INFLUENCE OF RACING AIR FILTER ON MOTOR PERFORMANCE MUHAMMADIYAH UNIVERSITY OF SURAKARTA

Drafted in as qualified to finish education graduates on the international department of mechanical engineering

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APPROVAL PAGE

The Final Project entitles "INFLUENCE OF RACING AIR FILTER ON MOTOR PERFORMANCE" has been approved by supervisors for getting the Bachelor Degree of Engineering in Mechanical Engineering Department Muhammadiyah University of Surakarta.

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DECLARATION OF RESEARCH AUTHENTICITY

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"INFLUENCE OF RACING AIR FILTER ON MOTOR PERFORMANCE"

That made to fulfill some of the requirements to get Bachelor Degree of Engineering in Mechanical Engineering Department Muhammadiyah University of Surakarta, as far as I know is not a plagiarism of a research that has been published, except the information source that to solve the problem.

Surakarta, 29 November 2017

Researcher

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INFLUENCE OF RACING AIR FILTER ON MOTOR PERFORMANCE

ABSTRAK

Tujuan dari penelitian ini adalah untuk mengetahui pengaruh filter racing pada kinerja motor Yamaha Jupiter Z 2010. Metode penelitian dilakukan dengan cara membandingkan kinerja motor dengan menggunakan filter udara standar dengan filter racing. Dan alat yang digunakan dalam penelitian ini adalah dengan menggunakan Dynojet 250i. Data yang diperoleh setelah pengujian ditunjukkan pada grafik, kemudian dianalisis sehingga kita dapat mengetahui perbandingan penggunaan filter udara standar dengan filter racing, sehingga dapat diketahui perbandingan data yang dihasilkan.Dari hasil data ditunjukkan pada grafik dan setelah melalui analisis data, kita dapat mengetahui pengaruh penggunaan filter racing pada torsi dan tenaga yang dihasilkan dari Yamaha Jupiter Z, meski tidak signifikan. Filter racing menghasilkan torsi maksimum 5,14 ft-lbs pada 5.400 rpm dan daya maksimum 6,96 hp pada 8400 rpm, sedangkan filter standar menghasilkan torsi maksimum 5.12 ft-lbs pada 5.000 rpm dan daya maksimum 6.82 hp pada 7.500 rpm. Sehingga dapat disimpulkan bahwa penggunaan filter racing berpengaruh pada kinerja motor Yamaha Jupiter Z.

ABSTRACT

The objective of the research is to know the influence of the racing air filter on the Yamaha Jupiter Z 2010 motor performance. Methods of research done by way of comparing the performance of motor using standard air filter with racing air filter. And the tool used in this research is by using Dynojet 250i. The data obtained after testing are shown in the graph, and then analyzed so that we can know a comparison of the use of standard air filter with racing air filter, thus we can know the comparison of the data generated.From the results data is shown in the graph and after through the analysis data, we can know influence of using racing air filter on the torque and power produced of Yamaha Jupiter Z, although not significant. The racing air filter generates an maximum torque of 5.14 ft-lbs at 5400 rpm and maximum power 6.96 hp at 8400 rpm, while the standard air filter generates data an maximum torque 5.12 ft-lbs at 5000 rpm and maximum power 6.82 hp at 7500 rpm. So we can be concluded that the use of racing air filter influence on the Yamaha Jupiter Z motor performance.

Keywords: Standard, racing, filter, performance

1. INTRODUCTION

1.1 BACKGROUND

Combustion motor is a machine with internal combustion, which at present is still widely used for various purposes, especially in the field of transportation. Its role in the field of transportation is very large, because almost all vehicles, especially those operating on land use motor fuel as a driver. Motor fuel itself is divided into two main types, namely Motor Gasoline (Otto) and Motor Diesel. The difference between the two types of motors is very clear that if the gasoline motor uses gasoline (premium), while diesel motors use diesel fuel. The main difference also lies in the ignition system, where on the gasoline motor using spark plug as ignition system while in diesel motors utilize high compression temperature to be able to burn diesel fuel.The air requirements for the above combustion process are obtained from the surrounding air. The surrounding air contains a lot of dust and dirt that can interfere with the combustion process. For that, several types of carburetors are equipped with several filters to filter air coming into the carburetor. Therefore, the carburetor working system one of them influenced by the filter, so that the effect on the work of the machine.In the development of human life has been much supported by the development of the automotive world. Motorcycle is one of the automotive products that many people in demand. Therefore, problems concerning the operation of a motorcycle is a very important problem. Based on this background description it is necessary to do research about the influence of air filters on the carburetor on the performance of motorcycle engines.

1.1.1 Objective of Study

This research intends to know and analyze the effect of filter change on the performance of 4 cylinder 1 step engine by performing dyno test.

1) Knowing the torque difference on each filter use. And
2) Knowing the difference of power by comparing the test result data.

1.2 LITERATURE REVIEW

NaifFuhaid, 2010,Pengaruh Filter Udara Pada Karburator Terhadap Unjuk Kerja Mesin Sepeda Motor. In this research the authors do the test by comparing of 3 types of filters that are standard filters, filter modifications and without filters. From the test results showed that the filter modification produces higher efficiency than standard filters and no filter, but on the other hand filter modifications also produce good engine work and fuel consumption is still quite sparing. This is because the power generated filter modification value is greater than the standard filter and without a filter.

Muhammad Kambrany, AkhmadFarid, NuridaFinahari, 2014, Pengaruh Filter Udara Terhadap UnjukKerja Mesin Pada Motor Matic. In this test the authors conducted a study on the comparison of the use of 3 types of filters that are standard filters, filter modifications, and without filters. The result obtained from the test is that the effective power and indication power generated by the modified filter is larger than the standard filter and without filter, then the air effect on the efficiency is shown by the without filter.

Ahmad Rifai, Toni Dwi Putra, Muhammad AgusSabhana, 2013, Pengaruh Jumlah Sekat Filter Udara Sebagai UpayaMeningkatkan Performa Mesin Diesel. From these studies show that the efficiency produced by air filters with the most or normal number of insulation 153 produces high efficiency. This is because the use of fuel used in the combustion process more efficient and stable. Meanwhile, the fewer number of blocks 144 and 135 is less efficient, because of the more extravagant fuel consumption.

1.3 BASIC THEORY

1.3.1 Engine Performance

Engine performance has a function to test engine ability. There are some procedures and ways to test an engine. Engine Performance is an ability of an engine based on torque, power, consumption of fuel and rpm.

1.3.2 Torque

Torque is a multiplication between load and engine shaft rotation is formulated as below :

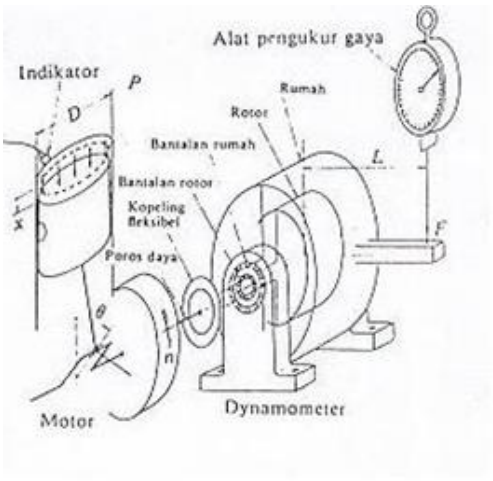

Figure 1.Dynamometer and Indicator

$$T = F.L \text{ ……..…….(2.1)}$$

Where :

T = Torque (Nm)

F = Force (N)

L = Lever length (m)

Engine torque is normally measured with a dynamometer. The engine is clamped on a test bed and the shaft is connected to the dynamometer rotor. Figure 2.6 illustrates the operating principle of a dynamometer. The rotor is coupled electromagnetically, hydraulically, or by mechanical friction bearings. The stator is balanced with the rotor stationary. The torque exerted on the stator with the rotor turning is measured by balancing the stator with weights, springs, or pneumatic means.

1.3.3 Power

Power is work that produced by an engine in an experiment can be formulated as below:

$$N = \frac{2..\pi.T.n}{60 \cdot 746} \text{.....(2.2)}$$

Where :

N : Power (Hp)

n : Engine rotation (rpm)

T : Twisting Moment (Nm)

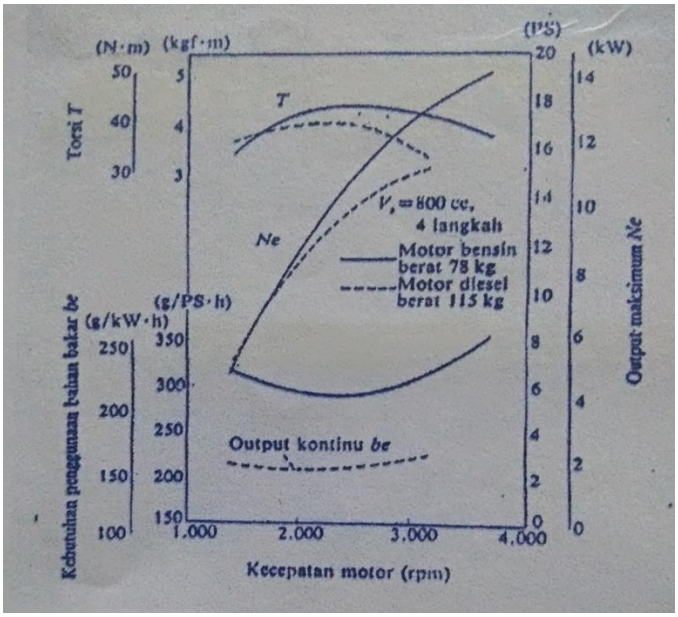

Figure 2.Correlation between Torque, Power and KBBS to RPM

1.3.4 Carburetor

Carburetors are the most important part of a motorcycle. Almost all motorcycle bikes use carburetors because most motorcycles use gasoline as fuel. Therefore a good carburetor should be able to make the perfect gas and fit the needs of the machine. to get the perfect combustion in the required comparison of engine and air in gas mixing, according to theoretical is 1:15 means 1 gram of gasoline mixed with 15 grams of air.If the mix ratio is more than 1:15 eg 1:18 it says a poor mix of 1:12 in say rich mixture.

1.3.4.1 Functions of Carburetor :

1) To regulate air and fuel into suction channel.
2) To adjust the ratio of air fuel at various loads of motor speed.
3) Mix the fuel and air evenly.

1.3.5 Air Filter

The air filter on the car or motor serves to filter the air that will enter into the combustion chamber so that it is clean of any kind of dirt, especially this air will flow through various systems such as going through the carburetor etc. so that if the incoming air is dirty then it can clog that will interfere performance of the components of the fuel system and other components through which the air passes.

1.3.6 Standard Air Filter

The standard mill filter box has been designed in such a way as to supply the air requirements in the combustion process on the engine, in low to high rotation in accordance with the standard carburetor performance as well as the standard exhaust and keepthe air in quiet condition before entering into the carburetor.

Figure 3. Standard Air Filter

Standard filters are paper-based, so they are only disposable and must be replaced when the filter is very dirty, can't be cleaned and used again.

1.3.7 Racing Air Filter

Racing filters are designed in such a way as to provide a larger air supply than standard filters, made of stainless steel so it is more durable and the air hose also tends to be shorter so the air supply can be faster.Filter racing is quite durable and for the treatment is also easy, if dirty filter we can clean it using brush or toothbrush and gasoline after that we can using again.

Figure 4.Racing Air Filter

Here are the claims of the FBR filter:

a) Easy maintenance, because this filter is made from STAINLESS STEEL material. density up to 45 microns. And the filter frame is made of silicone that is guaranteed not to brittle due to engine heat.
b) Very easy to clean, every time service schedule can stay washed with water added with detergent. Can also be brushed if there is a stubborn stain, after dry can be used optimally.
c) Increases to motor performance.

2. RESEARCH METHODOLOGY

2.1 Flow Chart of Research

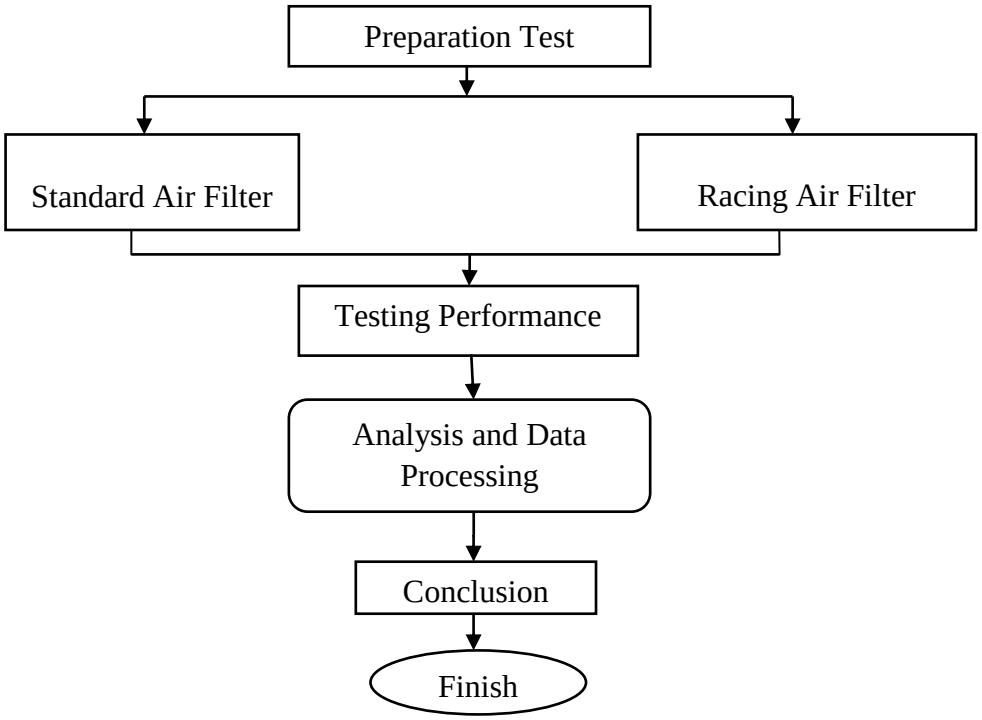

Figure 5.chart of research

2.2 Materials of Research

1. Motorcycle Type : Yamaha Jupiter Z 2010
2. Standard Air Filter of Yamaha Jupiter Z 2010
3. FBR Racing Air Filter

2.3 Research Tool

Research tool that will be used is :

1) Dynojet type : Dynojet 250i Performance Evaluation

2.4 Research Step

1) Set up and records the volume of fuel in the measuring tube
2) The gear ratios were tested is gear ratio of 1- 4
3) Turn on the machine and positioning of experiments on the gear ratiowith standard engine conditions
4) Set the throttle opening to reach the round of 4000 rpm.
5) Start the testing or data collection process by the engine dynamometer. Testing is done by opening the throttle until it reaches round of 4000 rpm, the next throttle rapidly opened up the throttle fully open and achieve maximum rotation achieved further detained until the engine rev up to 8000 rpm and testing is complete
6) After reaching the 8000 rpm collect data is complete.

From the dataabove, it canbecalculatedto determine theperformanceofthe engine. Dataobtainedin the form ofthe following values:

1) Torque(T)
2) Power(N)

Figure 6. Yamaha Jupiter Z ready for testing

3. RESULT AND ANALYSIS

From the results of tests getting data such as shown in the graph :

Figure 7.Graph result of Dynojet Research

Table 1.Table of Result

Type Air Filter	Maximum Torque	Maximum Power
Racing Air Filter	5.14 ft-lbs at 5400 rpm	6.96 Hp at 8400 rpm
Standard Air Filter	5.12 ft-lbs at 5000 rpm	6.82 Hp at 7500 rpm

From the graph above we can know the maximum torque obtained from testing between standard filters with racing filter that is on racing air filter produce maximum torque 5.14 ft-lbs at 5400 rpm engine speed, while the standard air filter produces maximum torque of 5.12 ft-lbs at 5000 rpm. From the difference of data result that occurs at maximum torque of each filter, and again racing air filter is slightly superior to standard air filter and proved to have influence from the usage of racing air filter in torque.From the data shown on the graph we can know, between the official data from Yamaha about the maximum power motor Jupiter Z with data generated from the test independently showed almost the same results. In the official data of Yamaha, maximal power of Jupiter Z is 6.6 hp at 7500 rpm, while the data we get from the self-test produces maximum power worth 6.82 hp at 7500 rpm has a small difference, from the data we can conclude that the accuracy tools used quite well.And the data generated from the test using racing air filter shows the results maximum power reaches 6.96 hp at 8400 rpm, from the data we can conclude that the power generated by the racing air filter is greater than the standard air filter.

4. CLOSING

4.1 Conclusion

From the results of observation and testing "Influence of Racing Air Filter On Motor Performance", it can be concluded as follows:

1) From the test we can get the results of maximal torque on the racing air filter of 5.14 ft-lbs at 5400 rpm, while for the standard air filter we get the maximum torque of 5.12 ft-lbs at 5000 rpm. From the results can be concluded that there is influence of the use of racing air filter on the torque.
2) From the test we can get the results of maximum power on the racing air filter is 6.96 hp at 8400 rpm, while in the standard air filter we get a maximum power of 6.82 hp at 7500 rpm. From the results can be concluded that there is influence of the use of racing air filter on the power.

4.2 Suggestion

From the above conclusions, the authors propose the following suggestions:

1) Conduct an appropriate trial as in the procedure.
2) Experiment several times, in order to obtain accurate data.
3) There should be further research on the effects of torque or power by factors of fuel consumption.

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