

Effect of Variations Fuel Heating on Fuel Consumption for the Suzuki SJ410 Engine

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Abstract – Transportation is one of the needs to make a movement from one place to another place. One of generally used transportation is motorized vehicles that run on gasoline. Fuel consumption affects the power generated as well as the costs incurred and the time required by motorized vehicles to carry out their functions. This research method uses experiment research to conduct performance tests using a Suzuki SJ410 motorized vehicle with an F10A type engine and a capacity of 970 cc. The test was carried out by carrying out the treatment of heating premium fuel through a copper pipe that was installed on the radiator upper tank with a length of 450 mm (mod 1) and 900 mm (mod 2) and also under standard conditions (STD). The results obtained stated that fuel consumption under standard conditions (STD) fuel consumption for 26.03 s/50 ml, for a pipe length of 450 mm (mod 1) for 31.90 s/50 ml and for a pipe length of 900 mm (MOD 2) for 33.27 s/50 ml.

Keywords- efficiency; carburetor; fuel consumption; Suzuki SJ410.

I. INTRODUCTION

The development of the automotive world is very rapid with new innovations to improve motor vehicle products. Motorized vehicles are a means of transportation that require engines as prime movers [1]. Gasoline motors are one of the internal combustion engines, very commonly used in our world of life [2]. Energy sources derived from petroleum are increasingly depleted due to continued human use without being matched by the discovery of renewable energy [3]. The increasing consumption of fuel oil causes the availability of fossil energy to decrease and has an impact on increasing world oil prices [4]. In the long term energy consumption causes a decrease in economic growth [5]. One of the efforts to save fuel consumption is to increase the efficiency of fuel use. Engine efficiency is the ability of the machine to be able to convert energy from fuel into mechanical power [6].

Motorized vehicle Suzuki SJ410, one of the types of offroad vehicles with a capacity of 970 cc, is equipped with an F10A type engine which is known for being fuel efficient and tough in use, still using a carburetor system. The carburetor functions to mix fuel with air so that it becomes a homogeneous mixture at the required ratio [7]. To be able to increase engine power with a carburetor system requires treatment so that the efficiency of fuel use can be optimal. Engine performance parameters can be seen from torque, power and fuel consumption [8]. The process of burning fuel in the cylinder is influenced by temperature, mixture density, composition and turbulence present in the mixture [9]. If the temperature of the gasoline rises, it causes the particle size to become smaller and

evaporates easily, causing the air-fuel mixture to burn more easily in the cylinder when exposed to sparks from the spark plug. The perfection of the fuel combustion process in the engine will affect fuel consumption and pollutant content in the exhaust gas [10]. Fuel consumption is the amount of fuel needed to produce power in a certain time [11].

This study conducted an experiment by providing treatment for premium fuel by heating the fuel through a copper pipe that was installed on the upper tank radiator, so that it is expected that the temperature of the fuel condition can increase, the fuel mixture which has a high temperature is expected to burn with perfect. heating is done by utilizing the fluid in the radiator which is in the radiator upper tank by making a heating channel made of copper pipes through the radiator upper tank, then the fuel before entering the carburetor is flowed through the pipe. variations made during the study based on the length of the pipe, namely 450 mm and 900 mm with a pipe diameter of 6 mm. With this treatment, it is expected that fuel combustion will be more perfect and can increase engine power so that the amount of fuel used is less. The research Marinus S et al. showed that the higher the fuel temperature, the lower the consumption, so it can be concluded that heating the fuel affects the efficiency of fuel consumption [12]. Research by Ilham et al, The addition of a fuel heater has a significant effect on power and fuel consumption than without using a fuel heater [13]. The fuel used in this study was PERTAMINA gas station standard premium with RON 88. The rotation of the motor used in this test used low rotation of 2500-3400 rpm, medium rotation of 3500-4400 rpm and high rotation of 4500-5400 rpm. Fuel consumption is measured by the time it takes the engine to use up 50 ml of premium fuel in a measuring cup.

II. METHODS

The method in this study used experimental research using two groups, the first group was given treatment while the second group was without treatment. Experimental research methods can be interpreted as research methods used to find the effect of certain treatments on others under controlled conditions [14]. The research object used in this study was the Suzuki SJ410 with the F10A 4-cylinder 970 CC engine type made in 2000 under standard no-load conditions. Several things that affect engine performance are the octane rating of the fuel, its compression ratio, the air pressure entering the combustion chamber, and the level of homogeneity of the fuel and air mixture [15]. The equipment used in this test includes: On wheel chassis dynamometer, measuring cup, stopwatch, tachometer, tool contact set, thermometer

The stages in this study are presented in Fig. 1. In the research, it begins with finding a focus that will be used as research, followed by searching the literature to get references related to the research. Then next stage is to collect tools and materials that support the research process and manufacture pipes with different length variations. Testing on the engine using a pipe that had been made with a length of 450 mm (MOD 1), a length of 900 mm (MOD 2) and also without additional pipe length for standard conditions (STD) to flow fuel to the carburetor. Data collection was carried out during testing and then the data was processed and analyzed, so that the results obtained were in the form of differences between the standard conditions (STD), the conditions before the addition of pipe treatment (without heating) and conditions with additional treatment of pipes (using heaters with variations in pipe length).

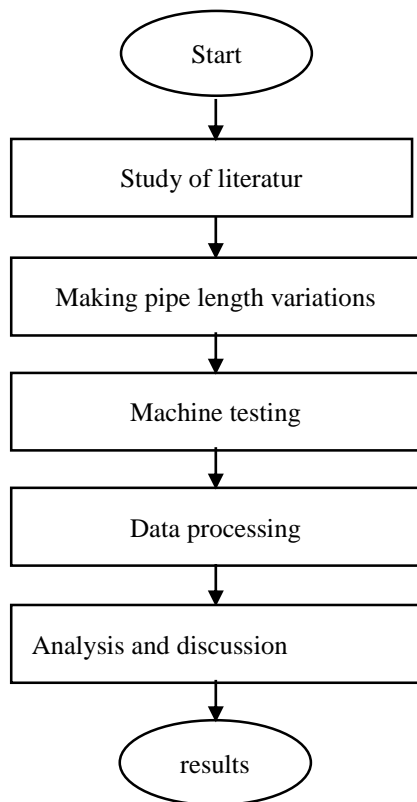


Fig. 1. Research flow chart

III. RESULTS AND DISCUSSION

Table 1 shows the test results on the Suzuki SJ410 4-cylinder 970 cc fuel consumption with and without heating. From table 2. which is the result of research data conducted at engine speed in multiples of 100 rpm starting from 2500 rpm to 5400 rpm. The average fuel consumption time required for the Suzuki SJ410 engine using a fuel heater with a pipe length of 900 mm (MOD 2) for 33.27 s/50 ml is greater than the engine without using a fuel heater (STD) which produces a for 26.03 s/50 ml and using a fuel heater with a pipe length of 450 mm (MOD 1) for 31.90 s/50 ml. With the increasing amount of fuel burned, the increase in pressure that occurs in the combustion chamber due to combustion will increase which in turn will increase the power generated by the combustion engine. So that with the same load fuel consumption will be reduced.

TABLE 1. TEST RESULTS ON THE SUZUKI SJ410 4-CYLINDER 970 CC WITH HEATING AND WITHOUT HEATING

No	RPM	Without Using a Heater (STD)	Using a Heater	
			Heating Pipe Length 450 mm (MOD 1)	Heating Pipe Length 900 mm (MOD 2)
		Consumption of fuel (s/50ml)	Consumption of fuel (s/50ml)	Consumption of fuel (s/50ml)
1	2500	32,04	37,89	39,27
2	2600	31,63	37,48	39,00
3	2700	31,22	37,07	38,45
4	2800	30,80	36,65	38,03
5	2900	30,39	36,24	37,62
6	3000	29,97	35,82	37,20
7	3100	29,56	35,41	37,05
8	3200	29,14	35,20	36,37
9	3300	28,73	34,58	35,96
10	3400	28,32	34,17	35,55
11	3500	27,90	33,75	35,13
12	3600	27,49	33,34	34,72
13	3700	27,07	32,92	34,30
14	3800	26,66	32,51	33,89
15	3900	26,24	32,09	33,47
16	4000	25,83	31,68	33,04
17	4100	25,42	31,27	32,65
18	4200	25,00	31,05	32,23
19	4300	24,59	30,44	31,52
20	4400	24,17	30,02	31,40
21	4500	23,76	29,61	31,03
22	4600	23,34	29,19	30,57
23	4700	22,93	28,78	30,16
24	4800	22,52	28,37	29,75
25	4900	22,10	27,95	29,33
26	5000	21,69	27,54	28,92
27	5100	21,27	27,30	28,50
28	5200	20,86	26,71	28,09
29	5300	20,44	26,29	27,67
30	5400	20,03	25,88	27,26

TABLE 2. STATISTIC ANALYSIS OF FUEL CONSUMPTION DATA ON THE SUZUKI SJ410 ENGINE

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
STD	30	26,0370	3,64720	,66588	24,6751	27,3989	20,03	32,04
MOD 1	30	31,9067	3,64378	,66526	30,5461	33,2673	25,88	37,89
MOD 2	30	33,2710	3,66733	,66956	31,9016	34,6404	27,26	39,27
Total	90	30,4049	4,79616	,50556	29,4004	31,4094	20,03	39,27

REFERENCE

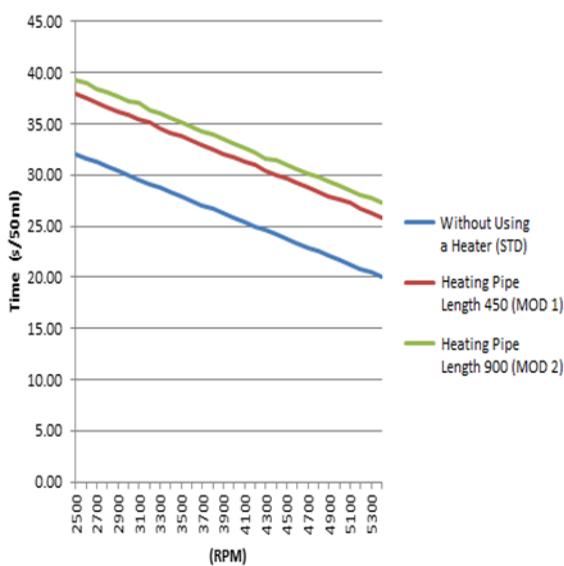


Fig. 2. Graph of fuel consumption test results on the Suzuki SJ410 engine

Fig. 2. shows the difference in achieving maximum fuel consumption time for engines using fuel heaters with a pipe length of 900 mm (MOD 2) for 39.27 s/50 ml greater than engines without using fuel heaters (STD) which takes time. for 32.04 s/50 ml and using a fuel heater with a 450 mm tube length (MOD 1) for 37.89 s/50 ml. The fuel consumption time needed by the engine using a fuel heater is longer than the engine without using a fuel heater.

IV. CONCLUSION

By treating the engine's fuel consumption on the Suzuki SJ410, using a fuel heater with a pipe length of 900 mm (MOD 2) has the best effect on the average 50 ml of gasoline for 31.90 seconds and third place in standard conditions (STD) record for the longest time consuming 50 ml of gasoline for 33.27 seconds, while in the second place fuel heating using a pipe with a length of 450 mm (MOD 1) spends an average of spends an average of 50 ml gasoline for 26.03 seconds.

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