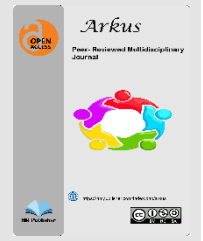




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Differences of Power and Torsion Output in One Cylinder Motorcycle

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ABSTRACT

The purpose of this literature review is to describe the differences of power, torsion, and fuel consumption output of an one cylinder motorcycle which given ignition system variances between CDI standart, CDI racing, standart spark plug, and iridium spark plug used three kinds of gasoline premium, pertamax, and pertamax plus. minimum fuel consumption can be obtained by reduce the ignition system which followed by appropriate octane gasoline usage in this case reduce the ignition system into CDI racing kurva 2 and standart spark plug using pertamax gasoline.

1. Introduction

Technological developments at this time are increasingly rapid, encouraging humans always to create innovations. Technological developments also occur in the automotive sector, especially in combustion engines. The combustion engine is one of the internal combustion engines or often referred to as an internal combustion engine, namely a machine that converts energy thermal energy into mechanical energy. The energy itself can be obtained from the combustion process. One of the simple motorized vehicle transportation tools that are widely used by society today is the motorcycle. The ability of a motorcycle is influenced by several factors, including the quality of the fuel and the ignition system. The use of poor quality fuel can result in a decrease in

motorcycle engine performance. Therefore, the selection of the right fuel refers to the compression ratio of each motorcycle. The higher the compression ratio of a motorcycle, the better the quality of fuel it must use.¹

The motorcycle is a means of transportation that is driven by a gasoline engine. The type of gasoline can be divided into three types, namely premium, pertamax, and pertamax plus. The difference between these three types of fuel is in the octane number, where the octane number usually indicates the quality of the fuel. The higher the octane number, the more expensive the price per liter. Motorcycle engines require the type of fuel according to the engine's design to work correctly and produce optimal



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performance.^{2,3}

The low octane number allows the fuel to detonate. Fuel that is easy to detonate will reduce motor performance because it will experience power losses due to fuel-burning prematurely and making fuel consumption more wasteful. After all, the combustion is not perfect, while the higher the octane number allows the fuel not to detonate to increase fuel consumption. Motor performance and make combustion more perfect so that fuel consumption becomes efficient. The ignition system is one of the many components of a motorcycle that is most often developed. Obtaining good engine performance required a good ignition system as well. The ignition system is a critical system on a motorcycle.^{4,5}

According to Jama and Wagino (2008b: 165), the ignition system on a gasoline engine regulates the combustion process of a mixture of gasoline and air in the cylinder according to a predetermined time, namely at the end of the compression stroke. The ignition system is very influential on the engine's power, torque, and fuel consumption. The ignition system, especially on the four-stroke gasoline motor, has undergone many improvements. The motorcycle started to produce ignition systems on gasoline motors using a conventional ignition system (platinum). The conventional ignition system is an ignition system that uses platinum (contact breaker) to disconnect and connect the battery voltage to the primary coil.^{6,7}

Conventional ignition systems on motorcycles have developed, namely the CDI (capacitor discharge ignition) ignition system. The conventional ignition system has begun to be abandoned by motor manufacturers and switched to the CDI ignition system because the conventional ignition system still causes many weaknesses. The ignition system that is very popular at this time is the CDI ignition system. Because the CDI ignition system has overcome some of the weaknesses caused by the conventional ignition system, the CDI system is still used in

vehicles, especially motorcycles, at this time.

According to the current source used, the CDI ignition system is divided into two types, namely CDI-AC and CDI-DC. The CDI-AC system is an electronic ignition system with an electric current source coming from an excitation coil. In this CDI, the ignition is unstable because the current used by this ignition system depends on the engine speed. This will make the ignition that occurs at a low speed less than the optimal ignition system.⁸

CDI-DC is an electronic ignition system with an electric current source coming from the battery so that the ignition that occurs will be stable from low to high rotation. However, in this ignition system, the battery must always be charged because the current source used in this system comes from the battery. In today's production motorcycles, most of the ignition systems use a CDI limiter ignition system. CDI limiter is a CDI that has a limit in splashing sparks into the combustion chamber at a certain rpm, and the sparks generated at high rpm are relatively less stable.⁹⁻¹¹

The CDI on this factory default motor has a limiter of around 8000 rpm to 9000 rpm. So if the motor is driven at a high rpm more than the rpm that the CDI has determined, so the motor will feel like stuttering, and its performance will decrease. With the disadvantages caused by the CDI limiter, consumers who like high speed are less favored by consumers, especially young people today. Because many young people like the world of motor racing sports such as road race, drag race, moto GP and others. To overcome the weakness of this CDI limiter (standard) and obtain a more optimal engine performance, Many CDI manufacturers offer a CDI limiter (BRT Powermax Dualband) instead of a CDI limiter.

CDI unlimited is a CDI that works without any ignition limitations and can serve engine work at high RPM depending on how strongly the motorcycle engine rotates. The CDI limiter also has a limit in sparking up to 20,000 rpm. The CDI limiter also has



a better ignition than the CDI limiter. So that with no limitations in the ignition, it is expected that the engine performance will achieve maximum performance.

Many consumers today replace the CDI limiter on bicycles with a CDI limiter. However, many consumers do not know how much engine performance is produced between those using a CDI limiter and a CDI limiter. The ignition system is not only CDI but there are also spark plugs. Spark plugs help generate sparks using the high voltage generated by the coil. The sparks produced by this spark plug are then used to start the combustion of the fuel-air mixture that has been compressed in the cylinder.^{1,5}

The insulator on the spark plug serves to prevent the leakage of electric current with the high voltage. It continues to flow through the middle electrode, and the side electrode continues to return to the mass while producing sparks when jumping from the middle electrode to the side electrode. All parts of the spark plug are held in place by the spark plug body, which is commonly referred to as the "shell," which is made of steel. To attach the spark plug to the cylinder, threads are made at the bottom of the body so that it is easy to attach it to the motor cylinder. To distinguish between hot spark plugs and cold spark plugs, the length of the porcelain insulator on the spark plug can be seen. If the insulator is long, the spark plug is a hot spark plug and vice versa.⁶

Motor fuel

Motor fuel is a machine that converts energy from chemical energy contained in the fuel into mechanical energy on the motor fuel shaft so that the valuable power will be directly used as a driving force is the power on the shaft. The piston fuel motor is divided into two types, namely gasoline motors and diesel motors; the main difference lies in the ignition system. A spark in the spark plug ignites the fuel in a gasoline engine; that is why a gasoline engine is also called a spark-ignition engine.⁷

Ignition system

The start or the start of combustion is essential because, in a gasoline engine, combustion cannot occur by itself. Combustion of a mixture of gasoline and compressed air occurs in the combustion chamber (cylinder block) after the spark plugs spark so that power is obtained due to the expansion of the gas (explosive) resulting from combustion, pushing the piston to the TMB position (lower dead center) as a business step. In order for the spark plug to spark the spark properly, it is necessary to have a system that works accurately. The ignition system consists of several components, which work together in a speedy and short time. The spark on the spark plug comes from a high voltage electric current where this current flows at a particular time, so when current flows, the spark plug sparks, and when there is no flow, the spark plug turns off.^{8,9}

There are two types of ignition systems for motorcycles, namely conventional ignition systems and electronic ignition systems. The conventional ignition system is an ignition system that still uses platinum to disconnect and connect the voltage on the battery to the primary coil. The CDI ignition system is made to overcome the weaknesses in conventional ignition systems, both those that use batteries and magnets. In conventional ignition, it is generally difficult to make components such as contact breakers (platinum) and automatic ignition timing units that are precise enough to ensure the reliability of the engine work. Even when used under normal conditions, the wear of these components is unavoidable.

According to Jama et al., the essential requirements that gasoline motors must own so that the engine can work efficiently are high compression pressure, proper ignition timing, strong sparks, the correct ratio of gasoline and air mixture. Machmud found that at the ignition degree, which was advanced from the standard, an increase in the engine performance value was obtained, compared to



the standard ignition degree.^{3,5}

The CDI ignition system used on motorcycles can be classified into two variances, namely: CDI limiter, which is a CDI that has a limit on its ignition and is usually found on current motorcycles; Unlimiter CDI is a CDI that has no ignition limit. Moreover, usually many are sold in the market.

Ignition angle

The ignition timing of the fuel mixture is when a spark occurs at the spark plug a few degrees before the top dead center (TDC) at the end of the compression stroke. When a spark occurs at the spark plug, it must be determined correctly to burn the fuel and air mixture perfectly to obtain maximum engine performance. To obtain maximum power from an operation, the ignition should be adjusted so that the maximum gas pressure occurs when the piston is around 15 to 20 degrees crank after TDC. Thus, a good ignition depends on the speed of flame propagation, the maximum flame propagation distance, and the speed of the crankshaft.

If the ignition occurs too early (the ignition angle is too large), then the residual gas that has not been burned, affected by the ongoing combustion and ongoing compression, will burn itself. This means power loss. According to Soenarta et al., in complete combustion after ignition begins, the fire spreads from the spark plug and in all directions in proportional time, with a crank angle of 20 degrees or more to burn the mixture until it reaches maximum pressure. The speed of fire is less than 10-30 m/sec. If the ignition is too slow, the number of strokes is reduced, but it also means a decrease in power. However, it is conceivable that slow ignition can result in self-ignition, although this rarely happens in practice. If the ignition is delayed, the space above the piston at the end of combustion is enlarged so that a small part of the heat is converted into pressure. The result is a large amount of residual heat large left in the motor. Not only caused by the thermal loading of

some parts, such as the valve becoming too hot but caused by high temperatures will exceed the limit of self-ignition. The advanced ignition timing is the ignition angle advanced several degrees before TDC when the spark plug ignites the fuel mixture in the combustion chamber during the compression stroke. Reverse ignition timing can be defined as changing the ignition angle so that the fuel-air mixture occurs more slowly than the time specified by the manufacturer.^{1,2}

CDI ignition system

CDI ignition system is one type of electronic ignition system. The CDI ignition system is one of the most famous ignition systems used on motorcycles today. The CDI ignition system has proven to have more advantages than conventional ignition systems (using platinum). The ignition voltage released by the CDI ignition system can reach approximately 35,000 volts. During the combustion process, the fuel mixture can burn more completely than using a conventional ignition system. The CDI ignition system does not require maintenance and adjustment such as that using a conventional ignition system because a thyristor has replaced the role of platinum as an electronic switch and a pulse coil or pick-up coil (coil pulse generator) which is installed near the flywheel generator or alternator rotor (sometimes a generator). Sometimes, the pulser coil is incorporated as part of the components in the stator disk, sometimes installed separately).^{3,8}

According to Hidayat, the working principle of CDI is the 12-volt battery voltage that enters the regulator inside the CDI to be stabilized and fed into the step-up transformer. The voltage that enters the transformer is increased to 300 volts with a switching system carried out by the PWM control model (pulse wide modulation). The diode rectifies the output voltage of the transformer, and the output becomes a DC voltage. Then it is used to charge the capacitor, and it is ready to be coil triggered. The microcomputer



gave the SCR command to discharge the capacitor (capacitor discharge) with a voltage of 300 volts. The capacitor charge is discharged through the ignition coil and is enlarged by the coil to 35,000 volts. When the microcomputer determines the discharge time of the capacitor, it is called ignition timing. ²

2. Conclusion

The power generated in the ignition system that uses CDI racing curve two and standard spark plugs with premium fuel shows the highest power from each variation of the ignition system.

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