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Variations in Electrode Shape and Fuel Variation on Motorcycle Bike Power and Top Speed

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ABSTRACT
In gasoline engines, spark plugs produce sparks to burn fuel to affect the combustion process. To produce a perfect combustion process, the two parameters need special attention, so that combustion failure does not occur which can reduce engine performance. The objective is to determine the minimum maximum power and top speed on a 150 cc petrol engine. The research method is in the form of experimental laboratory research with data collection using the open full throttle method and the results of the data will later be processed into tables and graphs . The results of research on power with sharp iridium spark plugs with octane 92 fuel produce a maximum power of 15.86 hp at 10,000 Rpm and a minimum power of 3.19 hp at 1500 rpm, power with round iridium spark plugs with octane fuel 92 produces a maximum power of 15.83 hp At 10,000 Rpm the minimum power is 3.16 hp at 1500 rpm, and when using standard spark plugs it produces a maximum power of 15.61 hp at 10,000 rpm and a minimum power of 3.13 hp at 1500 rpm. Meanwhile, power with iridium spark plugs with 95 octane fuel produces a maximum power of 15.95 Hp at 10,000 Rpm and a minimum power of 3.38 hp at 1500 Rpm, power with round iridium spark plugs with 95 octane fuel produces maximum power at 15.90 hp at 10,000 Rpm and a minimum power of 3.31 Hp at 1500 Rpm and when using standard spark plugs it produces a maximum power of 15.85 Hp at 10,000 Rpm and a minimum power of 3.23 Hp at 1500 Rpm. The best power is produced by taper iridium spark plugs with 95 octane fuel. The results of the top speed, speed (Km/h) with taper iridium spark plugs with 92 octane fuel results in a peak speed of 148.49 km/h, for the use of round iridium spark plugs in obtain a top speed of 148.15 km/hour, and for the use of standard spark plugs, a peak speed of 146.28 km/hour is obtained. Whereas the use of 95 octane fuel with taper iridium spark plugs produces a peak speed of 149.66 Km/hour, and the use of round iridium spark plugs produces a peak speed of 149.03 Km/hour and the use of standard spark plugs produces a top speed of 148.10 Km /O'clock. So it can be concluded that the highest peak speed is obtained by using sharp iridium spark plugs with 95 octane fuel, which is 148.49 km/hour. And for the fastest time obtained on the use of sharp iridium spark plugs with 95 octane fuel , which is equal to 2.6 s

Keywords: *spark plug, power, speed, taper, round, standard and octane*

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I. Introduction

Every motorized vehicle is always equipped with technical specifications set by the manufacturer, all of which are called standard specifications.

In the combustion process, the existence of a spark plug plays an important role when the combustion process takes place because if it does not play a role, it will result in incomplete combustion or nonstoichiometry. This condition will have an impact on the overall performance of the vehicle engine. Because the spark plug functions to sprinkle sparks in the combustion chamber, one way to get perfect combustion is to increase the intensity of the spark ignition from the spark plug. And also the shape of the spark plug electrodes affects the sparks that are produced. Sharp electrodes will affect the results of sparks that are more focused so that the combustion process can be more complete [1], so the shape of the electrodes will affect the sparks produced.

The use of fuel can also greatly affect engine performance because fuel is a matter in the form of material that can usually be converted into energy, so the higher the octane rating in the fuel, the better the engine performance because the fuel combustion process is also more perfect. So it will be good for the engine and also the performance of the vehicle. But it also needs to be underlined that the use of fuel also needs to see the needs of the engine if the higher octane will make the engine heat up quickly [2].

1.1.1 Stroke motor

Based on the occurrence of the combustion process, there are 2 (two) types of engines, namely internal combustion engines and external combustion engines [3]. The combustion engine is included in the internal combustion engine where in this engine the process of converting the chemical energy of the fuel into combustion heat energy which then becomes mechanical or mechanical energy occurs inside the engine itself. Meanwhile, based on the working principle, a 4-stroke motor generates power if it has worked 4 times the piston stroke or 2 crankshaft rotations. To open and close the inlet (intake manifold) and cylinder outlet (exhaust manifold) is done by the valve.[4] for the working step of the 4 stroke motor as follows:

1. The suction step: the piston moves from TMA to BDC, the in valve opens and the ex-valve closes. This condition causes a vacuum to occur in the combustion chamber so that fuel will automatically be sucked into the cylinder chamber.
2. Compression stroke: the fuel mixture enters the cylinder chamber, the piston moves from BDC to TMA, the in and ex valves close, the fuel mixture is compressed. The narrowing of space causes pressure and temperature to increase. Approaching the final step of compression, the spark plug sparks and the combustion process occurs.
3. Step effort: burning fuel produces an explosion and makes the piston pushed by the pressure from the explosion which makes the piston towards the TMB so that it produces a thrust to rotate the crankshaft.
4. Exhaust stroke: the piston moves from TMB to TMA, the in valve closes and the ex-valve opens, the remaining combustion gases will be pushed out by the piston movement to expel the combustion residual gases.
5.

1.1.2 spark plug

Motorcycle spark plugs are electrical components used for the process of burning fuel in motorcycle engines. The spark plug is on the inside of the combustion engine with an iron electrode tip in the combustion chamber. The spark plug's job is to spark the sparks needed to burn the compressed air and fuel mixture until it becomes a business step.[5]

Spark plugs also have a variety of electrode shapes. Spark plugs that offer good performance are spark plugs that are able to reduce resistance, which means it inhibits the flame explosion process. Meanwhile, the smaller the electrode, the smaller the resistance and also the material from which it is made also affects it. With a stronger fire explosive power, of course, in the end it can make fuel use efficiency better.[6]

1.1.3 Power

Power is the ability to generate torque at a certain rev or speed. Power describes the amount of engine work output related to time, or the average work produced. The power function produces the optimum speed, when road conditions are flat. So the higher the engine speed generated, the power generated also increases. [7].

1.2 METHOD

The research method is in the form of laboratory experimental research with data collection using the open full throttle method and for the results of the data will be processed into tables and graphs.

1.2.1 Tools and Materials

The tools and materials used for research are as follows:

Table 1: Research Tools and Materials

No	Information	
1.	Material	Iridium spark plugs (round and taper electrodes)
		150 cc motorbike
		92 and 95 octane gasoline
2.	Tool	Power meter (dyno test)
		Spark Plug Lock
		Hoses and fuel reservoir
		blowers

1.2.2 Equipment Settings

The procedure for using the test equipment is described as follows:

1. First check the chain wheel adjustment and tire pressure, especially the rear tires.
2. Turn on the computer and enter the current temperature and humidity data into the program. As well as setting the received folder to save the DYNOTEST results.
3. Lift the motor on the DYNOTEST machine, insert the front wheel into the wheel slot, then adjust the length of the motor with the DYNOTEST machine roller. The motor length adjustment is adjusted until the wheel axis is aligned with the roller axis.

4. The RPM sensor leads are connected to the coil leads. Then the frame tie straps are attached to the front of the motorcycle and clipped to the DYNOTEST bodywork. Once installed, tighten it and the left and right tightening process must be straight in balance so that the bicycle is completely upright.
5. The engine is turned on and allowed to stand for a moment so that the engine reaches its ideal temperature.
6. Enter the data about the vehicle being tested and the program in run mode where in this method the program is ready.
7. Then run the engine until the number of revolutions to be tested is reached (the rear wheel must continue to turn). When it reaches the RPM to test, it waits for a code from whoever pressed the starter button.
8. After the start button is pressed, the motorcyclist must open the gas to the maximum until the engine shows its maximum capacity (RPM MAX). When the start button is pressed, it indicates that the PC program is carrying out the process of recording graphics. The start button pressure must coincide with the pilot opening the throttle.
9. After the machine reaches its maximum capacity, immediately press the start button again.
10. Then on the PC monitor you can see the results in the form of graphs and tables.

II. RESULTS AND DISCUSSION

The compiler performs data processing on power and top speed test data. The data that has been obtained is then plotted into a graph and processed. After data collection was carried out three times, the average was taken from each test performed.

1.3.1 Power Test (Hp)

Table 2: Data on average power yields of 92 octane fuel

Rpm	Testing with 92 octane gasoline		
	average		
	hp std	Round phone	Sharp cellphone
1500	3,13	3,16	3,19
2000	3.65	3.81	3.85
3000	5.09	5,13	5,18
4000	6,32	6,47	6,68
5000	7,74	7.96	8,15
6000	9,20	9.77	9,83
7000	10.74	11,22	11.37
8000	12.34	12.5	13.05
9000	14,11	14,18	14.38
10000	15,61	15.83	15.86

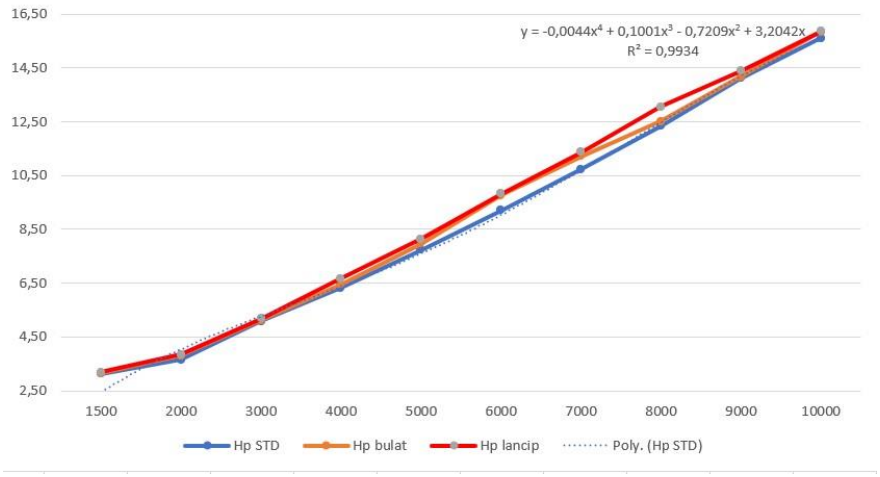

Figure 1: Power test graph using Octane 92 Fuel

From Figure 1 the results of the test analysis above it can be said that iridium spark plugs which have pointed electrodes affect the power of the motorcycle, because the sharp iridium spark plugs have a better and more focused electric jump than round electrode iridium spark plugs and make the fuel burn more completely even though it uses the same fuel from both types of taper and round spark plug electrodes.

The results of the power test for motorcycles using 92 octane fuel with standard iridium spark plugs produced the highest power of 15.61 Hp at 10,000 Rpm and the lowest of 3.13 Hp at 1500 Rpm round producing the highest power of 15.83 Hp at 10,000 Rpm and for power the lowest was at 1500 Rpm with a result of 3.16 Hp, while testing with iridium taper spark plugs produced the greatest power of 15.86 Hp at 10,000 Rpm and for the lowest power at 1500 Rpm of 3.19 Hp. Based on these results indicate an increase in power after using iridium taper spark plugs. The advantage of taper iridium spark plugs is that the electric jump becomes more focused because the tip of the electrode is in the shape of a taper, making the combustion process happen better.

Table 3: Data on average power yields of 95 octane fuel

Rpm	Testing with 95 octane gasoline		
	average		
	hp std	Round phone	Sharp cellphone
1500	3,23	3,31	3.38
2000	4,19	4,22	4,29
3000	5,22	5,31	5,51
4000	6,32	6,46	6,52
5000	8.04	8,19	8,25
6000	9.57	9.94	9.97
7000	11,12	11,4	11.55
8000	12.40	12,6	12.84
9000	14,13	14,2	14,32
10000	15.85	15.90	15.95

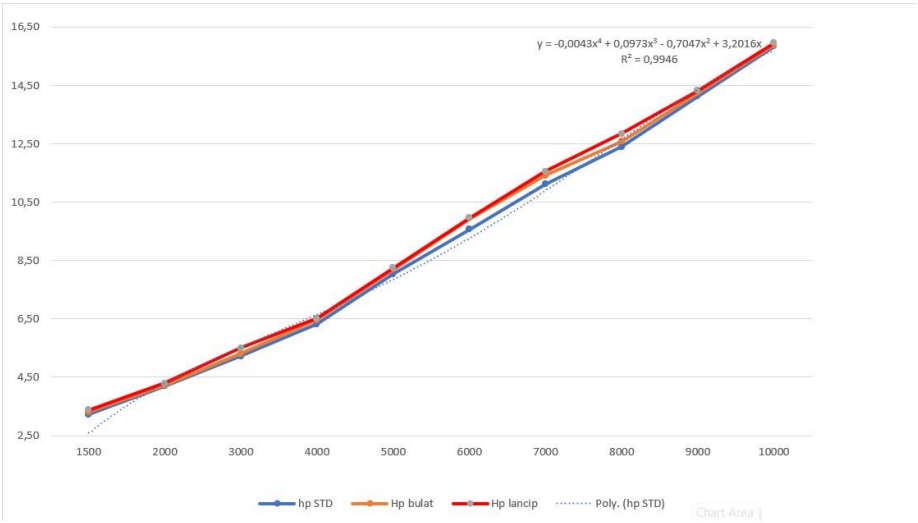

Figure 2: Power test graph using Octane 95 Fuel

From Figure 2 the results of the analysis of the power test above show that the use of iridium spark plugs with pointed electrodes has increased compared to round electrode iridium spark plugs. This is because the pointed tip iridium spark plugs have more focused sparks compared to round iridium spark plugs which ultimately makes combustion better and also the fuel has a high octane which makes combustion more complete than fuel that has a lower octane.

Based on Figures 1 and 2, the test results obtained, the power generated from testing the motor using a combination of sharp iridium spark plugs and using 95 octane fuel is greater. Octane 95 fuel that uses sharp iridium spark plugs which results in a more optimal combustion process has a positive impact on increasing the resulting engine power. 83 Hp while the sharp iridium spark plugs get 15.86 Hp, but when using octane 95 the highest power is obtained with standard spark plugs of 15.85 Hp when using round iridium spark plugs of 15.90 Hp while when using iridium taper spark plugs it is 15.95 Hp. So, it can be concluded that the combination of 95 octane fuel and the use of sharp iridium spark plugs makes motorcycles show increased power due to more complete combustion resulting in maximum combustion explosions. The explosion gives impetus to the piston, the greater the thrust, the faster the piston moves for the next process so that the power generated is also greater.

1.3.2 Top speed Speed (Km/H)

Figure 3: Graph of speed using Octane 92 Fuel

The results of the next test are data from the use of standard spark plugs, round iridium spark plugs and sharp iridium spark plugs with variations in fuel for top speed using 92 octane fuel, the graph presented in Figure 3 is obtained. with 92 octane fuel produced the highest peak speed of 148.49 km/hour and the use of standard iridium spark plugs with 92 octane fuel produced the lowest speed of 146.28 km/hour.

Figure 4: Speed chart using Octane 95 Fuel

The results of the next test are data from the use of standard spark plugs, round iridium spark plugs and sharp iridium spark plugs with variations in fuel for top speed using 95 fuel, a graph is obtained as shown in Figure 4. From Figure 4 it is described that when using iridium taper spark plugs with 95 octane fuel produces the highest peak speed of 149.66 km/hour and the use of standard iridium spark plugs with 92 octane fuel produces the lowest speed of 148.10 km/hour.

1.3.3 Top speed Time(s)

Figure 5: Graph of travel time using Octane 92 Fuel

In Figure 5, it is described that when using standard spark plugs, round iridium spark plugs and sharp iridium spark plugs with variations in fuel for the top speed time (s) using 92 fuel, a graph is obtained as shown in Figure 5. Figure 5 describes that using iridium taper spark plugs with 92 octane fuel produces the fastest travel time of 2.7 s and the use of standard spark plugs with 92 octane fuel produces the lowest time of 3.6 s.

Figure 6: Graph of travel time using Octane 95 Fuel

In Figure 6, when using standard spark plugs, round iridium spark plugs and sharp iridium spark plugs with variations in fuel for the top speed time (s) using 95 fuel,a graph is obtained as shown in Figure 6. Figure 6 describes that when using iridium spark plugs taper with 95 octane fuel produces the fastest travel time of 2.6 s and the use of standard spark plugs with 92 octane fuel produces the lowest time of 2.9 s.

III. CONCLUSION

Based on the results of testing and data processing that has been carried out on power and top speed using iridium spark plugs with variations in the shape of sharp and round electrode tips, it can be concluded as follows:

1. The results of research on power with sharp iridium spark plugs with octane fuel 92 produce a maximum power of 15.86 Hp at 10,000 Rpm and a minimum power of 3.19 Hp at 1500 Rpm, power with round iridium spark plugs with octane fuel 92 produces a maximum power of 15 .83 Hp At 10,000 Rpm the minimum power is 3.16 Hp at 1500 Rpm, and when using a standard spark plug it produces a maximum power of 15.61 Hp at 10,000 Rpm and a minimum power of 3.13 Hp at 1500 Rpm. While power with taper iridium spark plugs with 95 octane fuel produces a maximum power of 15.95 Hp at 10,000 Rpm and a minimum power of 3.38 Hp at 1500 Rpm, power with round iridium spark plugs with octane fuel 95 produces maximum power at 15, 90 Hp at 10,000 Rpm and a minimum power of 3.31 Hp at 1500 Rpm and when using standard spark plugs it produces a maximum power of 15.85 Hp at 10,000 Rpm and a minimum power of 3.23 Hp at 1500 Rpm. For the best power produced by taper iridium spark plugs with 95 octane fuel.
2. The results of research on top speed, speed (km/h) with a taper iridium spark plug with 92 octane fuel produces speed the peak reached 148.49 km/hour, for the use of round iridium spark plugs a peak speed of 1.48.15 km /hour was obtained, and for the use of standard spark plugs the peak speed was obtained for 146.28 km/hour. While using 95 octane fuel with sharp iridium spark plugs produces a top speed of 149.66 km/hour, and for the use of round iridium spark plugs produces a peak speed of 1 49.03 Km /hour and for the use of standard spark plugs produces a peak speed of 148.10 Km/hour. So it can be concluded that the highest peak speed is obtained by using sharp iridium spark plugs with 95 octane fuel, which is 148.49 km/hour.
3. The results of research on top speed, time (s) with a taper iridium spark plug with 92 octane fuel produces the fastest time of 2.7 s, for the use of round iridium spark plugs we obtain fastest time of 3.03 s , and for the use of standard spark plugs obtained fastest time in 3.6 s . While using 95 octane fuel with sharp iridium spark plugs produces the fastest time reaching 2.6 s, and for the use of round iridium spark plugs produces the fastest time in 2.8 s and for the use of standard spark plugs produces the fastest time of 2.9 s. So it can be concluded that the fastest time is obtained by using sharp iridium spark plugs with 95 octane fuel , which is equal to 2.6 s .

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