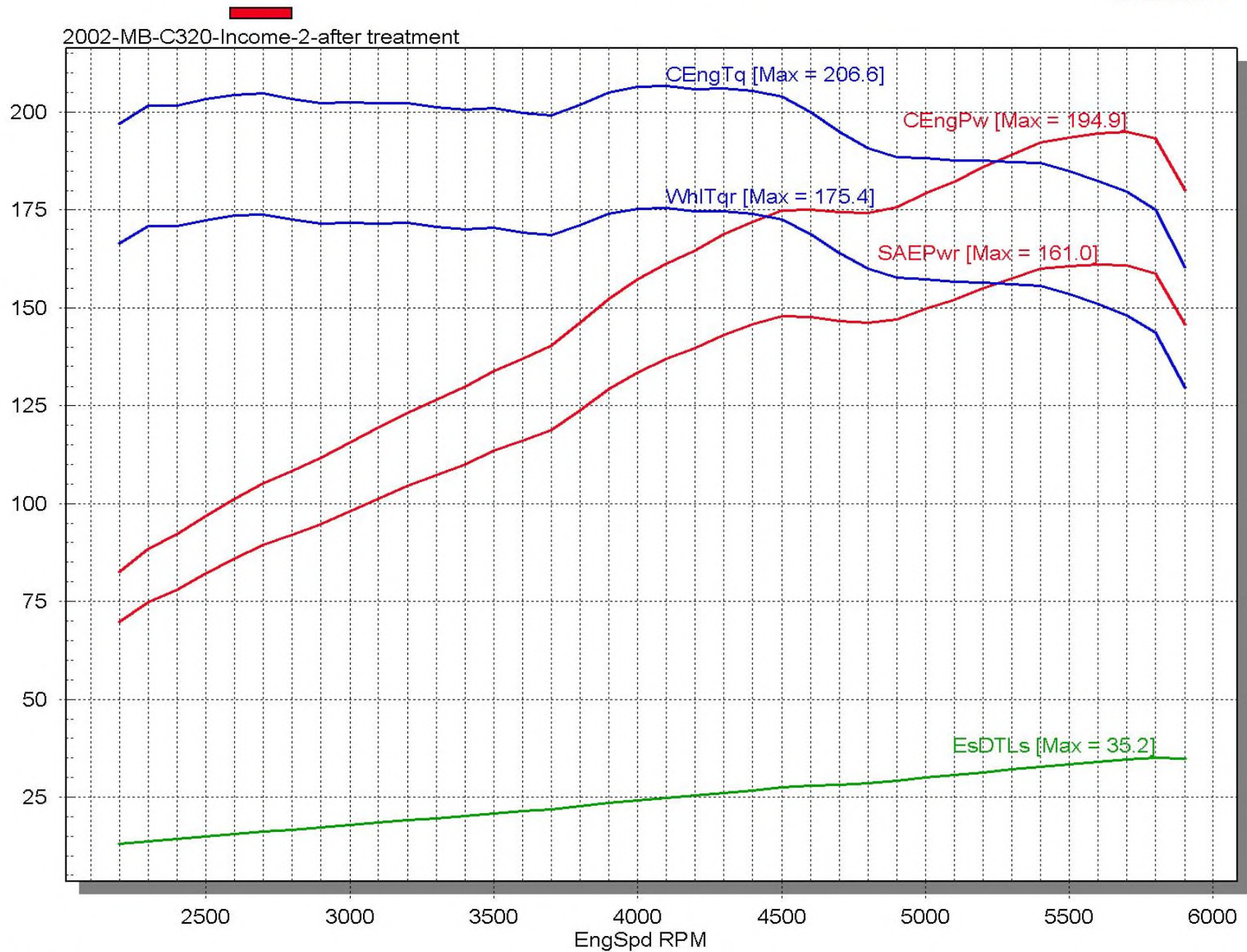


Corrected Brake Power vs. RPM

RSP-Motorsports Inc

2002-MB-C320-Income-2-after treatment,

ATTACHMENT 2



Vehicle: 2002 Mercedes-Benz C320 3.2L Wagon

VIN: WBRH64J12F173465

Transmission: Automatic

Chassis: W203

Mileage: 142,445 KM

Notice: Measured in 3rd gear ratio 1.49:1

Tire Pressure 2.0 bar front 2.2 bar rear

ATTACHMENT 2

INCOME AFTER ENGINE TREATMENT

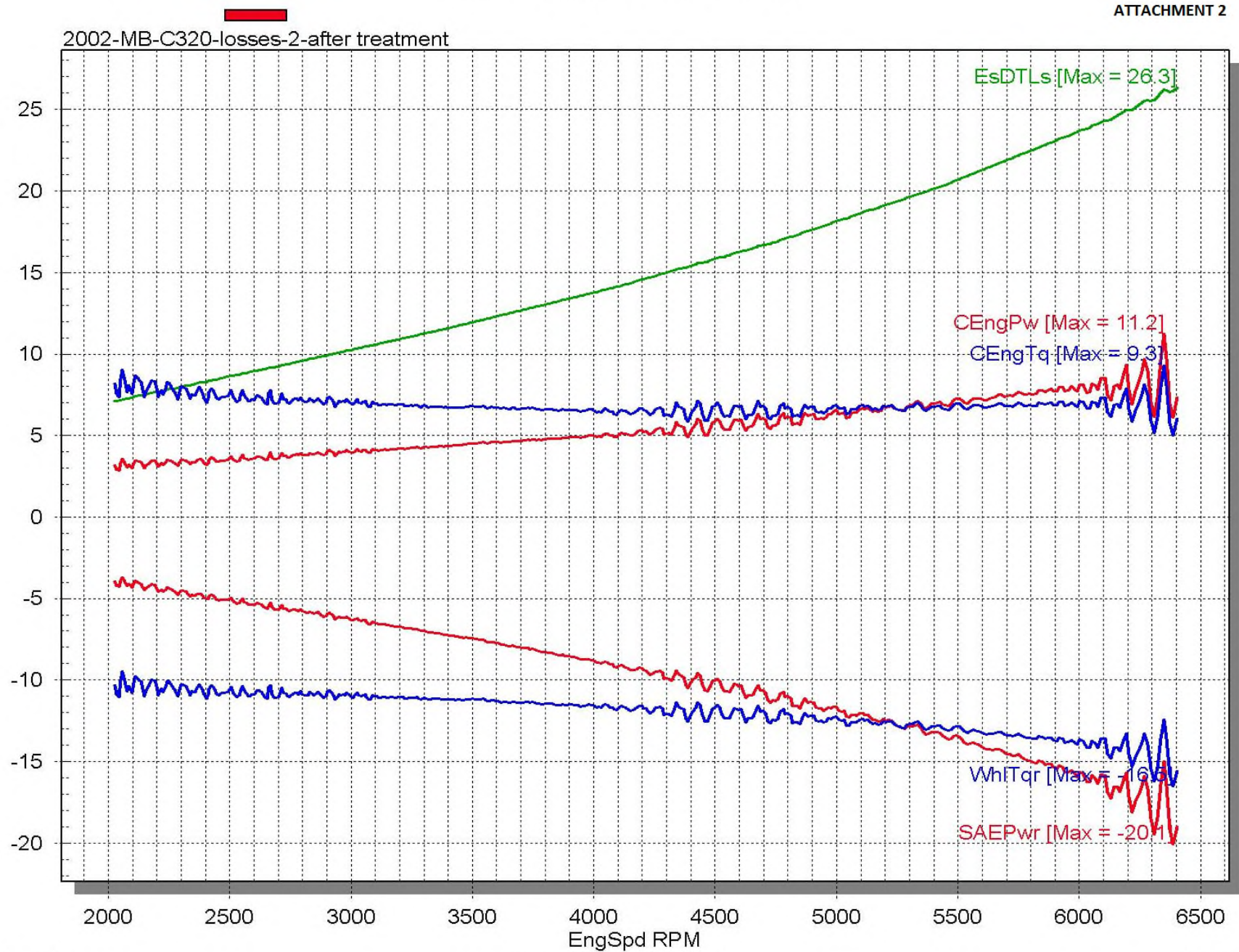
EngSpd RPM	CEngPw CHp	SAEPwr CHp	EsDTLs Hp	CEngTq Clb-ft	WhlTqr Clb-ft
2200	82.6	69.7	13.1	197.1	166.5
2300	88.3	74.8	13.8	201.7	170.8
2400	92.2	78.1	14.4	201.7	170.8
2500	96.8	82.1	15	203.3	172.4
2600	101.2	85.9	15.6	204.5	173.5
2700	105.3	89.4	16.2	204.8	173.9
2800	108.4	92	16.7	203.3	172.6
2900	111.7	94.8	17.3	202.3	171.6
3000	115.6	98.1	17.9	202.4	171.7
3100	119.4	101.3	18.4	202.2	171.6
3200	123.3	104.6	19	202.4	171.7
3300	126.4	107.2	19.6	201.2	170.6
3400	129.9	110.1	20.2	200.6	170
3500	134	113.6	20.8	201	170.4
3600	137	116	21.4	199.8	169.2
3700	140.3	118.8	21.9	199.2	168.6
3800	146.1	123.8	22.7	201.9	171.1
3900	152.2	129.2	23.5	205	174
4000	157.2	133.5	24.2	206.4	175.3
4100	161.3	136.9	24.8	206.6	175.4
4200	164.6	139.6	25.5	205.9	174.6
4300	168.7	143.1	26.2	206.1	174.7
4400	172.1	145.7	26.8	205.4	174
4500	174.8	147.9	27.4	204.1	172.7
4600	175.1	147.8	27.8	199.9	168.7
4700	174.4	146.7	28.2	194.9	164
4800	174.3	146.2	28.6	190.8	160
4900	175.8	147.1	29.2	188.4	157.7
5000	179.2	149.8	30	188.2	157.3
5100	182.3	152.2	30.6	187.7	156.7
5200	185.9	155	31.4	187.7	156.6
5300	189	157.5	32.1	187.3	156.1
5400	192.2	159.9	32.8	186.9	155.6
5500	193.6	160.7	33.4	184.9	153.5
5600	194.6	161	34.1	182.5	151
5700	194.9	160.8	34.7	179.6	148.1
5800	193.4	158.8	35.2	175.1	143.8
5900	180.2	145.8	34.8	160.4	129.8

Corrected Brake Power vs. RPM

RSP-Motorsports Inc

2002-MB-C320-losses-2-after treatment,

ATTACHMENT 2

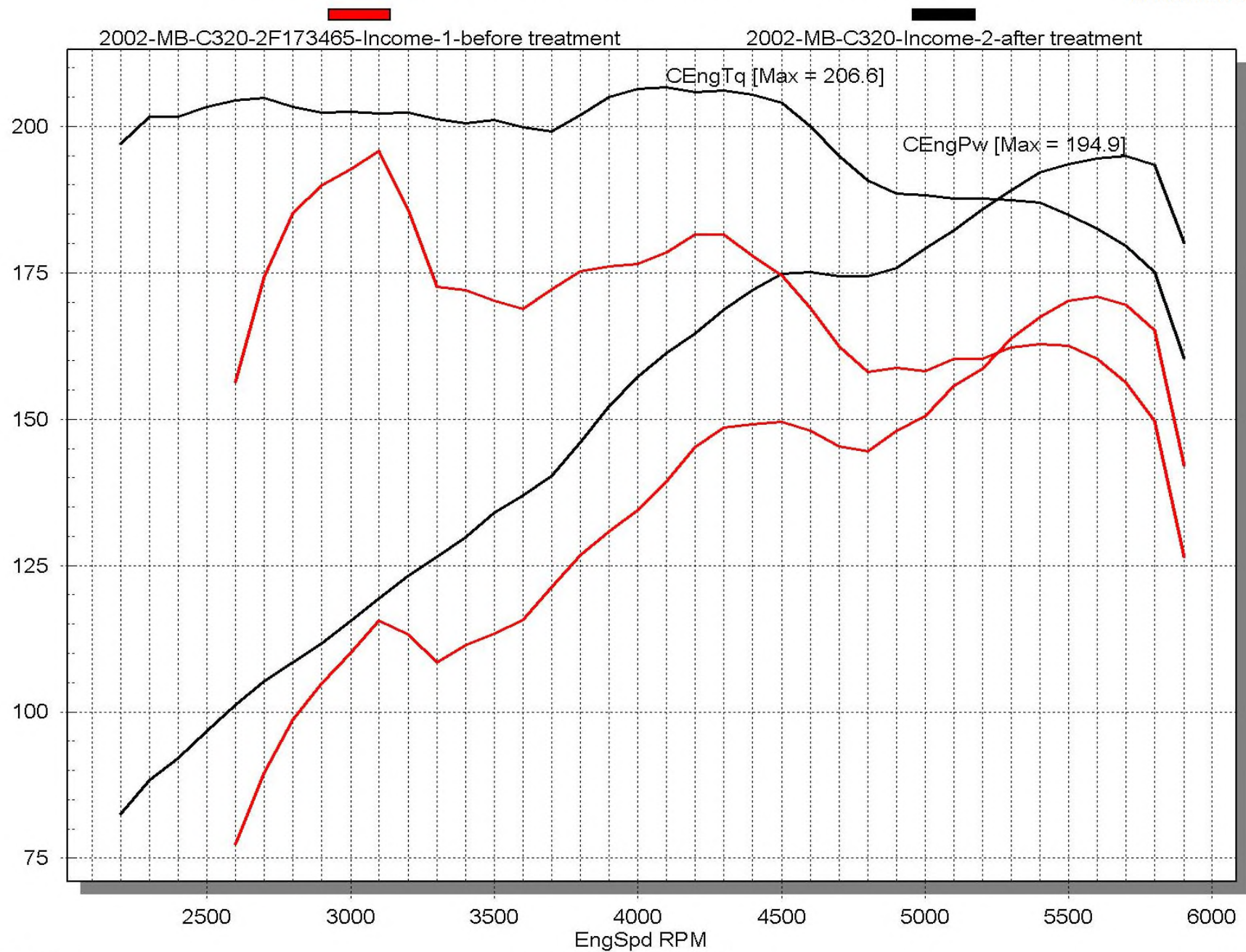


Corrected Brake Power vs. RPM

RSP-Motorsports Inc

2002-MB-C320-2F173465-Income-1-before treatment, 2002-MB-C320-Income-2-after treatment,

ATTACHMENT 3



Engine Treatment with Liqui Moly

ATTACHMENT 4

Vehicle: 2002 Mercedes C320 Wagon

VIN: WBRH64J12F173465

Chassis:W203

Condition: Operating Temperature

Measured in 3rd gear

Mileage: 142,445 KM

RPM	Throttle %	km/h	Airflow g/s	Dyno HP	Gain HP %
2000	15.00	40	27.80	29.50	
2000	15.00	40	29.50	32.50	10.2%
2500	17.60	56	37.50	44.20	
2500	17.60	56	38.50	46.50	5.2%
3000	20.00	70	45.86	52.00	
3000	20.00	70	0.00	55.00	5.7%
4000	36.00	94	102.69	125.00	
4000	36.00	94	104.5	130.50	4.4%

	before treatment
	after treatment

product information



LEICHTLAUF HIGH TECH 5W-40

DESCRIPTION:

Modern top class low-friction engine oil for all-season use in gasoline and diesel engines without diesel particulate filters (DPF). The combination of innovative base oils – based on synthesis technology and the latest additive technology – guarantees an engine oil that reduces oil and fuel consumption and that ensures fast lubrication of the engine. Depending on the manufacturer instructions, oil change intervals of up to 40,000 km are possible.

PROPERTIES:

- smooth engine running
- rapid oil delivery at low temperatures
- optimum oil pressure at all engine speeds
- high lubrication reliability at high and low temperatures
- high shear and ageing stability
- saves petrol and reduces pollutant emission
- long engine service life due to high level of protection against wear
- outstanding engine cleanliness
- tested with catalytic converters and performance proved with turboc
- miscible and compatible with commercially-available engine oils.

APPLICATION:

Ideally suited for modern gasoline and diesel engines with multi-valve technology, turbocharger and with or without charge air cooling. Especially suitable where there are long intervals between changes and heavy duty engine requirements.

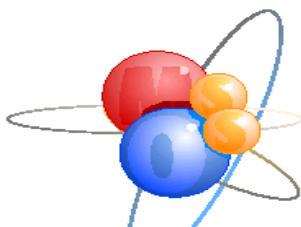
INSTRUCTIONS:

The operating instructions of the vehicle and engine manufacturers must be followed.



Specifications / Approvals:

API SN/CF
ACEA A3-08/B4-08
BMW Longlife-01
MB-Approval 229.5
Porsche A40
Renault RN 0700, 0710
VW 502 00/505 00
LIQUI MOLY also recommends this product for vehicles for which the following specifications are required:
Opel GM LL-B025
Fiat 9.55535-H2, 9.55535-M2, 9.55535-N2
Peugeot/Citroen (PSA) B71 2294, B71 2296



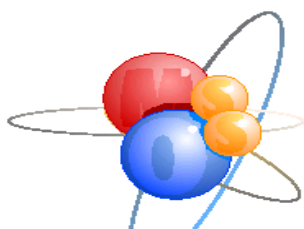
product information



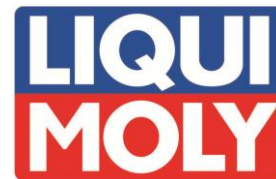
**LEICHTLAUF HIGH
TECH 5W-40
5 Liter
Part no. LM2332
Case Qty 4 Jugs**

**1 Liter
Part no. LM2331
Case Qty 6 Jugs**

Our information is based on thorough research and may be considered reliable, although not legally binding.



product information



Pro-Line Engine Flush

DESCRIPTION:

Highly effective detergent additives in Engine Flush clean interior engine before oil change.

PROPERTIES:

Gentle and rapid cleaning.
Neutral to seals and other materials installed in the engine
Compatible with catalytic converters.
Highly economical.
No additional environmental pollution.
Simple to use.

BENEFITS:

Removes Deposits, residues from all 4-stroke gasoline engines and diesel engines.
Dissolves sludge and lacquer and isolates solid particles and liquid contaminants.
Improves the combustion process and restores full engine performance.
Prevents corrosion of unprotected metal surfaces.
Recovers oil lubricating properties.

APPLICATION:

Suitable for all gas and diesel engines.

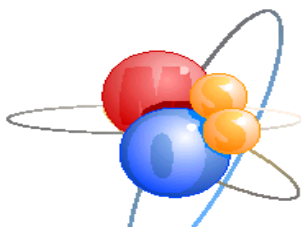
INSTRUCTIONS:

Add to engine oil before engine oil change. Let engine run on idle speed for 10 minutes. Drain oil, change oil filter and re-fill with fresh oil of high quality. Contents sufficient for 1.3 gal (5liters) sump capacity. Fully compatible with all commercially available engine oils.



**Pro-Line
Engine Flush
500ml can
Part no. LM2037
Case Qty 6 cans.**

Our information is based on thorough research and may be considered reliable, although not legally binding.



Cera Tec

DESCRIPTION

Micro ceramic solid lubricant suspension based on hexagonal boron nitride (BN) in mineral oil. The laminar graphite-similar structure reduces friction and wear and prevents direct metal-to-metal contact. The $< 0.5 \mu\text{m}$ particle size guarantees optimal filter flow properties and protects against depositing of solid lubricant particles.

PROPERTIES

- Mixable with all commercially available motor oils
- Stable even under high thermal and dynamic permanent loads
- No deposits and absolutely compatible with all commonly used filter systems
- Resists extremely high and low temperatures
- Reduces fuel consumption
- Increases engine service life
- Increases smooth operation
- Stable under extreme pressures
- Chemically inert
- Higher performance gain due to reduced friction
- Does not increase the phosphorous and sulfur content of the motor oil
- Tested with catalytic converters and diesel particle filter

TECHNICAL DATA

Base	:	BN micro ceramic	
Color:	:	Yellowish white	
Ceramic particle size	:	Majority $< 0.5 \mu\text{m}$	
Temperature stability of the ceramic particles	:	To $+1,200^\circ\text{C}$	
Density at $+20^\circ\text{C}$:	0.89 - 0.90	g/cm^3 DIN 51757
Viscosity at $+20^\circ\text{C}$:	~ 300	$\text{mPa}\cdot\text{s}$ DIN 51398
Flash point	:	200	$^\circ\text{C}$ DIN ISO 2592
Pour point	:	-20	$^\circ\text{C}$ DIN ISO 3016

APPLICATIONS

Added to the lubricating oil of engines, compressors, pumps and transmissions. Excellent for use in passenger car and commercial vehicle engines (gasoline and diesel). Mixable with all commercially available motor oils.

APPLICATION

300 ml will treat up to 5 liters of motor oil. Long-term effect up to 50,000 km.

Note:

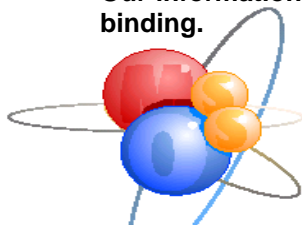
Not suitable for use with wet clutches!

AVAILABLE PACK SIZES

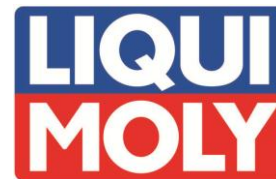
Cera Tec	300 ml can	Part no. 3721 D-GB-I-E-P-NL-F-GR-RUS
	300 ml can	Part no. 2321 Korea-D-GB-I-E-P
	300 ml can	Part no. 7181 D-GR-PL-TR-CZ-RO-H-BG

PI 05/05/13

Our information is based on thorough research and may be considered reliable, although not legally binding.



product information



Motor Oil Saver

DESCRIPTION:

Rejuvenates rubber and plastic engine seals and reduces oil consumption via the piston rings and valve guides; counteracts the loss in viscosity of motor oils. Puts an end to environmentally pollutant oil patches on the road and in the garage.

PROPERTIES:

Prevents blue, smoky exhaust fumes. Prevents leaks due to leaks at elastomeric seals. Regenerates engine seals made of plastic and rubber. Reduces engine noises. Prevents pollution of the environment due to oil dripping from the engine. Reduces oil consumption in gasoline and diesel engines.

BENEFITS:

Lower oil consumption, better oil pressure. Elimination of blue exhaust smoke due to oil burning. Postponement of costly engine repairs. No more unsightly, soil polluting oil spots.

APPLICATION:

For all gasoline and diesel engines. Compatible with all commercially available motor oils.

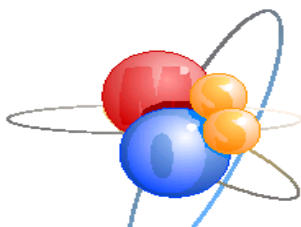
INSTRUCTIONS:

One 300 ml can of Motor Oil Saver is sufficient up to 5 liters of motor oil. The product can be added at any time. After adding, run the engine until warm. Sealing first takes effect after about 400-600 miles. To guarantee a lasting effect, add Motor Oil Saver after each oil change.

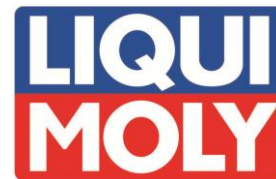


Motor Oil Saver
300ml can
Part no. LM2020
Case Qty 20 cans.

Our information is based on thorough research and may be considered reliable, although not legally binding.



product information



Fully Synthetic Gear Oil 75W-90

DESCRIPTION:

Our fully synthetic gear oil is a high-performance, high-pressure gear oil for high-load manual, auxiliary, transaxle and hypoid transmissions which require a lubricant according to API GL 5. High-quality, fully synthetic base oils and modern additive technology guarantee a wide application range for this oil as well as optimum transmission lubrication under extreme conditions.

PROPERTIES:

Wide viscosity range.
Outstanding wear protection.
Optimum high-pressure properties.
High rust and corrosion protection.
Low manual shifting effort.
Reduces transmission noise.

BENEFITS:

Fully Synthetic. Allows for easier shifting and quieter operation
Built in filling hose for easy installation.

APPLICATION:

For Manual Transmissions, Transaxles and rear axles where API GL-5 is specified.

INSTRUCTIONS:

Miscible with any mineral-base oil residues remaining during oil changes in transmissions and axle drives.

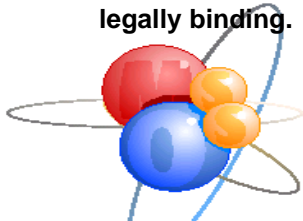


Specifications / Approvals:

API GL5
MIL-L-2105 C/D

Fully Synthetic Gear
Oil 75W-90
1 Liter
Part no. LM2048
Case Qty 6

Our information is based on thorough research and may be considered reliable, although not legally binding.



Top Tec ATF 1600

DESCRIPTION

Top Tec ATF 1600 is a new-generation, high-performance automatic transmission fluid based on synthesis technology and modern, high-performance additives. In addition to the outstanding stability against aging and oxidation, ideal shifting under all operating conditions is guaranteed thanks to the extremely high viscosity index. Top Tec ATF 1600 was developed specifically for the automatic transmissions that are installed in various Mercedes-Benz vehicles and is also used to eliminate shifting problems.

PROPERTIES

- Ideal viscosity/temperature properties
- Best possible anti-froth protection
- Excellent low-temperature properties
- Outstanding aging and oxidation stability
- Suitable for eliminating shifting problems
- Outstanding protection against wear and good friction characteristics
- Very good corrosion protection behavior

Specifications and approvals:

MB-approval 236.14

LIQUI MOLY also recommends this product for vehicles for which the following specifications are required:

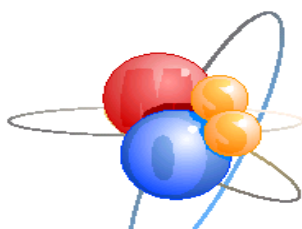
MB 236.12

TECHNICAL DATA

Density at +15 °C	: 0.850	g/cm ³	DIN 51757
Brookfield viscosity -40 °C	: < 8500	mPas	DIN 51389
Viscosity at +40 °C	: 29.6	mm ² /s	DIN 51562
Viscosity at +100 °C	: 6.5	mm ² /s	DIN 51562
Viscosity index	: 185		DIN ISO 2909
Pour point	: -51	°C	DIN ISO 3016
ASTM color	: red		DIN 51578

AREAS OF APPLICATION

Developed for the latest generation of the Mercedes Benz 7-speed automatic transmission and is backwards compatible with the older Mercedes-Benz 5-speed automatic transmissions. Transfer boxes also sometimes require a lubricant with this specification. Usage according to the prescribed specifications from the unit or vehicle manufacturer.



PRODUKTI NFORMATION



APPLICATION

The specifications and instructions from the unit or vehicle manufacturer must be followed. Optimum effectiveness is only possible when the product is used unmixed.

AVAILABLE PACK SIZES

Top Tec ATF 1600	1 l	Part no. 3659 D-GB-I-E-P
	1 l	Part no. 8042 D-RUS-UA
	20 l	Part no. 3694 D
	60 l	Part no. 3696 D
	1000 l	Part no. 1787 Export

PI 05/07/13

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