C.G-LIFE

Advanced fuel additive changes the fuel to earth environmental friendly fuel.

CLEAN GREEN CO.,LTD

Sole agent: C&J CO.,LTD.

■What is C.G-Life (fuel additive)?

C.G-Life (fuel additive) is a world-first proprietary technology developed in Japan that significantly improves fuel efficiency compared to conventional additives.

In recent years, as the reduction of CO2 emissions has become increasingly important around the world, the gasoline and diesel markets have been shifting from fossil fuels (traditional regular gasoline) to biofuels containing ethanol.

The primary biofuels in use are plant-derived biodiesel and ethanol—typically produced from feedstocks such as palm oil and sugarcane—and are commonly blended at concentrations of 5%, 10%, or 20%.

Even in countries where biofuels are not yet used, the governments have announced plans to transition to biofuels. As such, it is certain that biofuels will become mainstream worldwide in the future.

*Depending on the ethanol content, E5 contains 5%, and E10 contains 10%.

■Weaknesses of biofuels

Biofuels have the disadvantage that increasing the alcohol content reduces combustion efficiency.
To put it
the distance that can be traveled on 10 liters of conventional fossil fuel-derived mineral gasoline is A,
then the distance that can be traveled on 10 liters of biofuel is B,
then the distance that can be traveled on the same amount of fuel is "A > B," meaning that more biofuel is required to travel the same distance.

Another weakness is that due to combustion efficiency issues, a large amount of black smoke is emitted from the engine due to unburned fuel. Some people have pointed out that even though switching to biofuel is aimed at reducing CO2 emissions, this combustion efficiency issue means that it does not actually lead to any reduction in CO2 emissions.

■Current situation in Japan

The Japanese government has also decided to transition to biofuels within the next few years, but there are significant differences compared to other countries.

The first is
gasoline and diesel production technology. This is a unique, world-class production technology that is said to have a high combustion rate for the fuel itself.

Second,
biofuels are not currently on sale, so there is no decrease in fuel efficiency due to biofuels.

Due to these two differences, we have been testing C.G-Life (fuel additive) on Japanese vehicles for many years, and when compared to overseas markets, we have found that overseas markets, where biofuels are widespread, have achieved greater improvements in fuel efficiency.

C.G-Life (fuel additive) is a technology that can contribute to solving these problems in a market that is facing issues with biodiesel.

■What is the market for C.G-Life (fuel additive)?

It can be used in all fields that use biofuels, including trucks, buses, cars, motorcycles, construction machinery, military vehicles, and boilers.

Regarding engine types, it is a major advancement that the effectiveness has been confirmed for diesel engines, which was previously difficult to achieve.

If you visit a car specialty store, you will see a huge variety of fuel additives. There are probably dozens of types, including so-called engine cleaners and lubricant-type additives. What makes our product different from these?

Are there any cost benefits?
How much difference is there in performance?
We can provide detailed explanations on these issues.

■What is C.G-Life (fuel additive)?

This fuel improver is environmentally friendly and customer-friendly, thanks to its CO2 reduction and improved fuel efficiency, both of which are key goals in the biofuel market.

C.G-Life is a technology developed based on data obtained from various long-term testing, and unlike conventional combustion accelerators, it does not use any chemical agents or microorganisms.

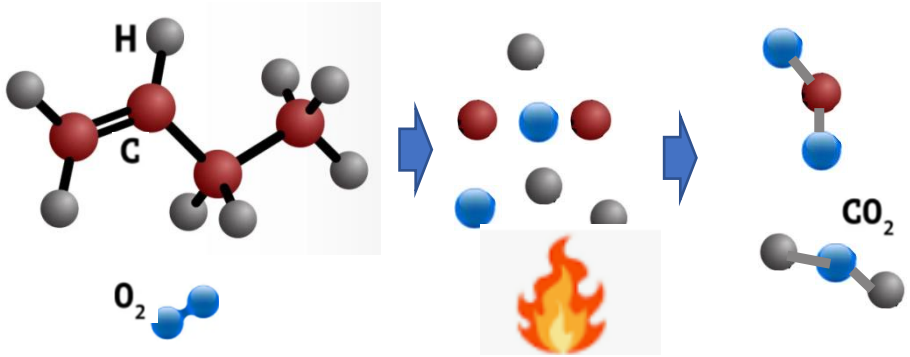
It is made from gasoline, petroleum and hydrodesulfurization and does not contain any ingredients that can have a negative effect on the engine's combustion chamber.

Unlike other companies, our proprietary new technology activates the fuel during combustion, achieving high-speed combustion with minimal combustion delay. This improves fuel efficiency by efficiently converting heat during combustion into horsepower. In addition, complete combustion keeps the combustion engine (inside the engine) clean, leading to reduced black smoke and PM in exhaust gases and reduced engine noise.

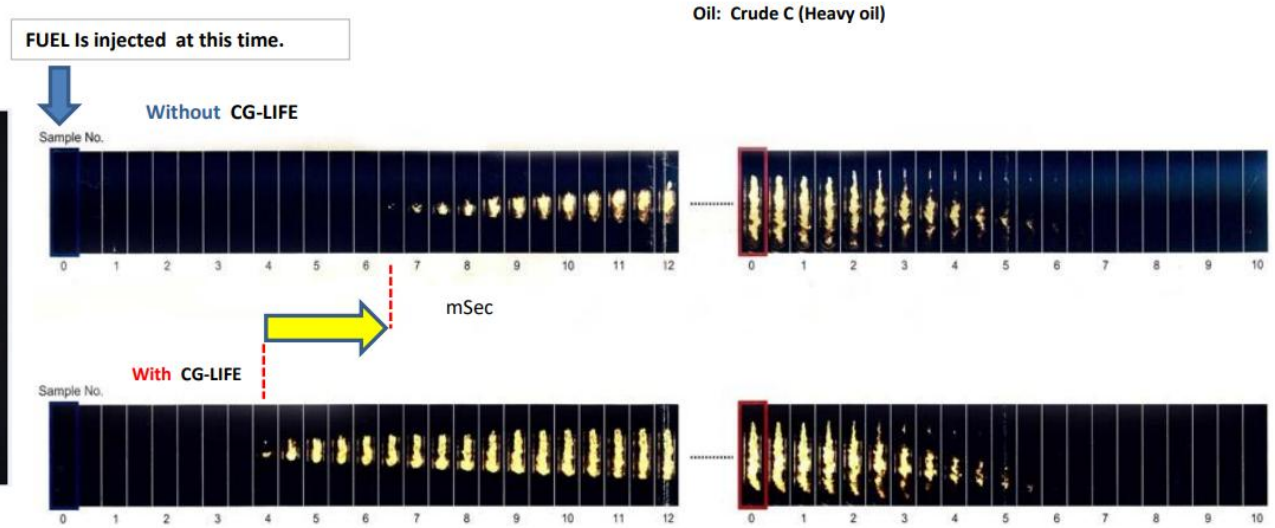
C.G-LIFE's Function：

Molecules of hydrocarbon fossil fuels such as diesel typically consist of around 20 carbon (C) and hydrogen (H) atoms.
The high temperatures inside the engine cylinders (from the spark in gasoline and from compression in diesel) break down hydrocarbon molecules into carbon (C) and hydrogen (H) atoms, simultaneously breaking down oxygen (O) molecules in the air into individual atoms.
These broken-down hydrocarbon atoms (carbon, hydrogen) combine with oxygen atoms to generate heat and turn into carbon dioxide (CO2) and water (H2O), a process known as combustion (radical reaction). These broken-down hydrocarbon atoms (carbon, hydrogen) combine with oxygen atoms to generate heat and turn into carbon dioxide (CO2) and water (H2O), a process known as combustion (radical reaction).
In combustion (radical reaction), the faster hydrocarbon molecules are broken down into carbon (C) and hydrogen (H) atoms, the faster they bond with oxygen atoms and the more efficient the combustion.

C.G-LIFE breaks down hydrocarbon molecules quickly a nd smoothly (activates them), which speeds up combustion (radical reaction) and improves combustion efficiency. Furthermore, the rapidly broken down hydrocarbon atoms react more easily with oxygen atoms, reducing carbon monoxide and black smoke (carbon) from incomplete combustion.



Comparison of oil burning speed between with CG-LIFE and without CG-LIFE



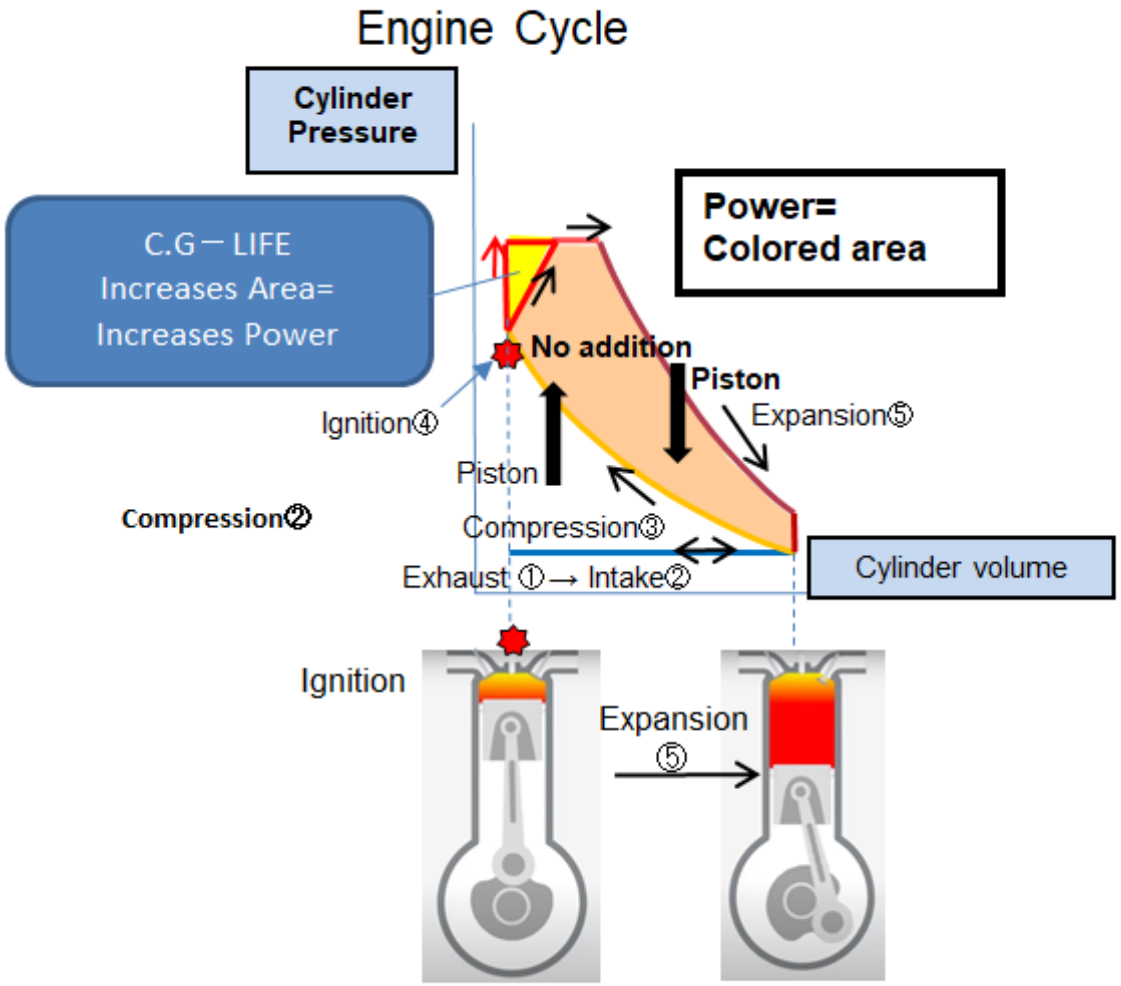
It was seen that CG-LIFE quickens the burning speed of oil. This improve the energy converssion efficiency of internal conbusion engine,which converts the thermal energy to movement energy.

Test2. T=648K(375deg.C)
Pressure＝1.8MPa
Injection nozzle＝0.20mm
Oxiygen21%
Injection temp.＝89deg.C
(Viscosity＝18cSt)

Why does high-speed combustion improve fuel efficiency?

This is an engine cycle diagram showing the relationship between engine combustion and horsepower. The horizontal axis shows piston position and the vertical axis shows pressure on the piston. The cycle is ① exhaust ② intake ③ compression ④ ignition ⑤ expansion. The yellow and blue areas represent horsepower.

Before adding C.G-LIFE, the combustion rate is slow, so the pressure rises slowly from ③ ignition to ④ explosion. The yellow area represents horsepower. After adding C.G-LIFE, the combustion rate is faster, so the yellow area added and total area is added and total area is increased .This means horsepower increases (fuel efficiency improves).



Actual Data

【Fuel consumption reduction rate: Actual data】

Bio-Gasoline vehicles	Bio-Diesel vehicles	Boilers	Ships
10%～20％	10%～20％	15%～20％	6%～11％

*The above reduction values are based on customer data statistics from JE Corporation in 2009.

【Environmental measures】

C.G-Life burns fuel in a near-complete combustion state, suppressing the generation of exhaust gases and black smoke, contributing to improving the environment and preventing global warming. Furthermore, the reduction in fuel consumption reduces the amount of exhaust gas generated.

Improving fuel efficiency with biofuels

CAMRY(TOYOTA) 2000CC

Fuel(Gasoline)	Fuel			Save Fuel	Ethanol concentration
	Normal Ghasoline		C.G-LIFE		
Gasohol 95	13.4 Km/ℓ	→	15.6 Km/ℓ	-16%	5%
Gasohol 91	12.1 Km/ℓ	→	14.1 Km/ℓ	-16.5%	10%
E20	10.4 Km/ℓ	→	12 Km/ℓ	-15%	20%

HI-LUX(TOYOTA) 3,000 CC

Fuel(Diwsel)	Fuel			Save Fuel	
	Normal Diesel		C.G-LIFE		
Diesel B5	13.3 Km/ℓ	→	15.3 Km/ℓ	-15%	5%

B5=E5

Improving fuel efficiency for Caterpillar Backhoes

Normal Fuel

Date	Hours	Oil consumption (liters)	Usag(liters)e/hour
3/56	532	8,532	16.04
4/56	608	9,360	15.39
Average	570	8946	15.69

Fuel with C .G-LIFE

Date	Hours	Oil consumption (liters)	Usag(liters)e/hour
2. 22/5/56	45	220	4.89
3. 22/5/56	12	212	17.67
4. 22/5/56	11	183	16.64
5. 23/5/56	8	143	17.88
6. 24/5/56	16	260	16.25
7. 24/5/56	10	140	14.00
8. 25/5/56	12	120	10.00
9. 25/5/56	10	177	17.70
10. 26/5/56	13	220	16.92
Total	137	1,675	12.23

Mainus 22 %

【10-15 mode exhaust gas test results】

＜Test vehicle: Mitsubishi PA-FE72DE＞

	NO x	CO	CO_2	PM
Before addition	1.836g/km	0.005g/km	292.6g/km	0.098g/km
After addition	1.822g/km	0.002g/km	288.4g/km	0.02g/km
Comparison	-0.76%	-60.00%	-1.44%	**-79.59%**

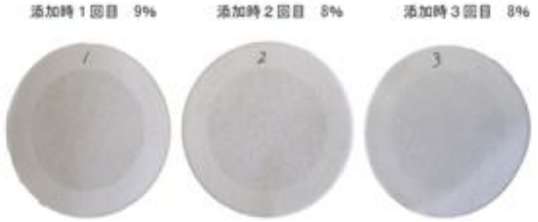
Testing and inspection organization: Japan Automobile Transport Technology Association

【Black smoke test measurement data】

C.G-Life	1'st	2'nd	3'rd	Average
Before addition	13%	15%	15%	14%
After addition	9%	8%	8%	8%
Comparison				**-43%**
TAITAN (MAZDA truck)				

Before addition

After addition

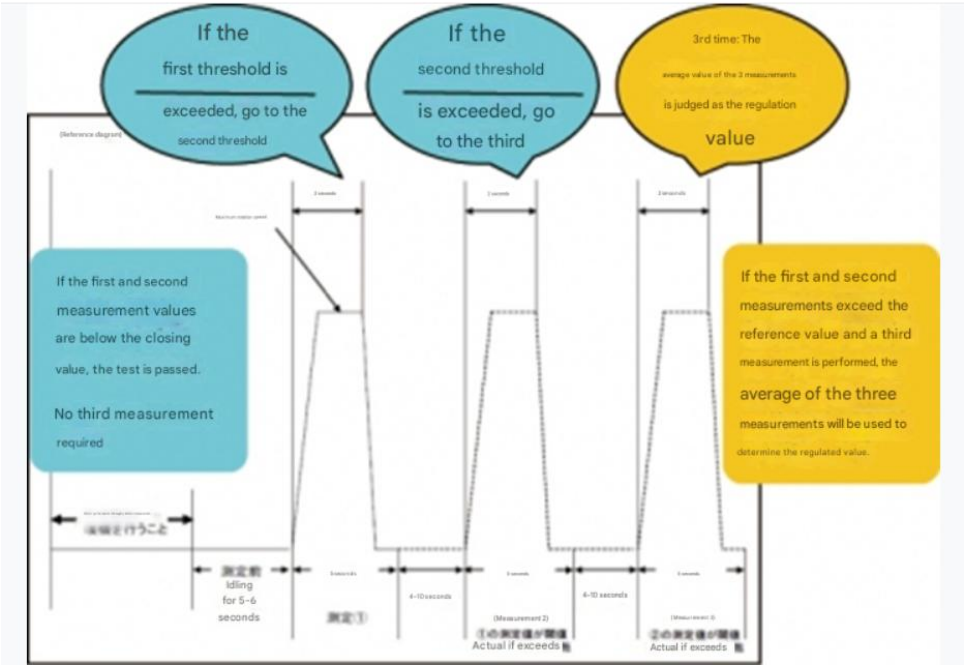


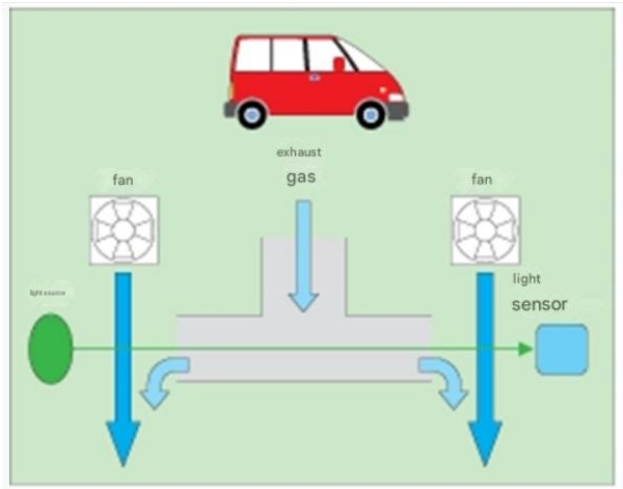
■Measurement of black smoke from C.G-Life (fuel additive)

Black smoke measurement after adding C.G-Life using an opacimeter (a light transmission type black smoke measuring device), we measured the black smoke density of various model with diesel engines, construction machinery, etc., and found that the black smoke concentration density was reduced after adding C.G-Life to all make and model. The measurement results were obtained after a short period of operation after addition, so further reduction in black smoke can be expected by operating the engine for a long period of time.

Measurement principle
Optical transmission opacimeters look at the attenuation of light by passing exhaust gas between a light source and a light sensor.

Measurement method: Free axle measurement, averaged over three measurements.





Regulation and screening values using an opacimeter

『About screening values』
The screening value is the value when the measured value of black smoke is expressed as a light absorption coefficient. A screening test is an opacimeter test performed using an opacimeter. The judgment value obtained in this test is called the screening value.*Screening value = regulatory value.

『About thresholds』
The threshold value is a screening value, or a value that is approximately 80% of the regulatory value. With a black smoke detector, a pass/fail decision is made based on the average of three measurements, but with an opacimeter, if the first and second measurements are below the threshold, the standard is considered to be met at that point and the inspection can be ended.

Black smoke regulation values, screening values and thresholds

Black smoke regulation value (%)	Screening value [m]	Threshold [m²]
50	2.76	2.20
40	1.62	1.29
35	1.27	1.01
30	1.01	0.80
25	0.80	0.64
—	0.50	0.40

Diesel engine exhaust gas standards for construction machinery

■ Primary exhaust gas standards

Motor output classification: P (kW)	Black smoke (%)
7.5≦P<15	50
15≦P<30	50
30≦P<272	50

■ Secondary exhaust gas standards

Motor output classification: P (kW)	Black smoke (%)
8≦P<19	40
19≦P<37	40
37≦P<75	40
75≦P<130	40
130≦P<560	40

■ Exhaust gas 3rd standard

Motor output classification: P (kW)	Black smoke (%)
8≦P<19	40
19≦P<37	40
37≦P<56	35
56≦P<75	30
75≦P<130	25
130≦P<560	25

Black smoke concentration measurement results using an opacimeter

Measuring equipment: 0.75m³ backhoe
Manufacturer: Sumitomo

Model: SH200-5
Rated output: 117.3kW

Special purpose vehicles that comply with emission standards

Measurement results (before addition) August 18, 2010 17:27

Measurement results (after addition) August 18, 2010 17:49

1st time 0.020 m -1
3rd time 0.016 m -1

Average 0.020 m²¹ -1
(Regulation: 0.80 m²)
(Threshold: 0.64m²)

1st time 0.006 m -1
2nd time 0.002 m -1
3rd time 0.005 m -1

Average 0.004 m² -1

(0.020 − 0.004) ÷ 0.020 × 100 = 80.00%

Measuring equipment: 10.0t tire roller
Manufacturer: Sumitomo

Model: HN210WHH
Rated output: 67.4kW

2nd standard exhaust gas countermeasure type

Measurement results (before addition) August 24, 2010 8:52

Measurement results (after addition) August 24, 2010 9:03

1st time 1.585 m -1
2nd time 1.555 m -1
3rd time 1.581 m -1

Average 1.574 m
(Regulatory value: 1.62 m²¹)
(Threshold: 1.29m²)

1st time 0.925 m -1
2nd time 1.006 m -1
3rd time 0.898 m³ -1

Average 0.943 m 1

(1.574 − 0.943) ÷ 1.574 × 100 = 40.09%

Measuring equipment: Motor grader
Manufacturer: Komatsu

Model: GD405A-3
Rated power: 92.0kW

Measurement results (before addition) August 24, 2010 11:30

1st time 1.111 m²¹
-1 2nd time 1.106 m²¹
3rd time 1.102 m²¹

Average 1.106 m²¹
(Regulated value: 1.62 m²¹)
(Threshold: 1.29m²)

Measurement results (after addition) August 24, 2010 11:27

1st time 0.726 m
2nd time 0.703 m -1
3rd time 0.687 m²¹

Average 0.705 m

(1.106 − 0.705) ÷ 1.106 × 100 = 36.26%

Measuring equipment: 0.22m backhoe
Manufacturer: Kubota

Model:RX-503
Rated output: 29.4kW

2nd standard exhaust gas countermeasure type

Measurement status

Measurement results (before addition) August 17, 2010 15:16

1st time 0.780 m²¹
2nd time 0.666 m
3rd time 0.671 m 1-

Average 0.706 m²¹
(Regulatory value: 1.62 m²)
(Threshold: 1.29 m²¹)

Measurement results (after addition) August 17, 2010 16:45

1st time 0.536 m²¹
2nd time 0.498 m²¹
-1 3rd time 0.479 m²

Average 0.503 m²¹

(0.706 − 0.503) ÷ 0.706 × 100 = 28.75%

Measuring equipment: 0.45m³ backhoe
Manufacturer: Kobelco

Model: SK115SR
Rated output: 58.8kW

Measurement results (before addition) August 18, 2010 9:34

Measurement results (after addition) August 19, 2010 10:35

1st time 0.238 m^{-1}
2nd time 0.209 m^{-1}
3rd time 0.231 m^{-1}

Average 0.226 m^{-1}
(Regulatory value: 2.76 m^{-1}) (Price: 2.20 m^{-1})

1st time 0.153 m^{-1}
2nd time 0.171 m^{-1}
3rd time 0.152 m^{-1}

Average: 0.159 m^{-1}

(0.226 − 0.159) ÷ 0.226 × 100 = 29.65%

測定機械：0.50m^3 バックホウ
メーカー：コマツ

型式：PC138US
定格出力：68.4kW

特定特殊自動車 排出ガス基準 適合車

測定状況

測定結果(添加前) 2010年8月18日 9:04

測定結果(添加後) 2010年8月19日 10:58

1回目 0.416 m^{-1}
2回目 0.470 m^{-1}
3回目 0.487 m^{-1}

平均 0.458 m^{-1}
(規制値:1.01 m^{-1})
(閾 値:0.80 m^{-1})

1回目 0.393 m^{-1}
2回目 0.383 m^{-1}
3回目 0.393 m^{-1}

平均 0.390 m^{-1}

黒煙濃度削減率

(0.458 − 0.393) ÷ 0.458 × 100 = 14.19%

オパシメーターによる自社での測定結果では14.19%黒煙濃度を低減する事ができました。

Measuring equipment: Air compressor
Manufacturer: AIRMAN

Model: PDS65SS
Rated output: 139.7kW

*1 standard exhaust gas resistant type

Recruitment status

Measurement results (before addition) August 18, 2010 10:05

Measurement results (after addition) August 19, 2010 13:52

-1 1st time 2.345 m²¹
2nd time 2.424 m²¹
3rd time 2.363 m²¹

Average 2.377 m²¹
(Regulatory value: 2.76 m²¹)
(Threshold: 2.20m²¹)

1st time 1.811 m²¹
2nd time 1.886 m
3rd time 1,900 m²¹

Average 1.866 m

Black smoke concentration reduction rate

(2.377 − 1.866) ÷ 2.377 × 100 = 21.50%

Measuring machine: 2.0t dump truck
Manufacturer: Mitsubishi Fuso

Measurement status

Model: KK-FE51EBD
Rated output: 5.24kW

Measurement results (before addition) August 17, 2010 15:45

Measurement results (after addition) August 18, 2010 13:56

1st time 0.393 m²¹
2nd time 0.395 m
3rd time 0.369 m²¹

Average 0.386 m²¹
(Regulation: 0.80 m²¹)
(Threshold: 0.64m²¹)

1st time 0.285 m²¹
2nd time 0.299 m -1
3rd time 0.273 m²¹

Average 0.287 m

Black smoke concentration reduction rate

(0.386 − 0.287) ÷ 0.386 × 100 = 25.65%

■Effects of C.G-Life (fuel additive)

Please take a close look at the photos of each internal engine part. The left side shows the inside of the engine before adding C.G-Life, and the right side shows the inside of the engine after 15 hours of driving with C.G-Life added. Before adding this product, carbon and sludge had built up. In this state, the vehicle's original power and torque are not realized. (Photo on the left)Adding this product removes carbon and sludge, restoring power and torque close to that of a new vehicle, maintaining a healthy engine environment, and reducing engine strain. (Photo on the right)

■How to use C.G-Life (fuel additive)

C.G-Life is added directly to fuel, so no capital investment is required. If your company or facility has a shared fuel tank, you can add it there, eliminating the need to add it to each vehicle.

If there is no shared fuel tank, divide the fuel from the 18 liter can into bottles and use it.

■Economic Benefits of C.G-Life (Fuel Additive)

This technology solves this fuel economy problem by adding an additive (C.G-Life) developed in Japan to biofuel (at around 0.1%).T
his improves fuel efficiency by around 15% on average, so even after deducting the cost of the additive, there is still a profit.

(Example)
Assuming a diesel price of ¥100 per liter, adding an additive (0.1% at ¥5) = ¥105/L. Assuming a fuel economy improvement of 15%, adding the additive reduces diesel consumption by 15% for the same distance = ¥105 x 0.85 = ¥89, which is a savings of ¥11. Even after deducting the cost of the additive (C.G-Life), the savings are still positive.