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FUEL CONSUMPTION ANALYSIS OF INJECTION SYSTEM AND CARBURETOR SYSTEM ON HONDA BEAT FI 2013

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Abstract. An injection system is a process of burning fuel on an internal combustion engine by using an electronic system to inject fuel with air into the combustion chamber. The carburetor system uses a nozzle to blur the fuel mixture with the combustor air. The purpose of this study was to determine differences in the value of fuel consumption from the injection system with the carburetor system. This research was conducted by the experimental method. Research methods at least describe the approaches used in research, population and research samples, explain the operational definition of variables along with data measurement tools or how to collect data, and data analysis methods. If the data measurement tool uses a questionnaire, it is necessary to include the results of the validity and reliability of the research instrument. The results of the analysis showed that the average value of fuel consumption even with the injection system was 51.53ml, while the mean value of the carburetor system was 90.40 ml, this meant that the injection system was more efficient compared to the carburetor system of 44.89 ml or 47%. Conclusion injection system at any rotation is more economical than the carburetor system. It is recommended to conduct further research by taking real data that is distance and travel time.

Keywords: fuel consumption, injection system, carburetor system

1. INTRODUCTION

The development of technology in the field of automation is currently very rapid, one of the things that is widely used by the public is the motorcycle. Motorbikes are used as a means of transportation. Fuel combustion on a motorcycle both injection system and carburetor system can both produce pure gas [1]. In a two-wheeled vehicle, a component that serves as a place for combustion or a mixture of air and fuel is the carburetor [2]. The injection system on gasoline motors or often called injection motors functions to mix fuel and air in the intake manifold [3].

There are two kinds of suppliers of air and fuel mixture in a gasoline motor namely injection system and carburetor system. Please note that the carburetor system with the injection system has a completely different working principle. Carburetor is a device that mixes air and fuel for internal combustion engines [4]. Can be shown in Figure 1.

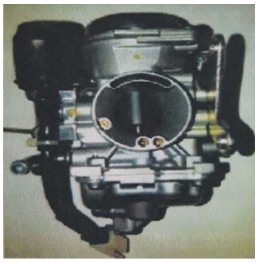

Figure 1. Carburetor System

While the injection system is a technology used in an internal combustion engine to mix fuel and air before burning, shown in Figure 2.

Figure 2. Injection System

The advantages and disadvantages of the injection system and carburetor system. The advantages of the injection system are as follows; The mixture of air and fuel is always accurate (ideal ratio on engine speed, pull is more responsive, the engine is easily started without being affected by changes in weather conditions, and environment friendly. Lack of injection system as follow; maintenance must be in a special workshop, the price of spare parts is more expensive, more sensitive to the quality of the fuel, and the electrical system is very complicated [3] The advantages of the carburetor system are as follows: cheaper compared to the injection system, the number of components is less, maintenance is easier and simple. The disadvantages of the carburetor system are as follows; done manually and can only be done once, requires more precise adjustments for all conditions, cannot cope with every different rotation condition, it needs additional components so that the carburetor works to adjust conditions such as an acceleration pump [4].

At present the carburetor system technology has arguably been abandoned by automotive manufacturers, especially motorcycles, while the injection system that is applied to motorcycle engines today is quite modern. But in fact, this relatively modern injection system cannot yet be fully understood by some people or motorbike users the value of fuel consumption between the injection system and the carburetor system. Based on these problems, researchers are interested in discussing "Analysis of Fuel Consumption Against the Injection System and Carburetor System on Beat Motorcycles in 2013. In an effort to overcome the problems that arise or are poorly understood injection systems by motorcycle motor users, especially beat 2013 motorcycle users. this needs to be explained experimentally through research.

The objectives in this study can be divided into two types: (1) The general objective to be achieved in this study is to determine the value of fuel consumption in the injection system and carburetor system, (2) The specific objectives to be achieved in this study are as follows: (a) Knowing how much the value of fuel consumption with the injection system at 2000, 2500 3000, 3500, and 4000 rpm rotation variations, (b) Knowing how much the carburetor system fuel consumption values in the 2000, 2500, 3000, 3500, and 4000 rpm rotation variations (c) Knowing how big is the difference in fuel consumption value between the injection system and the carburetor system in 2000, 2500, 3000, 3500, and 4000 rpm rotation variations.

The benefits in this study can be divided into two types: theoretical benefits and practical benefits. Theoretical benefit are: (a) the results of this study are expected to contribute thoughts in the development of science and technology related to automotive, (b) the results of this study are expected to be used as a reference by other researchers in conducting similar studies. (c) the results of this study are expected to be used as a reference in determining the fuel supply system to the combustion chamber. Practical benefits are: (a) useful for motorcycle users to change the fuel supply system to be more efficient, (b) the results of this study can be used as a reference in choosing a fuel supply system, whether using an injection system or using a carburetor

system, (c) useful for readers to increase knowledge about the injection system and the carburetor system, can find out the fuel consumption on the beat motorcycle 2013, from both types of systems.

Based on the description of the background, objectives and benefits above, this research is deemed necessary.

2. METHODS

2.1 Type of Research

This type of research is a research experiment. Research experiment is a study in which there is a treatment of the research object. Research experiments can elucidate explanations about "reasons why". Cause and effect relationships can be known because this study is possible to treat the research object [5].

2.2 Research Location and Time

The place to collect data on the 2013 Honda beat FI motorcycle is at the Global Motor workshop, Taman Griya, South Kuta, Badung. The time of delivery is in January 2020.

2.3 Data Sources

Primary data is data obtained by conducting experiments, then the results are tabulated. Secondary data is data obtained from library studies that are related to the research conducted.

2.4 Research Instruments

Some instruments or tools used in this research process include:

1. Tachometer. Tachometer is used to measure engine speed (rpm). Tachometer is used by directing the laser beam to the rotating machine component parts.
2. Thermometer. A thermometer is used to measure the temperature of the machine before testing. Thermometer is used by attaching the thermometer cable to the engine block being tested.
3. Measuring cup. Measuring cup is used to measure fuel consumption (ml). You do this by looking at the lines on the measuring cup.
4. Stopwatch. Stopwatch is used to measure fuel consumption time.

2.5 Research Procedure

The procedure in this study is as follows:

1. Survey and preparation of tools
2. Retrieval of data

The steps in taking the fuel consumption testing data on the injection system and carburetor are as follows:

a. Prepare the tools used and the ingredients.
b. Place the tools and materials in a clean place.
c. Open the front cover of the engine.
d. Open and release the saddle and trunk parts for comfortable and free data collection.
e. Remove the fan cover on the engine magnet to easily censor the magnet by using a tachometer to find out the rpm.
f. Empty the fuel tank to be completely empty.
g. Fill the measuring cup with Pertamax 200 ml and pour the fuel tank.
h. Start the engine according to rpm 2000, 2500, 3000, 3500, and 4000 rpm.
i. Prepare a stopwatch, with 10 minutes per rpm, with 200 ml of fuel.
j. Data retrieval is carried out three times for each rpm, in order to get maximum results.
k. Make a note of the results of these tests, and tabulated.

2.6 Data Analysis

The data that has been obtained is then processed and analyzed by conducting tests to determine the amount of fuel consumption with the injection system and the carburetor system.

3. RESULTS AND DISCUSSION

From the tests conducted, obtained test data for each of the conditions tested. The conditions of testing carried out include: Fuel consumption by injection system and fuel consumption by the carburetor system, each carried out three times the test.

3.1 Data Testing

Measurement data on fuel consumption by injection system and carburetor system which have been averaged, then used to calculate the magnitude of the differences of the two systems, shown in the table.

Table 1. Fuel Consumption in the Injection System

Engine Speed (rpm)	Fuel (ml)	Time (minute)	Test Results (ml)			Average (ml)
			1	2	3	
2000	200	10	40	40,5	40,5	40,33
2500	200	10	45,5	45,5	40,5	43,83
3000	200	10	50	55	50,5	51,83
3500	200	10	55,5	60,5	60,5	58,83
4000	200	10	60,5	65	63,5	62.83
					Average	51,53

Table 1 shows that the tests were carried out with rotation variations of 2000, 25000, 3000, 35000, and 4000 rpm, with 200 ml of fuel and a time of 10 minutes, with the average value of fuel consumption with the injection system being 51.56 ml.

Table 2. Fuel Consumption in the Carburetor System

Engine Speed (rpm)	Fuel (ml)	Time (minute)	Test Results (ml)			Average (ml)
			1	2	3	
2000	200	10	80	75	75	77
2500	200	10	85	85	80	83
3000	200	10	95	100	95	97
3500	200	10	105	110	105	107
4000	200	10	120	115	120	118
Average						96,40

Table 2 shows the tests carried out with variations of the rotation of 2000, 25000, 3000, 35000, and 4000 rpm, with 200 ml of fuel and a time of 10 minutes, with the average value of fuel consumption with the carburetor system is 96 ml.

Table 3. Average Fuel Consumption in the Injection System and Carburetor System

Engine Speed (Rpm)	Average Fuel Consumption Results (ml)		The mean difference (ml)
	Injection System	Carburetor System	
2000	40,33	77	36,67
2500	43,83	83	39,17
3000	51,83	97	45,17
3500	58,83	107	48,17
4000	62,83	118	55.17
Average	51,53	96,40	44,87

Table 3 shows that the average value of fuel consumption with the injection system is 51.53 ml, while the average value of fuel consumption with a carburetor system is 96.40 ml, there is a difference in the value of fuel consumption by 44.87 ml, or by 47%. Means that the use of the fuel system with an injection system on a 2013 beat motorcycle is more economical compared to a carburetor system.

3.2 Discussion

Subjects in this study were 2013 beat FI motorcycles, OHC 4-stroke engine type, 110 cc stroke volume, 9.2: 1 compression ratio, 3.7 liter fuel tank capacity, premium fuel [6].

In the test data the results of data calculations showed that there was a difference in the value of fuel consumption between the injection systems by 51.53 ml, whereas with a carburetor system of 96.40 ml, the difference was equal to 44.87 ml or 47%. Means that the use of the fuel system with an injection system on a beat motorcycle in 2013 is more economical than the carburetor system.

The injection system is more economical, because the injection system is more economical, because the injection system is equipped with an electronic system that functions to regulate the injection work system, namely the ECM (electronic control module) which has standardized controls and controls from the manufacturer. This ECM can automatically control the amount of fuel and air mixture that fits in certain engine speed conditions [3]. In the injection motor system there is also air control, this sensor helps ECM to circulate the right AFR (air-fuel ratio) according to the ideal mixture of fuel and air which is 14.5: 1 or 14.5 grams of air versus 1 gram of material burn [3].

In the carburetor system the results of the calculation of data are more wasteful, because in the carburetor system mixing fuel and air still experience many processes in the carburetor, unlike the injection system which directly sprays a mixture of material and air into the combustion chamber. In the carburetor system the mixture of fuel and air that will enter the combustion chamber depends on the piston stroke [7]. In the carburetor system an optimal setting is needed so that the fuel mixture burns completely and is not wasted which causes wasteful fuel consumption and poor exhaust emissions [4].

4. CONCLUSION

Based on the results of the changes made, it can be concluded that with the injection system the average value of fuel consumption is 51.53 ml, whereas with the carburetor system the average value of fuel consumption is 96.40 ml, this means that there is a difference between the average value of fuel consumption in the injection system with a carburetor system of 44.87 ml or 47%. So that the talent material injection system is more economical than the carburetor system, because the injection system is equipped with an ECM (electronic control module), which functions to directly control the fuel mixture in the engine chamber at certain engine speeds.

In the carburetor system is more wasteful, because the supply of a mixture of fuel and air into the combustion chamber undergo a working process of piston movement.

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