

Vespa Motorcycle Lighting Modification Using AHP System With Fullwave Ignition

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Article Information

Article History

Received : June 28, 2024

Revised : July 05, 2024

Accepted : July 08, 2024

Keywords:

*Motorcycle; Lighting
modification; AHP System*

Kata Kunci:

Sepeda motor; Modifikasi
lampu; Sistem AHP

ABSTRACT

Basically vespa vehicles still do not use AHO technology. The lighting system will only turn on if the vehicle engine is running. This indicates that the vehicle's spool or alternator charging system is directly connected to the lighting system. This study focuses on modifying Vespa motorcycle lighting by implementing the Aho system with Fullwave charging. Based on research with the Honda Tiger fullwave regulator replacement method and testing and measuring the charging voltage output on Vespa vehicles, it can be concluded that how to change the conventional lighting system into a fullwave Vespa motorcycle. The results before making modifications show current instability. There is an increase in charging current and voltage on the battery after being modified to fullwave. The combination of LED lighting with a fullwave shiner proved to be the optimal choice, offering a balance between better lighting and energy efficiency.

ABSTRAK

Pada dasarnya kendaraan vespa masih belum menggunakan teknologi AHO. Sistem penerangan hanya akan menyala jika mesin kendaraan dalam keadaan hidup. Hal ini menandakan bahwa sistem pengisian spul atau alternator kendaraan terhubung langsung dengan sistem penerangan. Penelitian ini berfokus pada modifikasi penerangan sepeda motor Vespa dengan penerapan sistem Aho dengan pengisian daya Fullwave. Berdasarkan penelitian dengan metode penggantian regulator fullwave Honda Tiger dan pengujian serta pengukuran output tegangan pengisian daya pada kendaraan Vespa, maka dapat disimpulkan bagaimana cara mengubah sistem penerangan konvensional menjadi sepeda motor Vespa fullwave. Hasil sebelum dilakukan modifikasi menunjukkan ketidakstabilan arus. Terjadi peningkatan arus dan tegangan pengisian pada aki setelah dimodifikasi menjadi fullwave. Kombinasi lampu LED dengan shiner fullwave terbukti menjadi pilihan yang optimal, menawarkan keseimbangan antara pencahayaan yang lebih baik dengan efisiensi energi.

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INTRODUCTION

A vehicle is a tool to move people and goods from one place to another. The role of vehicles in the world of transportation is very important for the economy. There are many means of transportation in Indonesia, almost all circles and all economic classes have vehicles. As a means of transportation, motorbikes must meet the minimum requirements needed in accordance with the provisions of the applicable traffic laws (Tang et al., 2021). The minimum requirement for a vehicle is not only to have a driving engine, but there must be an additional system as a condition for allowing a vehicle to be mass produced and then sold generally in the community. The requirement that must be met is to have a set of lighting system tools. The function of the lighting system is as a means of supporting lighting for the driver when walking on the highway. Another function of the lighting system is as a messenger of signals for other drivers. This function can be active when the dimmer function on the head lamp is used. The lighting system also plays an important role in the safety and security aspects of the highway, both at night and during the day (Yousif et al., 2020).

The Basic Law explains that motorcycle drivers are obliged to obey all applicable provisions, are required to turn on the headlights during the day. On the basis of this traffic law, all 2-wheeled motorcycle vehicles are required to turn on the headlights throughout the day and at night when driving. This regulation was made against the background of the high number of traffic accidents involving motorcycles, it is stated that a total of 60% of accidents that occur on the highway involve motorcycle vehicles (Rusmini, 2022). Several two-wheeled vehicle manufacturers are now introducing the Automatic Headlight On (AHO) type of headlamp model. Some of this technology has been applied to vehicles made in 2015 and above, even in 2017 several manufacturers have made AHO where the headlights start to turn on when the vehicle is only in the ignition on position. The purpose behind making AHO technology is to minimize riders who forget to turn on the lights during the day. This makes the motorcycle vehicle will be continuously lit throughout the day, both at night and during the day (Calma, 2023).

Traffic violations in the form of drivers who neglect to turn on the headlights can also be minimized. To support this AHO technology, a battery is needed to supply electric current to the headlight load which is continuously on even when the vehicle is in the engine off position. Batteries in vehicle lighting systems must also be supported by a good charging system. The charging system must be able to supply the electric current needs for all electrical loads, meaning that the maximum charging current capacity available must be greater than the total amount of load current requirements (Prasetijo et al., 2020). In the modern era like now, the rise of the vespa community has begun, both from within and outside the country, even in Indonesia is one of the most classic Vespa communities in the world. The vespa lifestyle that develops in the community also varies. They always hold events such as touring, vespa competition events, social services, and so on. Vespa itself was produced in 1946 by the Piaggio factory led by Enrico Piaggio. The word Vespa comes from the Italian language which means "wasp" if translated into Indonesian (Putra & Rahmawan, 2022).

Vespa is one of the relatively old motorized vehicles among Indonesian people which has its own charm for classic motorcycle lovers. Vespa enthusiasts in general are not more dominant in favor of the elderly or elderly community, seeing the age of a classic Vespa for decades. However, currently Vespa is more in demand by young people because using Vespa as a daily vehicle, has become a lifestyle that is classified as existing almost among young people like today. Thus Vespa users are not only used by the lower middle class but people who have high economic status also use Vespa as a daily vehicle. Vespa vehicles still do not use AHO technology (Pamungkas & Guridno, 2019). The lighting system will turn on only when the vehicle's engine is running. This indicates that the charging system of the vehicle's spool or alternator is directly connected to the lighting system. The electric current that powers the headlight load is AC or conventional electric current produced directly from the spool or alternator. This modification makes the head lamp when the ignition switch is ON will turn on continuously even though the motor engine is off. This makes the electric current stored in the battery wasted faster than usual,

because in the pre-modified condition the head lamp is not connected to the battery, but only connected to the lighting spool (Dahlan & Sarihati, 2019).

The Vespa charging system which is AC type to support additional loads on the vehicle is considered less capable. Another modification is needed to the Vespa motorcycle charging system which was AC to fullwave so that the battery charging current and voltage increase to compensate for the head lamp load. This research aims to change the Vespa motorcycle lighting system from conventional to AHO system and accompanied by activities to change the battery charging system from AC to fullwave (Srinivas et al., 2019). The results of this research will be in the form of data on the results of measuring the charging current and voltage before and after modification.

RESEARCH METHODS

The research method in this study is experimental. Experimental research is research conducted by experiment, researchers manipulate the variables under study to determine the effect of certain treatments on research results (Bloomfield & Fisher, 2019). This research modifies the vespa motorbike. The change or modification process is carried out to change the standard Vespa motorcycle charging system which still uses conventional so that it can be made fullwave. The thing that is done is to replace the standard regulator with a Honda Tiger fullwave regulator and change some of the cable lines so that they can be installed and function normally. This change from conventional to fullwave current can be different for each vehicle depending on the electrical system. Some motorcycle vehicles also require changes to the electrical spool or it is not enough to replace the regulator alone because the generator spool has a mass embedded in it and there is only one charging output to the regulator so it does not support changes to the fullwave charging system. The modification process is carried out following the flowchart below.

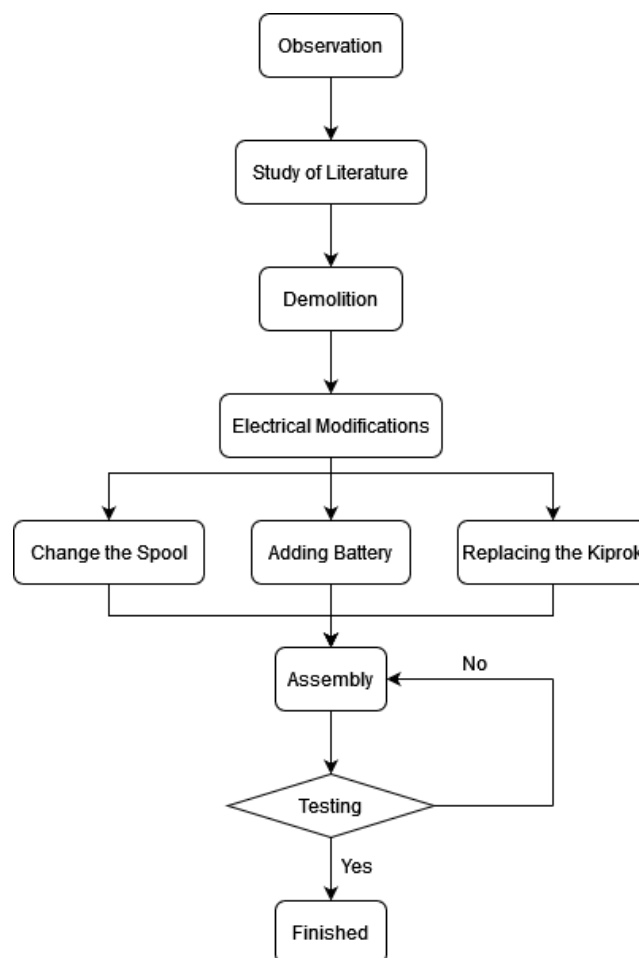


Figure 1. Flow Chart

RESULTS AND DISCUSSION

How to Convert AC Lighting System to Fullwave

The process in this implementation is by changing the regulator cable line which originally belonged to the Vespa standard to use the Honda Tiger. Another function of a regulator is to limit the maximum voltage on charging and lighting so that there is no over charging of the battery. Initially the Vespa motorbike used a halfwave type regulator where this system uses one diode as a rectifier. This kiprok will later be replaced with a fullwave kiprok type that uses 4 diode bridges where AC alternating current will be converted into DC current by taking all the waves of one cycle. Replacement of LED type lamps is also needed because LED lamps have a fairly small WAT compared to bohlamp lamps whose WAT is so large and very hot when used continuously. LED lights themselves are more optimal for use using DC currents whose electricity is directly sourced from batteries compared to AC currents that still follow engine rotation (idle).

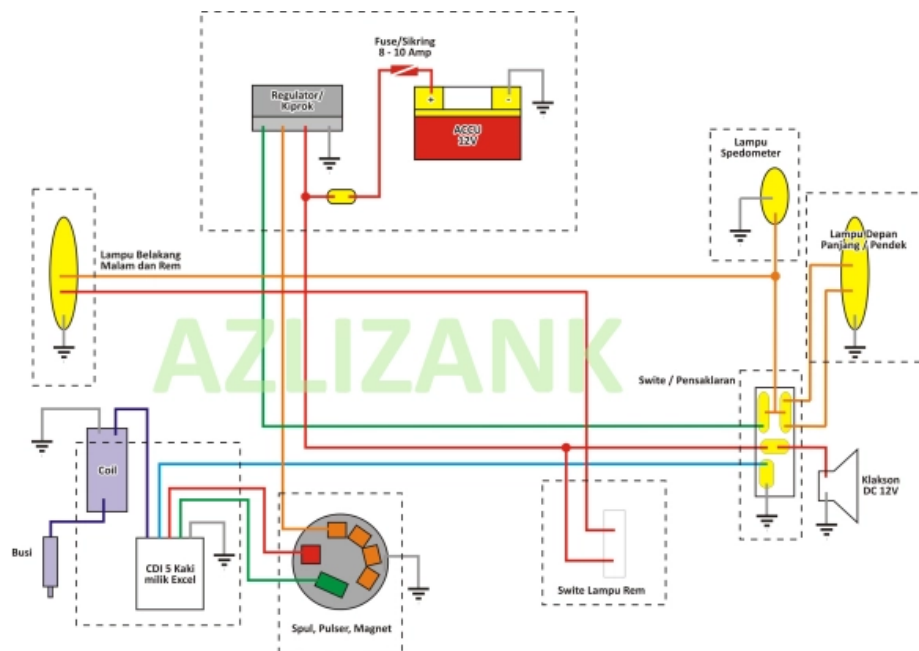


Figure 2. Vespa Electrical Scheme

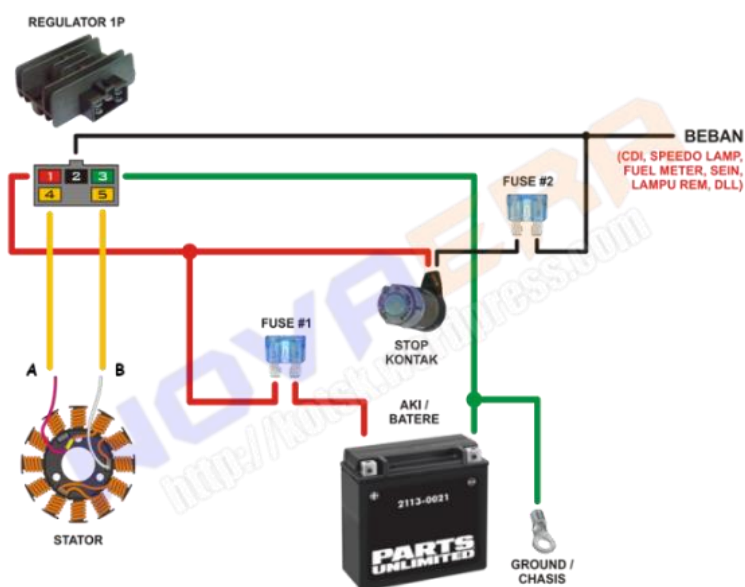


Figure 3. Honda Tiger Fuse Line Schematic

The following is an explanation of the honda tiger line scheme:

1. First, connect pin number 1 to the charging line plus the red battery
2. Second, connect pin number 2 to the black ignition output
3. Third, connect pin number 3 to the mass or ground of the green color body
4. Fourth, connect pin number 4 to the charging line from the spool, yellow cable.
5. Fifth, connect pin number 5 to the yellow spull cable

Normal Condition

The first test carried out is by measuring the voltage output directly on the vehicle using a digital multimeter so that it is read validly. The results obtained can be seen in the following figure.

Tabel 1. Results Before Modification

RPM	No Burden	With Load
Idle	12,8 Volt	12,6 Volt
Tall	12,8 Volt	13,6 Volt

The results show that the initial voltage output or before the replacement of the regulator without load is 12,8 Volts during stationary or idle rotation and 12,8 Volts during high rpm. When using a load of 12,6 Volts at idle and 13,6 Volts at high rpm.

Modification Condition

As was the case before the replacement, after the replacement, the same test was carried out as before in order to compare the two different charging systems. The results of measuring the voltage output on the Honda Tiger fullwave regulator at idle rotation without load are 13,6 Volts and 13,5 Volts with load as shown in the following figure.

Tabel 2. Results After Modification

RPM	No Burden	With Load
Idle	13,6 Volt	13,5 Volt
Tall	14,4 Volt	14,5 Volt

The results show that by doing or modifying the charging system from standard conditions to fullwave. The voltage output has increased. Measurement of stationary rotation voltage output measurement results on Honda Tiger fullwave regulator at high rotation also increased to 14.4 Volts without load and 14.5 Volts with load.

Rosiani et al., (2024) stated that Based on the AHP calculation results, the LED lighting system combined with fullwave ignition obtained the highest score. This is due to better visibility and superior energy efficiency (Abbas et al., 2021). The HID system with fullwave ignition also showed good performance in terms of lighting but had higher power consumption. The Halogen system with fullwave ignition scored the lowest due to less than optimal lighting performance and energy efficiency (Tomak & Polat, 2022). The process of integrating LED lighting with a fullwave ignition system emphasizes the importance of voltage regulation provided by the fullwave ignition system (Tjiptady et al., 2024). This ensures that the lighting system functions properly and consistently (Rahman, 2023). The tests conducted showed that this combination provides stable performance and improves rider safety, especially in low light conditions. The use of this AHP provides a systematic approach to analyzing various lighting modification options by considering various criteria that are relevant to Vespa motorcycle users. The combination of LED lighting with a fullwave shiner proved to be the optimal choice, offering a balance between better lighting and energy efficiency (Barker et al., 2021). This shows that AHP is effective in making informed decisions regarding lighting modifications for Vespa motorcycles. The combination of LED lighting with a fullwave ignition system offers significant improvements over the stock system, promising increased safety and performance (Mokhtar et al., 2023).

CONCLUSION

Vespa vehicles still do not use AHO technology. The lighting system will only turn on if the vehicle engine is running. This indicates that the vehicle's spool or alternator charging system is directly connected to the lighting system. This study focuses on modifying Vespa motorcycle lighting by implementing the Aho system with Fullwave charging. Based on research with the Honda Tiger fullwave regulator replacement method and testing and measuring the charging voltage output on Vespa vehicles, it can be concluded that how to change the conventional lighting system into a fullwave Vespa motorcycle.

The results before making modifications show current instability. There is an increase in charging current and voltage on the battery after being modified to fullwave, the value of this charging current and voltage is the highest compared to when the charging system is still AC and the results show the stability of the charging current. The use of this AHP provides a systematic approach to analyzing various lighting modification options by considering various criteria that are relevant to Vespa motorcycle users. The combination of LED lighting with a fullwave shiner proved to be the optimal choice, offering a balance between better lighting and energy efficiency (Barker et al., 2021). This shows that AHP is effective in making informed decisions regarding lighting modifications for Vespa motorcycles.

ACKNOWLEDGEMENTS

We would like to thank all the academic community involved at Raden Rahmat Islamic University Malang.

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