
G-LAY TEST RESULTS, ANALYSIS &



nanoTec International

117-3 Chimsan Daegu, Korea Tel: 82 53 354 5502 www.nanozr.com nanoteo7777@naver.com

TECHNICAL DATA SHEET

General Characteristics : Chemically Synthesized grapheneLayer

PRAMETER	SPECIFICATIONS
VISUAL:	Light Powder in oil
COLOR:	Match Standard, Black
SPECIFIC SURFACE AREA:	500 m ² /g – 700 m ² /g
Electrical Conductivity:	Ave. 5 S/cm (as powder resistance)
CARBON BY WT%:	78% – 82%
OXYGEN BY WT%:	10% - 15%
SULFUR BY WT%:	< 0~0.5%
ASH BY WT%:	≤ 4.0%
PHYSICAL SIZES:	
AVERAGE LATERAL	DIMENSION (x & y) ≥ 50nm
AVERAGE THROUGH-PLANE DIMENSION (z)	~ 0.18 – 0.30 nm (as estimated by BET)



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Quality Certificate

Item : grapheneLayer - graphene based oil additive for engine & all metallic mechanism

March 24, 2019

Name of Article	grapheneLayer	Remarks
Appearance	Black Color	Solution type
Flash Point(°C)	245	ASTM D92
Density	0.01g/cm ³	
Thickness (nm)	0.25nm ± 0.07 nano meter	Final treated size
Diameter (nm)	50nm ± 12 nano meter	Final treated size
Water Content(%)	None	Final treated size

Issued by P. J. Lee
Chief Production Engineer

NANOTEC INTERNATIONAL
Jaxon Park
JAXON PARK
MANAGING DIRECTOR





G-LAY OIL TEST CONDUCTED BY KOREAN INSTITUTE OF MACHINERY & MATERIAL



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Testing of total Acid Value numerical value of Acidity contained in lubricant oil



Dated Jan 5 - May 23, 2019

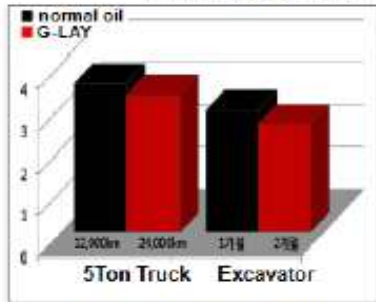
Vehicle; Hyundai Delivery truck. Running record 359,391km
Tested by Korean Institute of machinery & materials(KIMM)
Testing before and after G-LAY injection

Testing of total Acid Value:
numerical value of Acidity contained in lubricant oil
Oxidation of lubricant oil occurred according to long time exposure of oxygen and high temperature of long distance running.

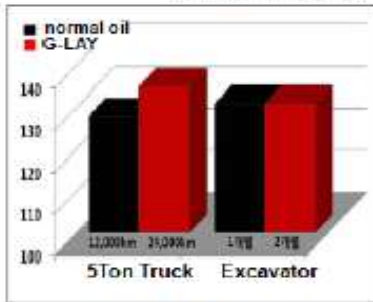
G-LAY has wonder character:
excellent effect of thermal conductivity, dispensability,, abrasion resistance, oxidation resistance.

KS M ISO 6619 : 2003

ASTM D 445 : 2012



Acid Value(mg KOH/g)



viscosity Index

Compared with normal oil, Acid value of G-LAY reduce to max 88%

Therefore, G-LAY extends life time of conventional engine oils till 30,000km run. Life time of conventional oil needs to change every 5,000 – 9,000km run.

G-LAY extend life time of industrial oil 2 time & maximum 3 times longer.



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Testing for Temperature of engine oil By Increased Lubricant membrane & effect of thermal conduction

Dated: April 14, 2019

Tested by Korean Institute of machinery & materials(KIMM)

Vehicle: Hundai Grandeur:

gasoline engine

year 1998

Running record 329,012km

Testing Method: Before 7 after injection of grapheneLayer(G-Lay)

After 2 hours engine idling, test temperature on oil fan party

Using thermal image camera

G-LAY	Q'ty	Temperature of Engine Oil (°C)			
		Before Injection	After Injection	Temperature Differences	Temperature(%) Reduction Rate
G-Lay AIO	1 pouch	94.3	84.2	10.1	13.4

Atmospheric Temperature: 29°C

Normal Temperature of Engine idling: 85°C - 90°C

Dated: April 15, 2019

Tested by Korean Institute of machinery & materials(KIMM)

Vehicle: Kia Sorento:

Diesel engine

year 2001

Running record 270,355km

Testing Method: Before 7 after injection of grapheneLayer(G-Lay)

After 2 hours engine running on road, test temperature on oil

fan party

Average running speed 80km/hr

Using thermal image camera

G-LAY	Q'ty	Temperature of Engine Oil (°C)			
		Before Injection	After Injection	Temperature Differences	Temperature(%) Reduction Rate
G-Lay AIO	1 pouch	130.3	109,5	20.8	16.0

Atmospheric Temperature: 25°C

Normal Temperature of Engine on 30km run: 105°C - 130°C



MECHANICAL TEST CONDUCTED BY KOREAN INSTITUTE OF MACHINERY & MATERIALS

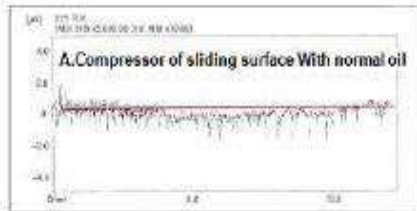
Abrasion Testing Report

Dated Feb 23, 2019
 Tested by Korean Institute of machinery & materials(KIMM)
 Durability of Abrasion for Car air-conditioned Compressor Cylinder 5hp
 Testing before and after G-LAY injection



Evaluation of anti-wear(Avg 1kg/cm²)

Result:
 normal oil: anti-wear 1 μ m
 with G-LAY: no anti wear



Test for noise reduction

Dated: March 21, 2019
 Tested by Dong Yang Car Maintenance Service Center
 Vehicle name: Eccus year 2010
 Running Record: 223,971km
 Testing Method: Normal engine oil and after inject grapheneLayer(G-LAY)
 Test with dB Tester in each condition, 60 minutes engine idling



Before Inject G-LAY



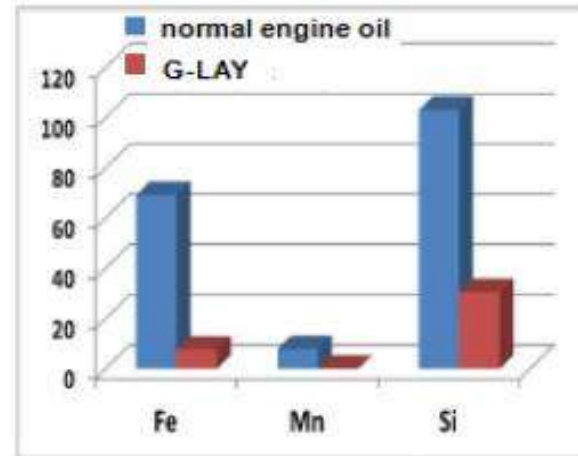
After Inject G-LAY



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Testing of Abrasion Loss on metallic surface of engine
 metallic particle: Fe, Si, Mn etc testing occurred by abrasion in engine oil

Dated Jan 5 - May 23, 2019
 Tested by Korean Institute of machinery & materials(KIMM)
 Vehicle; Hyundai Delivery truck. Running record 359,391km
 Testing before and after G-LAY injection



metal particle mg/kg

Detectable Amount of measured value

Compared with normal engine oil, G-LAY added oil dramatically shows reduction of Abrasive Loss



G-LAY ENGINE EFFICIENCY TEST CONDUCTED BY KOREAN AUTOMOBILE TECHNICAL INSTITUTE



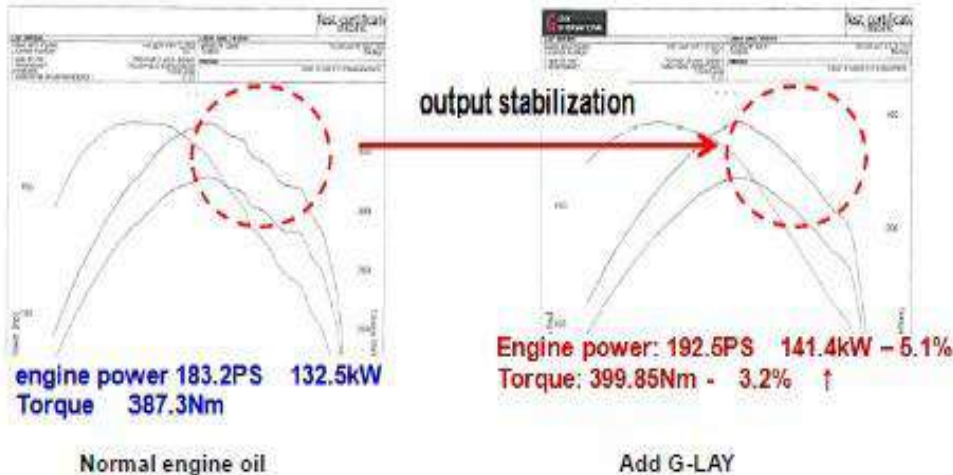
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Test of engine output

Dated March 12, 2019
Tested by Korean Automobile Technical institute
Vehicle name: Hundai Tucsan year 2011
Running Record: 165,996km

Testing Method: 300km run with Normal engine oil
and 300km run after inject grapheneLayer(G-LAY)



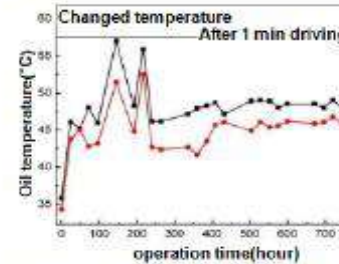
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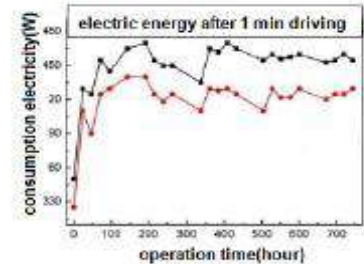
Compressor Test

Dated March 14, 2019
Tested by Korean Institute of machinery & materials(KIMM)
Compressor Cylinder 5hp
Testing before and after G-LAY injection
Testing Period: 0hr - 200hr

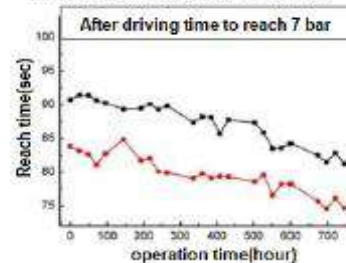
Engine heat value reduce(7 - 11%)



driving energy reduce(9 - 13%)



Pressure increased time(6 - 8%)



—●— Normal oil
—●— G-LAY adding



PISTON COMPRESSOR TEST REPORT

March 18, 2019

On measuring the parameters of piston compressor M110Y Ser. 2003122 treated by grapheneLayer

Parameter	Prior to treatment	After treatment	Remark
Current consumption [A]	30.06	24.20	24.0% reduced
Temperature at outside [°C]	38.50	29.91	29.0% reduced
Pumping time [sec]	72	46	From 1 to 5.9atm 35.2% reduced
Noise level [dB]	83.2	61.3	35% reduced

After treatment, power consumption was reduced by 24.0% and vibration and noise levels were improved. Compressor capacity increased positively in part of energy coefficient.

J. N. Song
Chief Manager
KATech



Date: May 26, 2019

Test Report

Test Sample: grapheneLayer Submitted by NanoTec International

Test Cell: Automobile Test Lab

Engine Type: RV 1.6 Gasoline, 4 Cylinder, 1500cc

Test Machine: Engine Dynamometer Tester

Engineer: JK Jang Ph.D.

Before Injection of grapheneLayer

speed	power	Torque	FCR	BSFC	Exhausted Gas	
rpm	ps	Kgfm	g/s	g/psh	P(mmHg)	
3521	59.4	12.19	5.20	321.2	121.0	
2507	43.3	12.98	3.48	285.8	66.8	
1521	22.9	10.86	1.92	292.8	30.21	

After running 50Km with injected grapheneLayer

speed	power	Torque	FCR	BSFC	Exhausted Gas	
rpm	ps	Kgfm	g/s	g/psh	P(mmHg)	
3526	67.6	15.10	4.22	230.7	94.6	
2510	52.7	17.20	2.67	214.8	43.2	
1523	31.30	14.20	1.39	191.45	20.23	

After running 200Km with injected grapheneLayer

speed	power	Torque	FCR	BSFC	Exhausted Gas	
rpm	ps	Kgfm	g/s	g/psh	P(mmHg)	
3491	73.2	16.20	4.17	198.80	86.43	
2493	56.20	19.10	2.08	192.50	41.90	
1517	32.10	14.91	1.25	181.49	18.56	



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Test of fuel efficiency



Dated March 25, 2019

Tested by Korean Automobile Technical institute

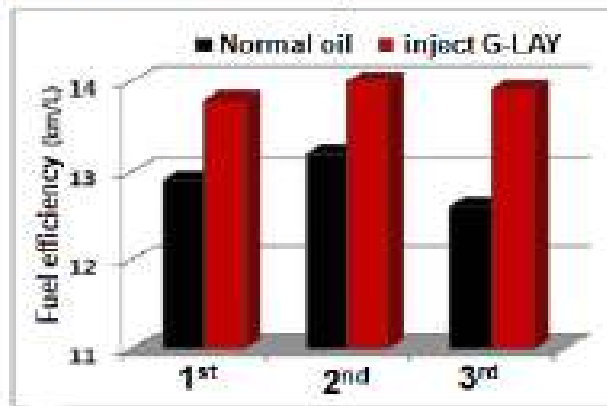
Vehicle name: Eccus year 2010 2,999cc

Running Record: 224,992km

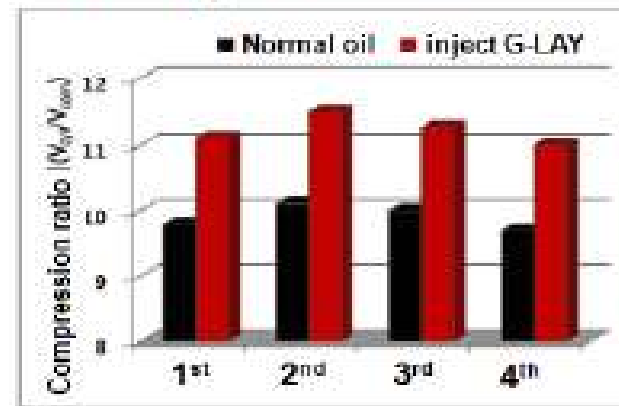
Testing Method: Normal engine oil and after inject grapheneLayer(G-LAY)

Average testing speed: 80km/h run

Test of Fuel consumption



Test of Compression ratio



Output and fuel efficiency
 Compression ratio approx 17% increased
 Output approx 8 – 9% increased



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Emission Testing Report

The Effectiveness of emission reduction

Dated Feb, 2019

Tested by Korea Automotive Technical institute

Testing Method: Normal engine oil and after inject grapheneLayer(G-LAY)

Test with Emission Tester in each condition, 30minutes engine idling



Before inject



After inject

Stabilization

Vehicle name	Year of production	Running record(Km)	Passed Standard(%)	Before Injection (%)	After Injection(%)	Reduction rate(%)
Tusan	2018	187,443	20	64	18	71.9

Reduction of Emission 71.9%



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Emission Testing Report

Dated Feb, 2019

Tested by Korea Automotive Technical institute

Testing Method: Normal engine oil and after inject grapheneLayer(G-LAY)

Test with Emission Tester in each condition, 30minutes engine idling

Testing Date: Feb 1st week, 2019

Vehicle name	Year of production	Running record(Km)	Passed Standard(%)	Before Injection (%)	After Injection(%)	Reduction rate(%)	Remark
Sorento	2003	205,338	20	49	15	69.4	
Santafe	2005	187,237	20	52	16	69.3	
Carnival	2011	143,095	20	43	12	72.9	

Testing Date: Feb 3rd week, 2019

Vehicle name	Year of production	Running record(Km)	Passed Standard(%)	Before Injection (%)	After Injection(%)	Reduction rate(%)	Remark
Trasse	2009	212,499	20	67	16	76.2	
Rivero	2007	307,350	20	48	11	77.9	
Tusan	2014	122,549	20	41	13	68.3	

Average reducing rate of emission after inject grapheneLayer(G-LAY): 72%



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Emission Testing Report

March 20, 2019

Testnig Date: March 11 – March 20, 2019

Emission testing: grapheneLayer

by DongYang Car Maintenance Service, Daegu Korea

Year	Name of Vehicle	Running Record(KM)	Emission before inject gL(%)	Emission after inject gL(%)	Emission reduction rate(%)	Remark: Running Km after injection
2013	Carnival	204,290	57	21	64	625km
2014	Sorento	240,673	69	16	77	370km
2014	Sonata	158,442	64	14	78	762km
2016	Musso	142,074	48	19	61	430km
2017	Tusan	125,976	42	23	46	302km

Tested by DongYang Car Maintenance Service

Before Inject rapheneLayer to above t vehicles, emission tested and.

After Inject rapheneLayer to above vehicles and

Emission tested after one week run around 300km – 800km run.

Engine Emission Tester indicates positive from 46% - to 78%.

UNICO

NANOTEC INTERNATIONAL
Jaxon Park
 JAXON PARK
 MANAGING DIRECTOR



CONSCIO

Representative :-

Unico Automotive Systems & Services Pvt. Ltd.

***A4-201, Ganga Satellite, Wanowarie, Pune-411040
Maharashtra, India.***

Contact No : +917795393518

Email:- Sravankatkoju@gmail.com

www.unicoautosystems.com

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