

# Comparative analysis combustion chamber cleaners use carbon cleaner on performance *engine type 16 3SZ-VE IL,-4 cylinder valve, DOHC,VVT-i, 1500cc Daihatsu Astra cars*

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**Abstract.** Car transportation tools are widely used in Indonesia. The car is experiencing rapid technological development, including a family car made by Daihatsu astra with 1500 Cc. Engine Type 16 3SZ-VE IL,-4 Cylinder Valve, DOHC,VVT-I) (Toyota New Avanza type Veloz, Toyota New Avanza type G, Toyota Rush and Daihatsu Terios, production is much loved by the public 2012-2015, because it is loaded with many people affordable prices but has sophisticated technology so it is comfortable when driving. As you use, the longer the car will experience a decrease in performance, this is caused by the engine combustion chamber experiencing crust, which results from incomplete combustion and poor fuel quality then care needs to be taken so that the car remains in top shape, Toyota's official workshop has a new innovation that is the engine combustion chamber cleaner using Camber Cleaner. Toyota's official workshop has a new innovation that is the engine combustion chamber cleaner using Camber Cleaner. The performance of the car will be excellent after the engine combustion chamber is cleaned using Camber Cleaner, The performance of the car will be excellent after the engine combustion chamber is cleaned using Camber Cleaner, many effects such as better acceleration, more efficient fuel, the combustion chamber will remain clean so that the combustion results released into the air will be less harmful material content many effects such as better acceleration, more efficient fuel, the combustion chamber will remain clean so that the combustion results released into the air will be less harmful material content. This also helps reduce air pollution caused by the large number of motorized vehicles.

## 1. Introduction

The development of automotive industry technology is growing rapidly , and Indonesia is a very promising automotive market because there are so many enthusiasts and / or hobbies and Indonesia is a very promising automotive market because there are so many enthusiasts and / or hobbies. The car has become a necessity for everyone, almost every house already has a car of at least one with the reason to use the car safer and more comfortable than a motorcycle and a family traveling The car has become a necessity for everyone, almost every house already has a car of at least one with the reason that using a car is safer and more comfortable than a motorcycle and a family traveling together using a car is more efficient. Toyota Rush, Daihatsu Terios, Avanza type G and Avanza Type Veloz with 1500 Cc Engine Type 16 3SZ-VE IL, -4 Cylinder Valve, DOHC, VVT-I, is the best-selling family car in the community, because the model is good and economical and the price is suitable for the lower middle class. is the best-selling family car in the community, because the model is good and economical and the price is



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The car is used every time causes the car's performance will decrease over time, The car is used every time causes the car's performance will decrease over time, The car is used every time causes the car's performance will decrease over time, then there must be regular maintenance so that performance is maintained. The causes of performance degradation in the car include the dirty combustion chamber caused by incomplete combustion and poor fuel quality then there must be regular maintenance so that performance is maintained. The causes of performance degradation in the car include the dirty combustion chamber caused by incomplete combustion and poor fuel quality. As a result the crust of dirt stuck to the piston head, which is getting thicker and longer so that incomplete combustion and wasteful fuel. Then the combustion chamber must be cleaned so that the car's performance is good. How to clean the combustion chamber in a car engine using Carbon Cleaner which is a product that is only sold by authorized workshops. As a result the crust of dirt stuck to the piston head, which is getting thicker and longer so that incomplete combustion and wasteful fuel. Then the combustion chamber must be cleaned so that the car's performance is good. How to clean the combustion chamber in a car engine using Carbon Cleaner which is a product that is only sold by authorized workshops.

The formulation of the problem in this research is how the process of cleaning the combustion chamber using Carbon Cleaner Camber Cleaner and Nulon Super Engine Cleaner and what are the effects on performance after the engine combustion chamber is cleaned using Carbon Cleaner on Toyota New Avanza Type 16 Type Engine 3SZ-VE IL, -4 Cylinder Valve, DOHC, VVT-I, made in 2012-2015.

The purpose of this study was to determine the difference in effect after the combustion chamber was cleaned using Carbon Cleaner and to determine differences in car performance after the engine combustion chamber was cleaned

The benefits of research in cleaning the combustion chamber using a Carbon Cleaner and being able to know the comparison before and after cleaning the combustion chamber on Toyota New Avanza G, Toyota Type Veloz, Type Rush and Daihatsu Terios1500 Cc with Engine Type 16 3SZ-VE IL, -4 Cylinder Valve, DOHC, VVT-I, made in 2012-2015.

## 2. Literature review

The gasoline engine is called a gasoline engine or otto engine or petroleum engine or spark ignition engine (SI engine) is one type of internal combustion engine, fueled by gasoline with spark ignition system.

Combustion occurs when there is hot fuel and air. Air in the atmosphere contains about 21% by volume of oxygen (O<sub>2</sub>). The remaining 79% consists of other gases, which are mostly nitrogen (N<sub>2</sub>). So the air volume consists of 21% and 79% nitrogen volume, so every mole of oxygen in the air is  $\frac{1-0,21}{0,21} = 3,28$  moles of nitrogen atmosphere.

Combustion is said to be perfect if the mixture of fuel and oxygen (from the air) has the right ratio, so that no residual is obtained. The combustion process in the engine can be divided into 2 parts, namely :

### 1) Perfect Burning (Normal)

Combustion in which all combustible elements in the fuel form CO<sub>2</sub> and H<sub>2</sub>O gas, so there is no fuel left.

### 2) Incomplete combustion

Incomplete combustion will cause a symptom called detonation or often called knocking, the mixture of unburned fuel increases in temperature so that it passes through the temperature to ignite on its own or the spark plugs sparks out of time.

Good combustion, the following conditions are required:

- a. Appropriate amount of air.

- b. Temperature corresponding to ignition of fuel.
- c. Sufficient burning time.
- d. Sufficient density to propagate fire in the cylinder liner

The combustion process is very influential for torque and power, where ignition timing that is too fast or too slow in the engine cycle greatly affects engine performance cause excessive vibration, and even damage the engine. Ignition timing also affects engine life, fuel consumption and engine power.

### 2.1. Engine Performance

Performance is the ability of the engine to change the energy of fuel that enters the combustion chamber to produce useful power called engine performance or engine performance.

#### a. Engine Torque

Torque is a measure of the engine's ability to do work. Torque magnitude is a derivative quantity commonly used to calculate the energy generated from a rotating object on its axis, the formula is as follows:

$$T = F \times b \quad (\text{N.m}) \quad (1)$$

Where:

$T$  = Rotating body torque (N.m)

$F$  = Is the centrifugal force of a rotating object (N)

$b$  = Is the distance of the object to the center of rotation (m)

#### b. Power

The unit power kW (Kilo Watts) or Horse Power (HP) has a close relationship with torque power is formulated as follows:

$$\text{Power (HP)} = \text{torque (lbs.ft). rotational speed (RPM)} / 5252 \quad (2)$$

One uses HP (horse power)

$$N = N - N + N \text{ (HP)} \quad (3)$$

With :

$N_e$  = Effective power or shaft power (HP)

$N_i$  = Power indicator (HP)

$N_g$  = Friction loss (HP)

$N_a$  = Accessories loss (HP)

### 3. The combustion chamber

The combustion chamber is a place for fuel and air burning caused by sparks generated by the spark plugs. There are 4 combustion chambers on the Toyota New Avanza Veloz 1500cc engine because there are four cylinders. Air and fuel enter through the intake valve and then the combustion process occurs which then combustion results out into the air through the exhaust valve and through the exhaust. The remaining combustion results in carbon crust attached to the piston head and cylinder wall. The longer the carbon crust accumulates causing the engine to experience a decrease in performance. Cleaning the combustion chamber using a carbon cleaner will restore the best performance car. The remaining combustion results in carbon crust attached to the piston head and cylinder wall. The longer the carbon crust accumulates causing the engine to experience a decrease in performance. Cleaning the combustion chamber using a carbon cleaner will return the car to its best performance.



**Figure 1.** Carbon Crust in the Combustion Chamber.

The quality of fuel and spark plugs is very influential on combustion results, the presence of carbon crust in the combustion chamber is also very influential in the process of combustion of fuel and air. Poor fuel also affects the carbon crust in the engine combustion chamber, because poor fuel quality will produce residual combustion in the form of lead attached to the combustion chamber

#### 4. Research Methods

##### Data Collection Methods

Equipment used for testing, as follows:



**Figure 2.** Toyota Avanza



**Figure 3.** Dynotest



**Figure 4.** Vacuum Fluida



**Figure 5.** Fuel ron 92

Figure 2. New Toyota Avanza Veloz 1500cc, Engine Type 16 3SZ-VE IL, -4 Cylinder Valve, DOHC, VVT-I production from 2012-2015.

Figure 3. Dynotest

serves to measure the maximum performance of torque and power (power) of the vehicle.

Figure 4. Fluid Vacuum

Functioning to suck the dirt clean carbon cleaner results from the engine combustion chamber. If the carbon cleaner liquid is still left in the combustion chamber resulting in wet spark plugs resulting in dead plugs.

Figure 5. Pertamina Fuel

In this test using Pertamina fuel with RON or octane 92.

In this research, Carbon Cleaner used is Camber Cleaner and Nulon Super Engine Cleaner. Carbon Cleaner is a product that consists of organic additive elements, functions as a combustion chamber and engine fuel lines. Carbon Cleaner contains Poly Ether Amine (PEA).

The most common fuel additives used today are deposit control detergents, polyisobutylene amine (PBA) and polyether amine (PEA) deposit cleaners used in gasoline. The chemical compounds of PEA mixed with gasoline are :  $C_3H_{10}N_2 + C_8H_{18} = C_{11}H_{28}N_2$

Carbon Cleaner, an additive that is added to the fuel that serves to clean the combustion chamber of a pile of carbon crust so that the combustion chamber becomes cleaner and reduces the emissions of exhaust emissions

The steps to clean the combustion chamber using a carbon cleaner as follows:



**Figure 6.** Camber Cleaner



**Figure 7.** Nulon Super Engine Cleaner



**Figure 8.** Remove the air filter



**Figure 9.** Remove the hose and socket

Figure 6. Camber Cleaner and

Figure 7. Nickel Super Engine Cleaner

Figure 8. Open the air filter housing cover by releasing the latch pressed by hand. There are five locks as marked in the picture

Figure 9. Remove the socket or connector and the hose attached to the air filter housing. The purpose is to lift the air filter housing.



**Figure 10.** Remove the ignition coil



**Figure 11.** Take off the spark plug



**Figure 12.** Spraying Combustion Carbon Cleaner

Figure 10. Remove the ignition coil 1,2,3,4 by opening bolt 10 using the sock 10 key that has been connected to the water ratchet. Ignition Coil.

Figure 11. Remove all spark plugs using the 16 mm spark plug lock set.

Figure 12. Spray the carbon cleaner Camber Cleaner and Nulon Super Engine Cleaner into the combustion chamber. Wait up to 30 minutes to get the best results. Spray the super engine cleaner to car A and camber cleaner to car B. For maximum results it takes approximately 30 minutes so that the carbon crust will be released from the combustion chamber.



**Figure 13.** Suctioning of Dirt Burns



**Figure 14.** Install Spark Plugs



**Figure 15.** Install the Ignition Coil

Figure 13. Vacuum carbon clean fluid in the combustion chamber using a vacuum fluid. Suck until the dirt from the carbon cleaner is sucked in all. If there is still liquid in the combustion chamber, the car will be difficult to live because the spark plug can get wet and cause the spark plug can not work or die.

Figure 14. Replace all spark plugs using a 16 mm spark plug lock set Bolt tightening torque of 2.5 kgm.

Figure 15. Replace the ignition coil to each spark plug. Bolt tightening torque is 2.5 kgm

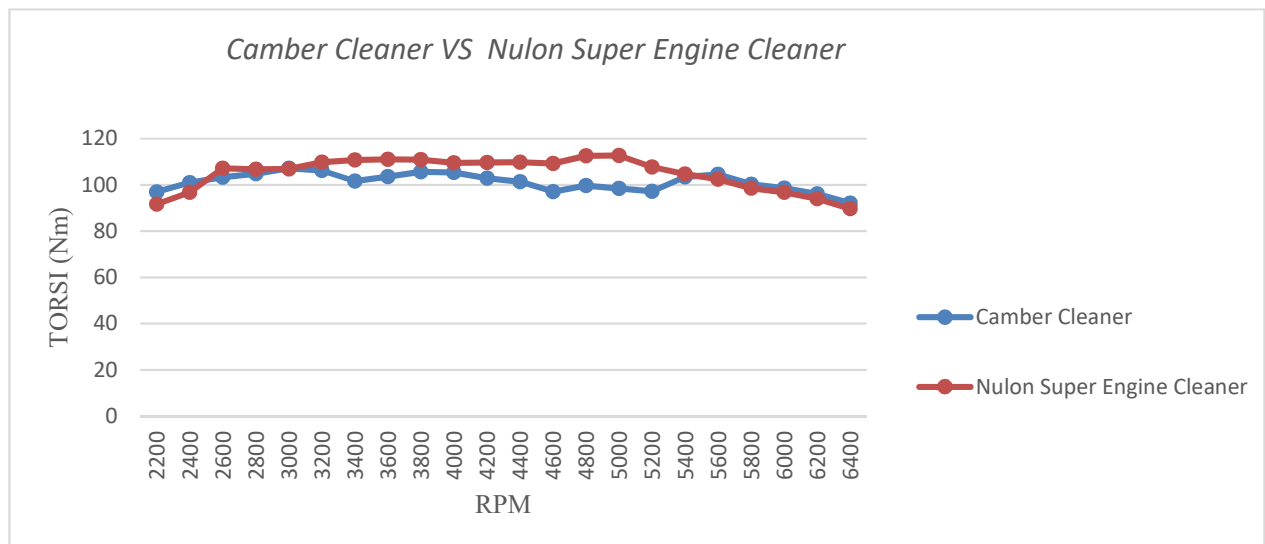
## 5. Research Results

Turn on the engine to get power and torque, set the engine speed to the maximum Rpm value. Performance testing (power and torque). at each engine speed while pressing the dynojet button when

every 1 to 4 times Run, for every 1 run, to always press the ready and stop buttons in each diagram the performance results appear on the laptop screen.

#### a. Torque

Following are the results of torque testing using the Dynotest tool. The amount of torque is also affected by the speed of the vehicle. The amount of torque does not depend on the high Rpm because it can be done when testing vehicles braking suddenly.

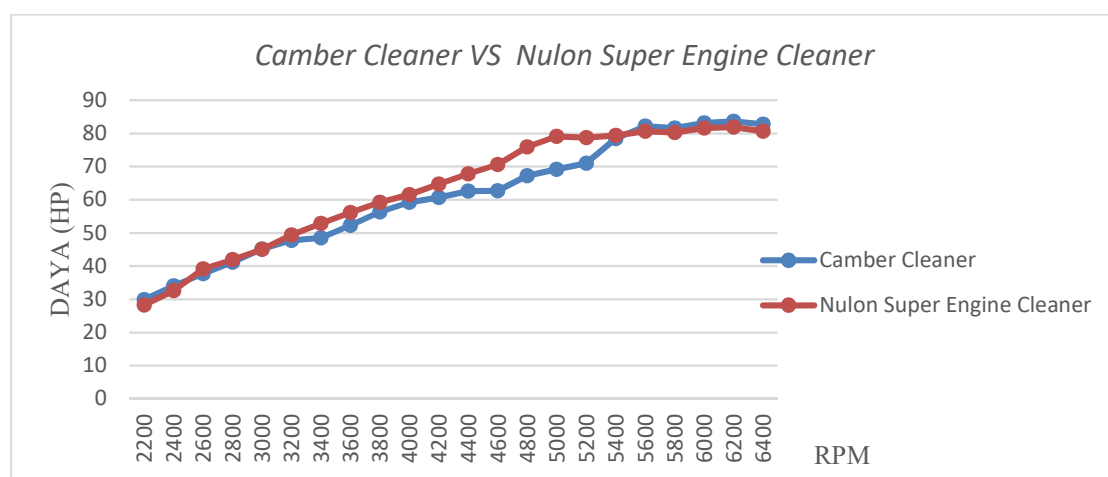


**Figure 16.** Torque Vs RPM

From the Torque test the Camber Cleaner has the highest value of 107.17 Nm at 3000 Rpm and after Nulon Super Engine Cleaner has the highest value of 111.11 Nm at 3600 Rpm. After the Camber Cleaner engine has a greater torque compared to using the Nulon Super engine Cleaner. With greater torque has an influence on the performance of the car which is a stronger car and is suitable for passenger cars such as the Toyota New Avanza type Veloz, Toyota New Avanza type G, Toyota Rush and Daihatsu Terios.

#### b. Power

Following are the results of testing the power using the Dynotest tool



### Figure 17. Power Vs RPM

The highest power test results obtained 83.65 HP at 6,200 Rpm after the combustion chamber was cleaned using Camber Cleaner. After cleaning using the Nulon Super Engine Cleaner the highest yield was 81.87 HP at 6,200 Rpm. Thus the combustion chamber after cleaning using Camber Cleaner has a higher power than the Nulon Super Engine Cleaner. For Toyota New Avanza type Veloz cars, Toyota New Avanza type G, Toyota Rush and Daihatsu Terios 1500 cc production from 2012-2015 are categorized as passenger cars so that they do not require too much power. Big power is more suitable for sports cars. However, if the usage of Toyota New Avanza type Veloz, Toyota New Avanza type G, Toyota Rush and Daihatsu Terios is driven alone without a full passenger, the use of Camber Cleaner affects acceleration.

### 6. Conclusions

The results of Camber Cleaner product testing have the highest value of 107.17 Nm at 3000 Rpm and after Nulon Super Engine Cleaner has the highest value of 111.11 Nm at 3600 Rpm. After the Camber Cleaner engine has a greater torque compared to using the Nulon Super engine Cleaner. With greater torque has an influence on the performance of the car which is a stronger car and is suitable for passenger cars such as the Toyota New Avanza type Veloz, Toyota New Avanza type G, Toyota Rush and Daihatsu Terios. From the data above proves that the higher the rpm, the higher the power of the car. Unlike the torque that is not affected by the car engine rpm.

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