ISSE 2(3)

by Fahmi. Farah

Submission date: 24-Jun-2023 05:58PM (UTC+0500)
Submission ID: 2121841161
File name: 2023_Fahmy_ISSE.pdf (252.77K)
Word count: 2812
Character count: 15212

ISSE
International Journal of Service Science, Management, Engineering, and Technology
pISSN 2964-7118, eISSN 2830-604X

THE EFFECT OF USING RACING CDI AND STANDARD CDI WITH VARIATION OF PERTAMAX FUEL ON MOTOR TORQUE POWER

Fahmy Riyadin, Fadllah Farah Diba

University of Sunan Giri Surabaya

correspondence: fahmyriyadin@elemeni.ac.id

Abstract -*The CDI-AC system is an electronic ignition system with an electric current source coming from the excitation coil. In this CDI, the ignition that occurs is unstable, because the current used by the ignition system depends on the engine speed. This research will analyze the effect of standard CDI and racing CDI also on the torque power of the motor and on fuel consumption. Gasoline is a saturated compound of hydrocarbons processed from petroleum. The quality of gasoline is expressed by the octane number or octane number. Pertamax is a type of gasoline fuel produced by Pertamina which is dark blue in color and has an octane rating of 92. Torque is a measure of the engine's ability to do work. Torque is a derived quantity that is commonly used to calculate the energy produced by an object rotating on its axis. The maximum torque generated with a racing CDI ignition is greater than that of a standard CDI ignition. the lowest fuel consumption is 0.281 L/hour on an internal combustion engine using a racing CDI ignition and the largest fuel consumption is 0.661 L/hour using a standard CDI ignition.*

Keywords: CDI, fuel, torque.

INTRODUCTION

Motorcycle fuel is one of the internal combustion engines or often referred to as the *internal combustion engine* , namely a machine that converts thermal energy into mechanical energy, the energy itself can be obtained from the combustion process. One of the simple motorized vehicle transportation tools that is widely used by the community at this time is the motorcycle.

The ability of a motorbike is influenced by several factors, including: The quality of the fuel and the ignition system. The use of fuel that is of poor quality can result in a decrease in the performance of the motorcycle engine. Motorcycles are a means of transportation driven by gasoline-powered engines. According to the type of gasoline can be divided into 3 types namely premium, Pertamax, Pertamax plus. The difference between the three types of fuel is found in the octane number, where the quality of the fuel is usually indicated by the octane number. The higher the octane number, the price per liter will generally be more expensive. Motorcycle engines require the type of fuel that is in accordance with the design of the engine itself so that it can work properly and produce optimal performance, for the use of motorcycles, of course, this cannot be separated from the use of the type of fuel used to obtain optimal engine performance including power and torque.

This ignition system is very influential on the power, torque and fuel consumption generated by the engine. The ignition system, especially for 4-stroke gasoline engines, has undergone many improvements. At the beginning of the motorcycle ignition system began to be produced on gasoline motorcycles 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. The conventional ignition system on motorcycles has undergone development, namely the CDI (Capacitor Discharge Ignition) ignition system. Conventional ignition systems are now being abandoned by motor manufacturers and switching to CDI ignition systems, because conventional ignition systems still have many weaknesses. The most popular ignition system today is the CDI ignition system. Because this CDI ignition system has overcome some of the weaknesses caused by conventional ignition systems, 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 the excitation coil. In this CDI, the ignition that occurs is unstable, because the current used by this ignition system depends on the engine speed. This will make the ignition that occurs at low speed less than optimal. CDI on this factory default motorbike has a limiter of around 8000 rpm to 9000 rpm.

So that if the motor is driven at high rpm exceeding the rpm set by the CDI, the motor will feel sluggish and its performance will decrease. With the weakness caused by the CDI limiter, it is not liked by consumers who like high speed, especially young people nowadays. Because many young people nowadays like the world of motor racing, such as: road race, drag race, moto GP, etc. To overcome the weakness of this CDI limiter (standard) and to obtain more optimal engine performance, when Currently, many CDI manufacturers offer unlimiter CDI (BRT Powermax Dualband) as a replacement for CDIlimiter.

Many consumers today are replacing the CDI limiter on bicycles with a CDI unlimiter. However, many consumers do not know how much increase in engine performance is produced between those using a CDI limiter and a CDI unlimiter. The ignition system is not only CDI, but there are also spark plugs. Spark plugs are used to produce sparks by using the high voltage generated by the coil. The spark produced by the spark plug is then used to start the combustion of the fuel mixture

with compressed air in the cylinder. The insulator on the spark plug serves to prevent the leakage of the high voltage electric current, so that 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. This part of the spark plug is held in place by the body of the spark plug which is commonly referred to as the "shell" which is made of steel. To attach the spark plug to the cylinder, a thread is made at the bottom of the body so that it is easy to attach it to the motorcycle cylinder. To distinguish between hot and cold spark plugs, you can see the length of the porcelain insulator on the spark plug. If the insulator is long, the spark plug is hot and vice versa" (Suyanto, 1989: 282 - 283). Based on the description above, the authors are interested in knowing the results of motorcycle performance, namely the torque power and fuel consumption of motorcycles that are given several variations of the differences between standard and iridium spark plugs that use premium fuel, Pertamax.

RESEARCH METHODS

Methodresearch used isexperiments , carried out on motorcycles Megaproshark Results data study analyzed with methode observein a manner direct results experiment Thenconclude and determine results research that has done informgraphs and tables . On testing The isuse ddynamometer for know power and torque generated, meanwhile Fortesting rate consumption material burnusetool burette measure , then done calculation consumption material burn . Follow channel research :

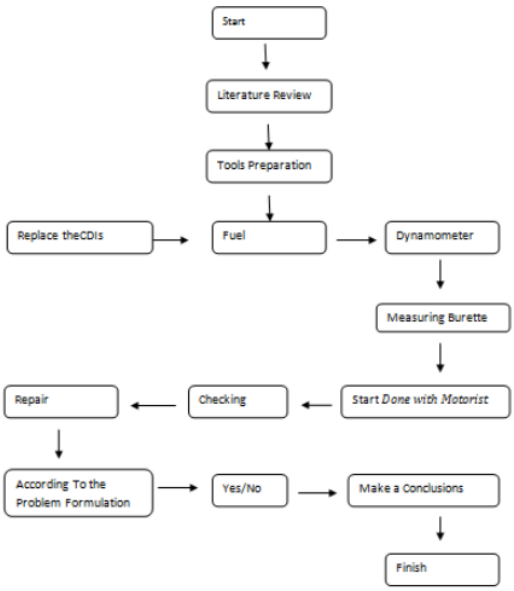

Figure 1 Research Flow

Variable Study

Parameters use calculation show intermediate motor workothers: torque, power , and consumptionmaterialburnspecific (SFC).

Torque

Torque issize ability machine Fordo work. The amount of torque is magnitude usual derivative used Forcount generated energy from objects that rotate on their axis (Raharjo and Karnowo , 2008: 98). Typical torque unitsstatedinNm (Newton meters).As forformulationisasfollowing :

$$T = Fxb$$

with :

T = torque (Nm)

F = force (N)

b = distanceobjecttocenterrotation (m)

Power

According to Arends and Berenschot (1980: 18) power is magnitude unitary motor worktime . Unit Power namely hp (*horse power*).(Raharjo and Karnowo, 2008: 111) Torque on a motorcycle canbe measured wit use dynamometer tool , so Forcount Power axiscanis know with use formula :

$Ne = T \times \omega$

with :

Ne = powershaft Nm/s (Watts)

T = torque (Nm)

ω = speedcomerrotate (rpm)

ConsumptionSpecific Fuel _

Consumption material burn Specific or *specific fuel consumption* (SFC) is amount material burn per time For produce Power of 1 hp. So SFC is size economy usage material fuel (Raharjo and Karnowo , 2008: 115)

$SFC = M_f / N_e$

$M_f = v \times \rho$ materialburn/t

Description :

SFC= consumptionmaterialburnspecific (kg/hour.KW)

M_f= amountmaterialburnunitytime (kg/hour)

v = volume of materialburn thatused

ρ= weighttypematerialburn thatused

t = time required Forconsumptionmaterialburn

Ne = generated power (KW)

Chassis Dynamometer

Dynamometer is a tools used for measurepower , style torque generated by the engine . Principle Work tool This is with give opposite load to direction round until approach zero rpm, load maximum read is style great braking. The same with style turn axis machine (Raharjo and Karnowo , 2008:98-99). on type Chassis dynamometer testuse machine and all chassis vehicle in circum stances completein stalled .

Data Analysis Techniques

Results data study analyzed with methode observein a manner direct results experiment. Then conclude and determine results research that has done informgraphs and tables . On testing This used dynamometer for know power and torque generated, meanwhile Fortesting rate consumption material burn use tool burette measure , then done calculation consumption material burn .

RESULTS AND DISCUSSIONS

How CDIs Work

Motorbikes are available two type system ignition , system ignition conventional and system ignitionelectronics. System ignition conventional is system ignition that still uses platinum for disconnect and connect battery voltage primary coil . System CDI ignition is made Forover come weaknesses that occur in the system ignition conventional, finewhich use batterynor magnets. On ignition conventional generally trouble make component such as contact breakers (platinum) and time control unit signition enough auto precision (meticulous) foren sure reliability fromWork machine how does this cdi component work. The system it self is divided into two types, namely simple and modern. The modern version, CDI is more durable because there are no platinum components but a pulse igniter, function isto send the PWM signal according to the time the machine is used. While the simple version is to use platinum. Platinum serves as a current diverter in the capacitor. CDI will not work before the motor contact is changed to On. Starting from this step, a current flow of CDI battery will be created. This current will pass through the converter and increase the battery voltage to 300 volts. Up to this stage, the machine is still not running and the current is stuck in the capacitor. However, when the engine is running, a signal will be sent to the PWM from *the pickup coil* . The signal sent is in accordance with the engine RPM and a certain pulse appears which is sent to the SCR. It is from this SCR that the capacitor current will be diverted. When the battery circuit is disconnected, the capacitor is directly connected to *the ignition coil*. Automatically a magnet appears in the large primary coil, where the magnetism will create an induction of the secondary coil and the voltage can be 7 times greater. The output is what causes the spark plug to create a spark. Just from the spark, combustion of vehicle fuel can occur and the engine will start immediately.

MaterialB rootgasoline

Gasoline ismaterialfuel used for combustion enginesgasor spark ignition engines. According to Winarno and Karnowo (2008: 43) " Gasoline is results purification neptha whose composition can used Formaterialfuel on the combustion engine . The so called neptha is alloillight with composition medium carbon i.e. 5 to 11 bonds not saturated ". " Gasoline basically is compoundfed up from hydro carbon , and is composition iso octane and normal heptane .

Performance Calculation Method

There are several influencing things combustion engine performancea number of among themis quality materialfuel and efficiency volume tric from machine the basically method know performance something machinecanis know from read and analyze the parameters writtenin. Areportor other media. From reading those parameters usually We can know power , torque, and consumption material burn from vehicle such. In a manner general Power compared straight with wide piston while the torque is proportional straight with steppiston .

Power

Powerismagnitudeunitary motor worktime . (Arends and Berenschot , 1980:18). UnitPowernamely hp (*horsepower*). Power on the motorcycle canbe measuredwithusetool*dynamometer* , soForcountPoweraxiscanis knownwithuseformula :

$P = 2.\pi.nT$ (hp)
75 x 60
Where:
P = shaft power (hp)
T = torque (Nm)
N = engine speed (rpm)
1/75 = conversion factor in kg. be hp
1/60 = rpm unit conversion factor to translation speed (m/s)
1hp = 0.7355 KW and 1KW = 1.36hp

Torque

The rotary force on the rotating parts is called torque, the motorcycle is driven by the torque from the crankshaft. (Jama, 2008: 23). Torque is a measure of an engine's ability to do work. Torque is a derived quantity that is commonly used to calculate the energy produced by an object rotating on its axis. (Raharjo and Karnowo, 2008: 98). Torque units are usually expressed in Nm (Newton meters). The formulation is as follows:

$T = Fxr$
Where:
T = torque (Nm)
F = force (N)
r = distance of the object to the center of rotation (m)

Fuel Consumption.

Consumptionmaterialburn isamountmaterialburn per time for produce power of 1 hp. So Consumption material burn is size economy usage material fuel (Winarno and Karnowo , 2008: 115).

$SFC = M_f / N_e$
$M_f = v x \rho$ materialburn/t
Where:
SFC= consumptionmaterialburnspecific (kg/hour.KW)
M_f= amountmaterialburnunitytime (kg/hour)
v = volume of materialburn thatused
ρ = weighttypematerialburn thatused
t = time required Forconsumptionmaterialburn
N_e = generated power (KW)

Measuring burette

Buretteistoollaboratory made from glass with form cylinder . Then tool This own line measure and block age faucet on the partun derneath . Block age tap This useful Forguard dripa number reagent liquid in experiment . Burette function for drippinga number reagent liquid in experiment, of course need precision , like experiment titration . Measurement from burette reall yaccurate . Even if compared to with glass measuring or dropper pipette , burette Class A hasthe highest accuracy . Ability from burette this of course very important For owned at a time utilized . Specifically inavoid error systematically in the research process .

Engine torque

Torque difference after happening rotation machine more from 4000 rpm. On round sengine 5000 rpm difference the torque thatof 1.6 Nm, 6000 rpm of 2 Nm and 7000 rpm of 1.2 Nm, on CDI racing morehigh . Based on research that hasdoneThisObtained data on differences in torque produced on standard CDI and racing CDI advanced 4o from 4000, 5000, 6000 and 7000. The difference in torque is due toexistsdifferencemagnitudesplashflowerthe resulting fire and also the timemomentignition . the use of racing CDI produces the greatest torquethat isof 5.9 Nm at revolutionengine 6000rpm. Powerthrust generated by the racing CDI morebigSocanincrease engine torque .

Consumption material burn

If the moretall round machines owill the more the rate of consumption is also large material burn it . Rate consumption material burn use more racing CDI ignition low because the moment proper ignition and condition material burn so that burning happen more perfect Once done testing consumption material burn Lowes to btained on the use of racing CDI ie of 0.281 Liters/hour at 3000 rpm while consumption material burn biggest obtained with the use of a standard CDIof 0.661 Liters/hour at rotationengine 5500rpm.

CONCLUSIONS

Torque generated by the ignition system using the standard CDI is 4.5 Nm at 9000 rpm engine speed, racing CDI shows the highest figure of 5.9 Nm at 6000 rpm engine speed. The maximum torque generated with a racing CDI ignition is greater than that of a standard CDI ignition.The fuel consumption generated using racing CDI ignition shows the lowest at engine speed, while the fuel consumption using standard CDI ignition is higher at engine speed.

The lowest fuel consumption is 0.281 Liters/hour on an internal combustion engine using a racing CDI ignition and the largest fuel consumption is 0.661 Liters/hour on a standard CDI ignition.

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