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The effect of replacing standard carburetor with PE-28 carburetor on performance fuel consumption on 2006 Honda Tiger Revo

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Abstract
Carburetors are one of the important components on motorcycles, through modification of replacing Standard Carburetor with Racing Carburetor is one of the ways to improve engine performance. There are several types and sizes of PE, namely PE 24, PE 28, PE 38. PE 28 carburetor is often used on racing motorbikes, both Drag bikes and Roodrace bikes, where this carburetor is able to produce maximum engine performance. By testing the maximum power using a standard carburetor found at 7000 rpm engine speed, which is 11.3 HP, while the maximum power testing using a PE 28 carburetor is found at 7000 rpm engine speed, which is 11.7 HP. For testing the maximum torque using a standard carburetor found at 6000 rpm engine speed, which is 11.7 N.m, while the maximum torque testing using a PE 28 carburetor is found at 7000 rpm engine speed, which is 11.8 N.m. The use of PE 28 carburetor on a 4 stroke motorcycle greatly affects the amount of fuel consumption, it is because the PE 28 carburetor is a racing carburetor that is very suitable for those who want top speed. In addition, the advantage of the PE 28 carburetor is that it is able to improve engine performance because the type of carburetor is different from the standard and there are changes in the dimensions of the venturi hole and intake manifold, so that it can fog up more air and fuel to be brought into the combustion chamber or into the engine cylinder.

Keywords: Carburetor, performance and fuel, Honda Tiger Revo 2006

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Introduction

In the development of the automotive world, the use of motorcycles is increasing because these wheeled vehicles take part as a means of transportation, this is very helpful for daily activities for the community. So people will choose vehicles that have great power and are fuel efficient as a means of transportation. In the automotive world, there are many types and brands, one example of which is the Honda brand, there are also many types of the Honda brand, one of which is Honda Tiger which is a motorcycle with the highest engine capacity produced by PT Astra Honda Motor (AHM) in the 90s [3], Honda Tiger has well-known reputation for toughness engine that is suitable for long-distance driving. It was first introduced in 1993 known as the Tiger 2000, and the last product released in 2013 was known as the Tiger Revo. Modifications in the automotive field are growing very rapidly and vary, almost all systems in automotive technology, both motorcycles and cars, have a touch of modification. Automotive modification aims to get better engine performance than standard engine performance, by changing component specifications or by adding additional components. Motorcycle vehicles must have good engine resistance and high speed to be used for daily activities, but nowadays people are not satisfied with the performance of their motorcycle engines and many of them want to improve the engine performance of their vehicles. The performance of the vehicle engine is increased in power and torque by redesigning components related to engine performance, one of which is related to the fuel misting system called the Carburetor [7].

Carburetors are one of the important components in motorcycles, with modifications to replace Standard Carburetor with Racing Carburetor is one of the ways to improve engine performance. PE series carburetor is a racing carburetor that is commonly used, because this carburetor is the most economical and easy to set up and the mechanism is simpler and easier than standard carburetor and its maintenance costs are more economical.

There are several types and sizes of PE, namely, PE 24, PE 28, PE 38. PE 28 carburetor is often used on racing motorbikes, both Drag bikes and Roodrace bikes, where this carburetor is able to produce maximum engine performance, the use of this carburetor can be used various types of motors with adjustment of engine specifications and replacement of supporting components to produce maximum engine performance. Based on this, to improve

the performance of the vehicle engine, one of which we have to modify or replace the carburetor with a racing carburetor such as the PE 28 carburetor, then a new idea is obtained to conduct experimental research to be able to determine the effect of the use of the PE 28 carburetor on engine performance and consumption. fuel on a 2006 Honda Tiger Revo motorcycle [3].

2. Material and Methods

2.1 Design and Sample

This type of research uses an experimental method by replacing a standard carburetor with a PE 28 carburetor on the power and torque of the 2006 Honda Tiger Revo motorcycle and also its effect on fuel consumption. The stages in analyzing are testing using a standard carburetor to obtain power, torque and fuel consumption data based on engine speed (rpm), then replacing the standard carburetor with a PE 28 racing carburetor and testing and retrieval of data as in a standard carburetor.

The determination of the sample in this study was carried out by a field survey at Bengkel Gede Widi Motor (DWM) at the exact address at Jalan Tukad Balian No. 118, Renon Denpasar for 3 months starting from June 2 to August 31, 2021, with a 2006 Honda Tiger Revo Motorcycle in good condition.

2.2 Variable

Research variables can be distinguished based on their function or role, namely:

1. Independent variables include: Carburetor, filter, fuel and lubricant.
2. Dependent variable: Combustion system.
3. Control variables: experience of drivers and repair shop technicians.

2.3 Materials

The research material used is one unit of 2006 4 Stroke Tiger Revo Motorcycle [3], with standard engine specifications, namely:

Figure 1. 2006 4 Stroke Tiger Revo Motorcycle

- Engine Type : 4 stroke, 1 cylinder, SOHC, air cooling
- Cylinder Volume : 196.7 cc
- Maximum Power : 17 PS/8,500 rpm
- Maximum Torque : 1.6 kgf.m/7,000 rpm
- Transmission : 6 speed M/T
- Fuel supply system : Carburetor
- Starter system : Electric and Kick Starter
- Bore x Stroke : 63.5 x 62.2 mm
- Oil capacity : 1 liter

2.4 Instrument

The instruments used in the research include:

- Toolbox set to make it easier for researchers to disassemble and install components on vehicles.
- Dynotest to measure the power and torque generated from the vehicle.
- Blower for air circulation during testing.
- Measuring cup to measure fuel consumption to be used.
- Stopwatch to measure fuel consumption usage time.

2.5 Research Procedure

The research procedure was carried out first, namely testing power and torque using a dynotest tool with the following stages:

- Perform a tune up first on the vehicle before testing to get the vehicle in optimal condition and ready to operate.
- Prepare the vehicle in the dynotest tool.
- Put the seat belt on the suspension or the legs of the vehicle that is fastened to the dynotest tool.
- Turn on the dynotest computer and perform the settings on the computer.
- Starting the test, press the start button on the dynotest to start then gas the vehicle until it shows 2000 rpm until the possible speed, then press the start button again to end.
- Power and torque data will be obtained on the dynotest monitor automatically in the form of a graph.
- Do each test 2 times.
- After testing using a standard carburetor is completed, then perform a test using a PE 28 carburetor.

Figure 2. Dynotest

The next research procedure is a test of fuel consumption:

- Prepare a measuring cup and pour the fuel into the measuring cup as much as 200 ml.
- Attach the measuring cup hose to the fuel line in the carburetor.
- Prepare a stopwatch to time the fuel consumption.
- Gas the vehicle to show 2000 rpm until possible speed.
- Then count the time using a stopwatch for 5 minutes each.
- When finished look at the measuring cup how much fuel is used
- After testing the fuel consumption using a standard carburetor is completed, then do the test using a PE 28 carburetor

Figure 3. Standart Carburetor

Figure 4. PE 28 Carburetor

2.6 Data Analysis

In testing before operation and after being operated on the replacement of the carburetor, there is an effect of engine performance and fuel consumption on a 2006 Honda Tiger Revo motorcycle on the replacement of a standard carburetor with a PE 28 carburetor.

3 Result and Discussion

3.1 Power

Power is the work produced by an engine, at a certain speed in an experiment. The amount of power generated depends on the high and low engine speed. The higher the engine speed, the greater the power produced, but for a certain rotation (maximum rotation) the power will reach the maximum, and after that the amount of power produced will decrease, while the power is calculated in units of KW (kilo watts) or Horse Power (HP) has a close relationship with torque. The amount of power can be known by using the formula [2]:

$P = 2.\pi.n.\ T\ 6000$ (kW)

Description:

P = Engine Power (kW)
n = Engine speed (rpm)
T = Torque (Nm)

Table 1. Average Power Test Results

No	Engine Speed (RPM)	Power Test Result (HP)	
		Power Test Result (HP)	PE 28 Carburetor
1	2000	2.6	2.0
2	3000	4.2	3.7
3	4000	4.6	5.1
4	5000	6.9	7.5
5	6000	10	10
6	7000	11.3	11.7

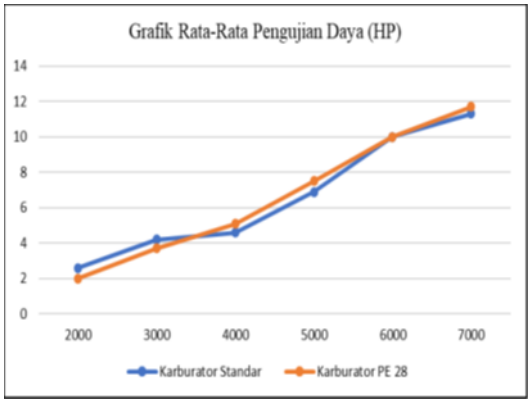

Figure 5. Power test average

Based on the average graph above, the maximum power tested using a standard carburetor is found at 7000 rpm engine speed, which is 11.3 HP, while the maximum power tested using a PE 28 carburetor is found at 7000 rpm engine speed, which is 11.7 HP.

3.2 Torque

Torque or torsion moment is the force multiplied by the length of the arm. In a combustion engine, the force is the motor power while the arm length is the piston arm. If the length of the arm is extended to produce the same moment, a smaller force is required. Conversely, if the distance is the same but the distance is enlarged, the resulting moment will be greater as well. This means that the greater the combustion pressure in the cylinder, the greater the moment generated.

Torque can be obtained by multiplying the force by the distance. (T = F x r) [2]. Maximum torque does not have to be generated at maximum power at the same time. Torque (moment) is closely related to the volumetric efficiency of the motor. This means that the moment is very dependent on the amount of fuel that can be sucked into the cylinder and then burned. This happens because the more fuel is burned, the higher the force generated to push the piston. The motor torque will be maximum if the efficiency is also maximum. If the power of the motor and the number of rotations are known, then the magnitude of the torque for a 4 stroke motor is calculated by the formula [2]:

T = 9550 *Pn* (Nm)

Description:

T = Torque (Nm)
P = Motor power (kW)
N = Engine rotation (rpm)
9550 = Constant (unchangeable amount of price)

Torque can also be determined by testing with a dynotest tool which can be formulated as follows [2]:

T = F. I = m.g.l

Description:
T = Torque moment (Nm)
m = Mass measured in dynamometer (kg)
g = Acceleration due to gravity (m/s2)
l = Arm length on dynamometer (m)

Tabel 2. Torque Average Test Results

No	Engine Rotation (rpm)	Torque Average Test Results (Nm)	
		Standart Carburetor	PE 28 Carburetor
1	2000	9.1	7.1
2	3000	9.8	8.9
3	4000	8.1	9
4	5000	9.8	10.6
5	6000	11.7	11.8
6	7000	11.5	11.8

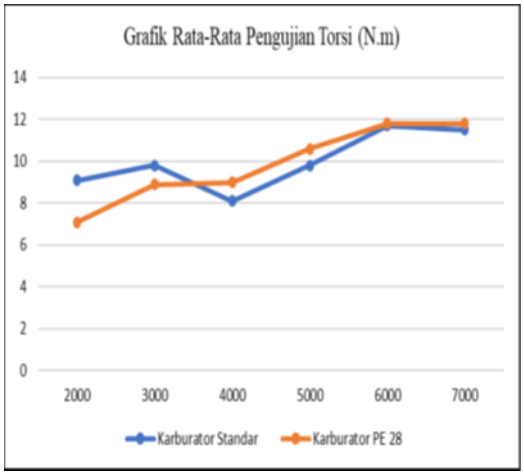

Figure 6. Torque test average

Based on the average graph above, the maximum torque tested using a standard carburetor at 6000 rpm engine speed is 11.7 N.m while the maximum torque tested using a PE 28 carburetor at 7000 rpm engine speed is 11.8 Nm.

The difference in power testing between vehicles using a standard carburetor and a PE 28 carburetor is that the average power of a vehicle using a PE 28 carburetor is higher than that of a standard carburetor and a tendency to increase engine speed from 4000 rpm to 7000 rpm. While the difference in torque testing is that vehicles using PE 28 carburetor have higher torque results than standard carburetor and the tendency is to increase from 4000 rpm to 7000 rpm.

Based on the graph of the average power and torque test results, using a standard carburetor the power at the lower engine speed is higher at 2.6 HP at 2000 rpm than the results obtained on the PE 28 carburetor, which is 2.0 HP at 2000 rpm. At engine speed, the maximum power obtained on the PE 28 carburetor is higher, namely 11.7 HP at 7000 rpm compared to the standard carburetor with 11.3 HP at 7000 rpm. As for the torque results at lower engine speed, the torque results on the standard carburetor are higher, namely 9.1 N.m at 2000 rpm while the PE 28 carburetor is 7.1 N.m at 2000 rpm. Furthermore, at the top engine speed, the torque obtained on the PE 28 carburetor is further increased, namely the maximum torque of 11.8 N.m at 7000 rpm and on the standard carburetor 11.7 N.m at 6000 rpm. So the use of PE 28 carburetor produces maximum power and torque at top engine speed. While the standard carburetor results are more leverage at lower engine speed.

The use of the PE 28 carburetor has higher power and torque test results, this is because the PE 28 carburetor has a larger venturi hole and there is a change in the dimensions of the intake manifold, so that it can fog up more air and fuel to be brought into the combustion chamber or into the combustion chamber engine cylinder.

In the standard carburetor there is a rubber filter that is attached to the carburetor and leads to the air filter, where the function of the air filter is to filter dust or dirt that enters the carburetor when the carburetor is working. While in the PE 28 carburetor the rubber filter and air filter are removed, so when the engine is running and the carburetor is running its function it can suck in more air and mix it with fuel to be taken to the combustion chamber or into the engine cylinder.

1.3 Fuel

In general, fuel is a compound that contains hydrocarbon elements. Almost all types of fuel on the market come from petroleum which is then processed into various kinds and types of fuels, such as gasoline which is used to describe complex mixtures of various refined hydrocarbons from crude oils to be used as fuel in engines [12].

The calculation of fuel consumption is calculated based on the number of comparisons between the volume of fuel consumed and the time to spend the fuel as follows:

Q = $v.t$ [2], in SI units, i.e:

Q = fuel consumption (ml/s)
t = time to spend fuel (s)
v = volume of fuel consumed (ml)

Table 3. Average Fuel Consumption Test Results (ml)

No	Engine Rotation (rpm)	Time (minute)	Standart Carburetor	PE 28 Carburetor
1	2000	5	50	70
2	3000	5	70	80
3	4000	5	90	100
4	5000	5	110	120
5	6000	5	130	140
6	7000	5	130	150

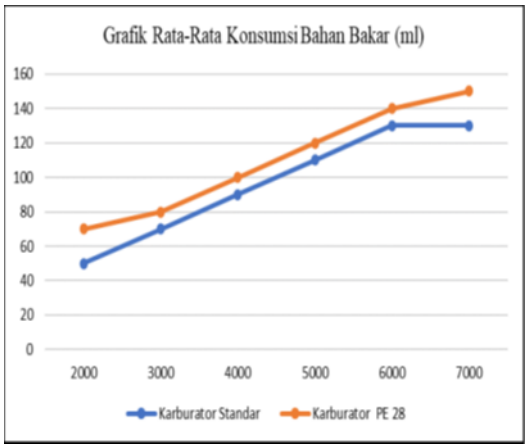

Figure 7. Average fuel consumption test

Based on the graph of the average results of fuel consumption above, the maximum test using a standard carburetor at 7000 rpm engine speed is 130 ml while the PE 28 carburetor at 7000 rpm engine speed is 150 ml. So in testing the fuel consumption using a standard carburetor and a PE 28 carburetor, the higher the rpm, the higher the fuel usage and from all test results, the use of a standard carburetor is more fuel efficient than the use of a PE 28 carburetor.

The conventional motorcycle fuel system generally consists of several components, including the gas tank, gasoline faucet, gasoline hose and carburetor. The carburetor is one of the important parts of a motor vehicle that functions to mix air and fuel, regulate the mixture ratio and control engine power.

The use of a PE 28 carburetor on a 4 stroke motorcycle greatly affects the amount of fuel consumption, this is because the PE 28 carburetor is a racing carburetor that is very suitable for those who want top speed, the PE 28 carburetor does not have an air filter like the standard carburetor which functions to filter dust or dirt. which will enter the carburetor, and this will also cause the PE 28 carburetor to be more fuel-intensive because it is not covered with air filter rubber. The advantage of the PE 28 carburetor is that it is able to improve engine performance because it has a different type of carburetor and there are changes in the dimensions of the venturi hole and intake manifold, so that it can fog up more air and fuel to be brought into the combustion chamber or into the engine cylinder.

4. Conclusions

Based on the results of the tests that have been carried out, the effect of replacing a standard carburetor with a PE 28 carburetor is a 3.5% increase in power at 7000 rpm on a 2006 Honda Tiger Revo motorcycle, as well as in the torsion test there is a 2.6% increase in torque at 7000 rpm. there is an increase in fuel consumption of 15.3%, more wasteful on the PE 28 carburetor because it has a larger venturi hole.

The solution found in replacing the Standard Carburetor with a PE 28 carburetor is that it can improve engine performance because the type of carburetor is different from the standard and there is a change in the dimensions of the venturi hole and intake manifold, so that it can fog up more air and fuel to be brought into the tank. combustion chamber or into the engine cylinder, and the PE 28 blurator is more suitable for sport motorbikes because of the high power and torque generated.

5. Acknowlegments

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