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ANALYSIS OF THE INFLUENCE OF THE INSTALLATION OF CYCLONE TURBO TYPES AND INTAKE MANIFOLD MODIFICATION OF CONSUMPTION FUEL IN CARBURETOR MOTORCYCLE

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KEYWORDS

turbo cyclone
intake manifold modification
fuel consumption

ABSTRACT

This research aims to know the reduction of fuel consumption on a motorcycle with the installation of turbo cyclone and intake manifold modifications compared with the standard condition. This research is carried out with machine rotation or rotation per minute (rpm) as control variables, specifically at 1500 rpm, 4500 rpm, and 7500 rpm. The method used in this research is a method of experimentation. The results of this research are the most excellent decline in fuel consumption is while using free vane turbo cyclone with a standard intake manifold with an average decrease of 0.67 ml / min or 13.4% at 1,500 rpm, on 4,500 rpm is around 1.5 ml / min or 11.54%, and at 7,500 rpm is 1.5 ml / min or 7.5%. Total fuel consumption decreased is 11 ml / min or 9.65% compared to standard conditions.

INTRODUCTION

One of the negative impact it caused by the increasing number of motor vehicles namely increasing fuel consumption. Fuel oil (BBM) sourced from fossils is a natural resource that cannot be renewed (unrenewable) in other words if it is used continuously it will be depleted and exhausted. Increased fuel consumption in motorized vehicles is influenced by several factors including fuel mixture with air that is not ideal, compression pressure that is not in accordance with engine specifications, the octane value of the fuel used is low, and combustion is not perfect. Incomplete combustion process results in the power produced by the explosion of the fuel mixture and the air in the combustion chamber is not optimal so that fuel consumption increases.

To get a mixture of fuel with more homogeneous air or evenly mixed it can be done by making a vortex of air that enters the carburetor or combustion chamber so that the fuel has a greater chance to mix with air and become more evenly distributed. The flow that rotates from the mixture of fuel and air in the combustion chamber will also accelerate the heat transfer process. Mixing of the burnt mixture with the unburned will increase the combustion speed so that the fuel consumption is more efficient (Zhang and Hill in Khoir and Marsudi, 2014: 80). To create a vortex of air that enters the cylinder can be done by adding equipment that is able to change the straight flow (laminar) of the air before entering the combustion chamber into a vortex (turbulent) ie by using a turbo cyclone and modifying the fuel inlet (intake manifold).

According to Ping Wang in Suliyono and Marsudi (2013: 28) Turbo cyclone is an additional tool used in an internal combustion engine that serves to create air flow that will enter the carburetor and the combustion chamber cylinder to spin or swirling . Turbo cyclone is similar to a swirl fan whose blade does not rotate (fixed vane) and is placed in the air inlet. Rotating the air flow will increase the efficiency of mixing fuel with air (fuel / air mixing), increase the intensity of combustion and stabilize the combustion flame by utilizing zones that are still

affected by internal recirculation zones and can improve fire propagation speed so that a perfect burner can achieved.

In addition to installing turbo cyclone to increase the mixture of fuel and air, it can be confirmed by modifying the fuel inlet (intake manifold). This can be done by making a groove or screw in the intake manifold. The purpose of this thread making is to change the flow rate of a laminar fuel mixture to be turbulent. In turbulent flow that occurs in the intake manifold the fluid particles move in irregular paths so as to form a swirl . It aims to accelerate the mixing of fuel and air so that combustion can also be accelerated. This study did a comparison between vehicles with turbo cyclone types and intake manifold modifications to the standard vehicle fuel consumption on Yamaha Byson motorcycle150 cc in 2012.

RESEARCH METHODS

The independent variables in this study are the type of turbo cyclone (free vane and fixed vane), modified intake manifold, and variations of motorbike engine rotation which are 1500 rpm, 4500 rpm, and 7500 rpm. The dependent variable in this study is the fuel consumption Byson motorcycle Yamaha 150 cc 2012. And the control variable is a motorcycle according to the standard conditions specified by the manufacturer, except the treated turbo cyclone as well as the intake manifold has been modified. Pertamax fuel with 92 octane is purchased from PERTAMINA gas stations. The blade on the turbo cyclone complies with factory standards. Choke systems and other components that affect engine speed do not work. Spark plugs on motorbikes according to factory standards. The time interval for each data collection is made for ± 10 minutes. this experimental research was conducted in Laboratory Automotive Education Program Mechanical Engineering, Faculty of Teaching and Education University March Surakarta.

Table 1. Yamaha Byson 150 CC 2016 Specification

Machine type	4 Steps, 2 Valve SOHC
Number of cylinders	Single Cylinder
Cooling system	Air
Cylinder volume	153 cc
Diameter x step	58.0 x 57.9 mm
Comparison of compression	9.5: 1
Maximum power	10.1 Kw / 7,500 rpm
Maximum torque	13.6 Nm / 6,000 rpm
Starter system	Electric starter and kick starter
System of expansion	Wet
Engine oil capacity	A total of 1.2 liters, periodic replacement of 1 liter
Fuel system	BS26 x 1 carburetor

The instrument used in this study are as follows:

1. Tool set is a tool used to remove and install components that are on a vehicle's engine or in this study to remove and install the carburetor, turbo cyclone, and intake manifold.
2. Measuring cups are used to measure the amount of fuel consumption on motorbikes used before and after testing during the study.
3. Tachometer is a tool used to measure the amount of engine speed when testing in data retrieval
4. Stopwatch is a tool used to measure time. In this study the stopwatch is used to measure the length of time for measuring fuel consumption.

Testing is done by comparing between standard vehicles and vehicles that have undergone modifications or experiments.

1. Experiment Preparation Steps
   a. Designing turbo cyclone tools and modifying the intake manifold.
   b. Prepare research tools and materials.
   c. Tune up to the research material to be used is Yamaha Byson motorcycle 150 cc in 2012.
   d. Install the turbo cyclone and modification intake manifold on a motorcycle.
   e. Connect a gasoline gauge with a fuel inlet to the carburetor.

f. Prepare a data table to record measurement results.

2. Measuring Measures for Fuel Consumption

a. Fill the measuring cup with 25 ml of powder.
b. Turn on the engine with idle rotation .
c. Turn the motorcycle gas up to 1500 rpm, 4500 rpm and 7500 rpm in 1 minute.
d. Turn off the engine and record how much fuel is consumed for 1 minute.
e. Repeat the test steps 3 times.
f. Repeat the testing steps for the standard group, and repeat the group using fixed vane turbo cyclone, free vane turbo cyclone with standard intake manifold as well as with modified intake manifold

This research is a type of quantitative research with experimental methods. Data obtained from this experiment are included in the table, and displayed in graphical form, then described and compared between standard motorbikes, motorbikes that use turbo cylone , motorcycles that use modified intake manifold as well as motorbikes that use turbo cylone and modified intake manifold . Then the conclusions were drawn and derived from the experimental results of fuel consumption measurement on a Yamaha Byson 150 cc motorcycle in 2015.

RESULTS AND DISCUSSION

Turbo Cyclone type installation

Based on the results of testing the use of turbo types The most effective cyclone in reducing fuel consumption on Yamaha Byson 150 cc motorcycles in 2012 was the use of cyaclone turbo with free vane turbo cylone type. Where the average consumption on the installation of free vane turbo cylone is at 1500 rpm engine speed of 4.16 ml / minute, at 4,500 rpm engine speed of 11.16 ml / minute, and at 7,500 rpm engine speed of 18.16 ml / minute. And the total amount of fuel consumption is 101 ml / minute.

Meanwhile for the installation of turbo cyclone with fixed vane turbo cyclone type, the average consumption is at 1,500 rpm engine speed of 5 , 16 ml / minute, at 4,500 rpm engine speed of 12 ml / minute, and at 7,500 rpm engine speed of 19, 16 ml / minute. And the total fuel consumption is 109 ml / minute. Where the fuel consumption ratio of the two types of turbo cyclone can be seen in the diagram below:

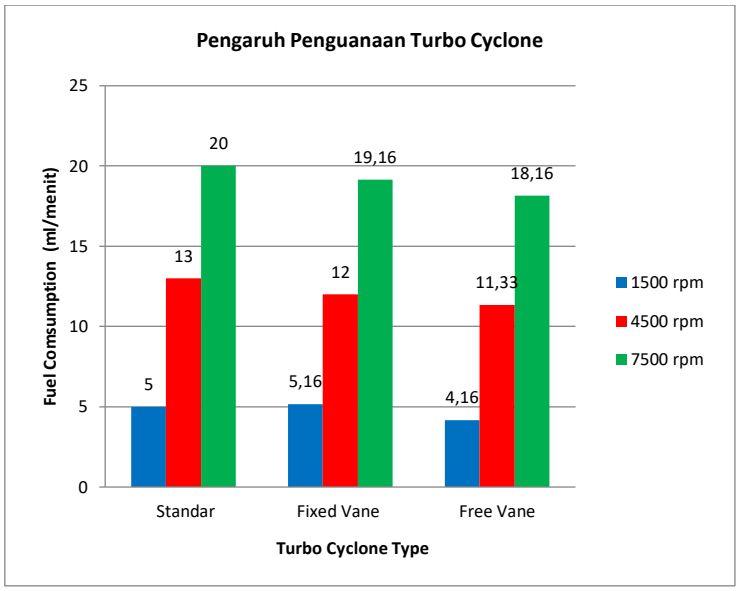

Figure 1. Fuel Consumption on Turbo Cyclode

Based on the data on the graph above the average consumption of free vane turbo cyclone is the most effective type of turbo cyclone when compared to the installation of fixed vane turbo cyclone with a decrease in consumption of 1 ml / minute or 19 , 38 % at 1,500 rpm, then 0.67 ml / minute or 5.58% at 4,500 rpm, and a decrease of 1 ml / minute or 5.22 % at 7,500 rpm.

Installation of Intake Manifold

Based on research data , the most effective use of the intake manifold in reducing fuel consumption on a Yamaha Byson 150 cc motorcycle in 2012 was the use of a modified intake manifold . Where is the average consumption for modification of intake manifold, namely at the standard intake manifold the average consumption is at 1500 rpm engine speed of 5 ml / minute, at 4,500 rpm engine speed of 13 ml / minute, and at 7,500 rpm engine speed of 20

ml / minute. And the total amount of fuel consumption is 114 ml / minute. Where is the ratio of fuel consumption from standard intake manifoldinstallation with modified intake manifold can be seen in the diagram below:

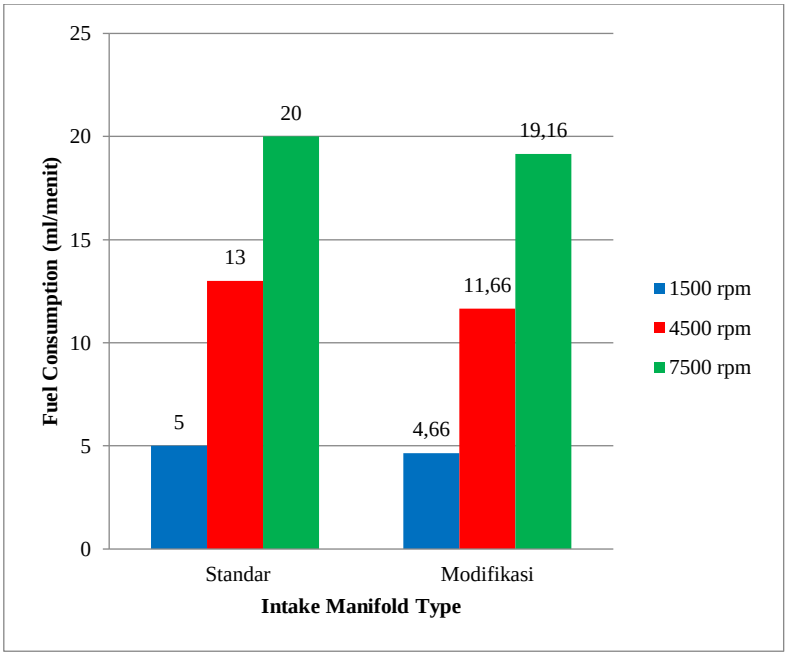

Figure 2. Comparison of fuel consumption bar diagrams using Standard and Modified Intake Manifolds

Installation intake manifold modification is a type the most effective intake manifold when compared with a standard installation of the intake manifold with a decline in consumption of 0.34 ml / min or 6.8% at 1,500 rpm rotation, then by 1.34 ml / min.

Turbo Cyclone Installation and Modified Intake Manifold

Based on the research data, the effect of installing a turbo cyclone and a modified intake manifold on fuel consumption on a Yamaha Byson 150 cc motorcycle in 2012 resulted in a decrease in fuel consumption. Where the average consumption of modified intake manifold at 1,500 rpm engine speed is 4.66 ml / minute, at 4,500 rpm engine speed of 11.66 ml / minute, and at 7,500 rpm engine speed of 19.16 ml / minute. Number of total fuel consumption using a modified intake manifold that is about 106, 5 ml / min.

S turbo cyclone after an intake manifold modification experiencing a decrease in fuel. Based on the test data, the average fuel consumption after the installation of free vane turbo cyclone with modified intake manifold ie at 1500 rpm engine speed of 4.33 ml / minute, at 4,500 rpm engine speed of 11.5 ml / minute, and at engine speed 7,500 rpm of 18.5 ml / minute. Total fuel consumption using fixed vane turbo cyclone with a modified intake manifold of 103 ml / minute.

While the fixed vane turbo cylone with the average consumption intake manifold modification is at 1500 rpm engine speed of 4.5 ml / minute, at 4,500 rpm engine speed of 11.5 ml / minute, and at 7,500 rpm the engine speed is 19 ml / minute. Total fuel consumption using fixed vane turbo cyclone with a modified intake manifold of 105 ml / minute. Where the ratio of fuel consumption in the installation of turbo cyclone and modified intake manifold can be seen in the graph below:

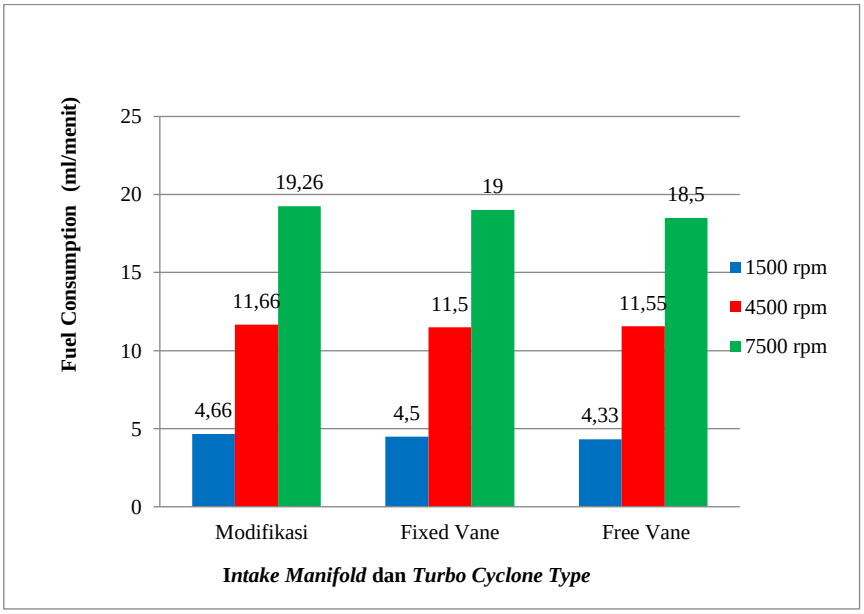

Figure 3. Influence of Turbo Cyclone and Intake Manifold Modification

CONCLUTION

Based on the results of research and data analysis carried out on fuel consumption testing using turbo cyclone types and modified intake manifold, the following conclusions can be drawn that Installation of free vane turbo turbo cyclone cyclone is the type most effective against the reduction of fuel consumption on a motorcycle of 150 cc Yamaha Byson 2012. With the largest enurunan p 0, 84ml / min or 16.8% at the engine speed of 1,500 rpm. Installation of intake manifold intake manifold modification is the most effective against the reduction of fuel consumption on a motorcycle of 150 cc Yamaha Byson 2012. With the largest enurunan p 1,34 mL / min or 10.31% at the engine speed of 4,500 rpm. Installation of free vane types cyclone turbo and intake manifold modifications to reduce the consumption of materials ar ba k on Yamaha Byson motorcycle 150 cc in 2012. With the largest decrease of 0.67 ml / min or 13.4% at the engine speed of 1,500 rpm.

REFERENCES

Al Vandy, R. Muhammad, Aris Triwiyatno, dan Budi Setiyono. 2013. Desain Kontrol Air Fuel Ratio(AFR) pada Model Spark Ignition Engine Dengan Metode Hybrid Fuzzy PI. TRANSIENT, VOL. 2, NO. 2 Juni 2013 ISSN: 2302-9927 halaman 217

Arikunto, Suharsimi.2011. Prosedur Penelitian Suatu Pendekatan Praktik. Jakarta: Rineka Cipta

Khoir, Miftahul dan Marsudi.2014. Pengaruh Penggunaan Turbo Cyclone dan Busi Iridium Terhadap Performa Sepeda Motor Honda Supra X 125 cc Tahun Perakitan 2011. JTM UNESA Volume 02 Nomor 02 halaman 79-88

Muchammad.2007. Simulasi Efek Turbo Cyclone terhadap Karakteristik Aliran Udara pada Saluran udara Sepeda Motor 4 Tak 100 CC Menggunakan Computational Fluid Dynamics. Rotasi Volume 9 Nomor 1 halaman 1-16

Shrirao, Pankaj.N dan Rajeskhumar U. Sambhe.2014. Effect of Swirl Induction by Internally Threaded Inlet Manifolds on Exhaust Emissions of Single Cylinder (DI) Diesel Engine. International Journal of Science and Research (IJSR). Volume 3 Issue 7

Sularto, Tri.2007. Pengaruh Modifikasi Diameter Venturi dan Pemasangan Turbo Cyclone terhadap Daya Mesin pada Sepeda Motor FIZ R 2003. Skripsi dipubikasikan: UNS Surakarta

Suliono dan Marsudi.2013. Pengaruh Penggunaan Turbo Cyclone dan Busi Iridium Terhadap Emisi Gas Buang pada Motor Bensin 4 Tak. JTM UNESA Volume 02 Nomor 02 halaman 27-35