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Analysis of Feasibility Indicators of Two Wheel Engine Oil Using Light Sensor (LDR)

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ABSTRACT

The oil feasibility measurement tool to determine the viscosity level contained in a two-wheeled vehicle using a light sensor (LDR) has been designed and implemented. Testing through five oil brands with homogeneous specifications that are generally used by two-wheeled vehicles. The manufacture of this tool uses three integrated systems in one method, namely: input via the LCD and laser sensors, the process system by the microprocessor in the form of Arduino, and the output in the form of an LCD final display. These three systems are connected through the gear box block mechanical system. The results are converted to the electrical resistance value that appears on the indicator. The set point in the form of the range of electrical resistance was obtained through experiments from the five new oil brands. Furthermore, the wheels of the Gear Box are rotated to produce a value in the form of RPM. From these five types of oil, data is obtained that the gear box which rotates in a duration of twenty minutes with a minimum speed of 210 RPM and a maximum speed of 720 RPM indicates that the quality of the oil is in a good category.

INTRODUCTION

Failure to change vehicle oil is a serious problem in engine damage, especially two-wheeled engine engines [1] [2]. This damage is often caused by engine components such as filter damage caused by old component life and unplanned maintenance. This failure is often caused by disruption of the operational performance of engine components [3].

The main obstacle to knowing whether or not vehicle oil is suitable for use is still using the old method, namely by checking the viscosity by removing the *dipstick* in the engine part. The checking process also depends heavily on human perception of the oil color change factor and the sense of touch to see whether the oil is thick or thin. From this subjective and less practical method, there is one way that can be done, namely by measuring the viscosity of oil using an LDR sensor. The engine is the main component in the vehicle.

One machine and another cannot escape mechanical contact. This mechanical contact causes friction and even wear. Although some wear is required, there is also wear that must be avoided [4]. To overcome this, use oil (lubricant). Other functions of oil besides overcoming wear are as a coolant, damper vibration, and transporting dirt on the fuel. Oil is also used as a *seal* (preventing leakage) in the compression system [5]. The traditional way is still often done by pulling out the *dipstick* in the engine. The checking process is still subjective and depends on human perception of the oil color change factor and the sense of touch.

From this less practical method, there is one way that can be done, namely by measuring the viscosity of the oil using the LDR sensor, then the results will appear on the indicator. Viscosity is the shear stress in the fluid plane per unit change in velocity with respect to the normal plane. The higher the viscosity value of the lubricant, then the texture also becomes

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thicker [6]. The nature of the fluid when exposed to a beam of light, then part of the beam will be absorbed by the fluid and the other part will be transmitted (transmitted) [7].

Oil

Oil or lubricant (lubricant or often called lube) is a material (usually in the form of a liquid) which functions to reduce thirst between two moving surfaces that rub against each other. A liquid material can be categorized as a lubricant if it contains basic ingredients (can be oil based or water / glycol based) and an additive package. Oil quality is also determined by engine temperature, both low and high temperatures have different impacts. High temperatures will have an impact on low viscosity [8].

The required engine power and heat generated by friction can be reduced due to oil [9]. Oil has the main function of reducing wear as a result of direct contact between two metal surfaces that rub against each other so that wear can be reduced**.** A good lubricant must be able to make engine performance lighter and serve as a protection for metal components in the engine from friction due to friction between metals. Lubricants also function as coolants due to friction or combustion [10].

Effect Of Oil On Fuel

The combustion process in the combustion chamber is influenced by temperature, mixture density, air flow composition and turbulence in the fuel and air mixture to be burned [11]. If the temperature of the air and fuel mixture rises, it is easier for the air and fuel mixture to burn.

If an air mixture process takes place in a part of the non-volatile fuel, the mixture distribution is very heterogeneous. This is the relationship between heating fuel and fuel consumption. The mixture becomes lean, it means that the ratio of air is more than the fuel, making it difficult to burn in the combustion chamber which results in reduced engine work power. This is where it is recommended to lubricate the engine of a vehicle that uses gasoline and requires perfect lubrication [12].

EXPERIMENTAL METHOD

This research was conducted to determine the feasibility level of the quality of an oil in motorized vehicles, especially two wheels. Fig. 1 is a diagram of the experimental flowchart.

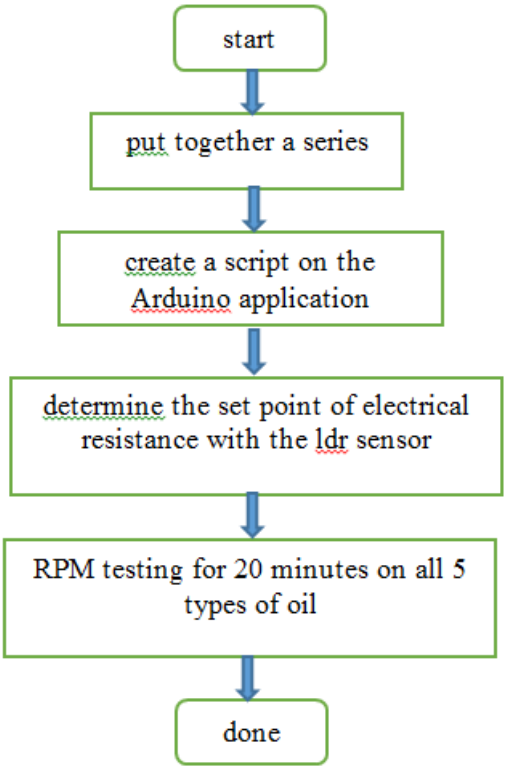

Fig. 1. Experiment Flowchart

This study uses five brands of oil which are generally used by two-wheeled engine engines. The types of viscosity standards for some oils can be seen in **Table 1**.

Table 1. Types of Oil

Type of Oil	SAE viscosity standard
Federal	10W-30
MPX2	10W-30
Yamalube	20W-40
Federal Ultratec	20W-50
Evalube	140

This activity was carried out for three months, the oil suitability check system has 3 main parts, namely, input or input, microcontroller and output or output. The first part or input to this system consists of an LDR sensor (light dep end resistor) and a laser. The LDR sensor functions to detect the color quality level of the

oil, while the laser functions to emit a light or influence the LDR sensor value to be captured by the LDR sensor. The oil categories, which are divided into three, namely good, moderate, and bad, have previously been determined by the set point of normal oil usage.

While the second part is in the form of a microcontroller system, the author uses the Arduino UNO microcontroller system which functions to process a program or language C. In Fig. 2, it can be seen when testing the tool using the five brands of oil.

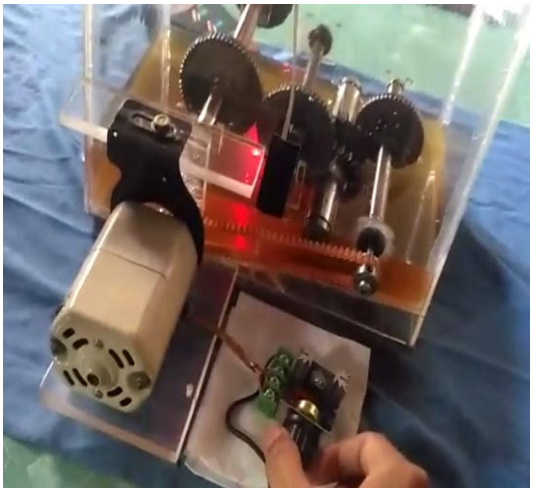

Fig. 2. Testing the tool

For the third part, which is in the form of an output, there is a 16 x 2 LCD which will display the reading from the sensor used to detect the suitability of the oil. In addition to using 3 main parts, the author also uses a mechanical system designed to resemble a *gear box* block on a motorized vehicle. If the laser light hits the LDR sensor, the sensor will read that the color quality of the oil is still good. As shown in Fig. 2 and Fig. 3 with a viscosity of 779 Ω and of good quality.

Likewise, if the laser light does not hit the LDR sensor, the LDR sensor will detect that the color quality of the oil is bad or bad. The test results of the five oil brands can be shown in Table 2.

Table 2. Observation of Oil Quality

Type of Oil	RPM	Viscosity	Quality
Federal)	245	671 Ω	Good
	399	620 Ω	Good
(SAE 10W-30)	550	572 Ω	Good
	690	533 Ω	Good
MPX 2 (SAE 10W-30)	245	649 Ω	Good
	396	653 Ω	Good
	456	550 Ω	Good
	700	450 Ω	Good
Yamalube (SAE 20W-40)	210	560 Ω	Good
	401	520 Ω	Good
	580	490 Ω	Good
	650	410 Ω	Good
Federal Ultratec (SAE 20W-50)	226	682 Ω	Good
	406	669 Ω	Good
	606	463 Ω	Good
	700	470 Ω	Good
Evalube (SAE 10W-30)	220	651 Ω	Good
	417	582 Ω	Good
	600	490 Ω	Good
	720	429 Ω	Good
	600	490 Ω	Good
	720	429 Ω	Good

In the Gear Box arrangement the researchers made 4 different gear motor arrangements that aim to produce maximum rotation output, in this Gear Box system a dynamo is also added which is equipped with an AC Dimmer which functions to rotate the AS that has been welded with the Gear motor. In this mechanical system functions to rotate the oil in a glass box, so that if the value of the AC Dimmer is changed, the rotation of the sewing machine also changes and the Gear Box also changes its rotation, in the end a value is obtained in the form of RPM generated from rotation of the wheel of that Gear Box

RESULTS AND DISCUSSION

During the research process, the measurement of the feasibility of oil based on the type of oil which is influenced by the variables such as the rotation produced from the Gear Box was carried out for a duration of twenty minutes . Previously, experiments were carried out to determine the set point of resistance read on the LDR sensor for the five types of new internal oil. The set point for Federal type oil is between 500 - 680 Ω, MPX 2 type oil set point 400-600 Ω , Yamalube oil set point 400-600 Ω, Federal Ultratex oil 400-700 Ω, and Evalube oil 400-670 Ω.

If after the rotation of the RPM, the resistance value is between the set point ranges, the oil is

categorized as having good viscosity, but on the other hand, if the resistance value obtained after the rpm rotation is done outside the set point range, the quality of the oil is categorized as poor and the oil is recommended to be new replaced.

The results show that the quality of the oil is still in a good category which is influenced by the variable in the form of gear box rotation (RPM). So that the LDR sensor works normally, because data is obtained if the oil is new, the color quality level of the oil is still good and the value of the LDR sensor which is affected by the laser is still high (large Ω). Changes in the LDR sensor are influenced by light hitting it, when the light comes, electrons will be released and change the LDR resistance [13] [14]. The greater the light obtained from the LDR, the better the oil quality, and vice versa.

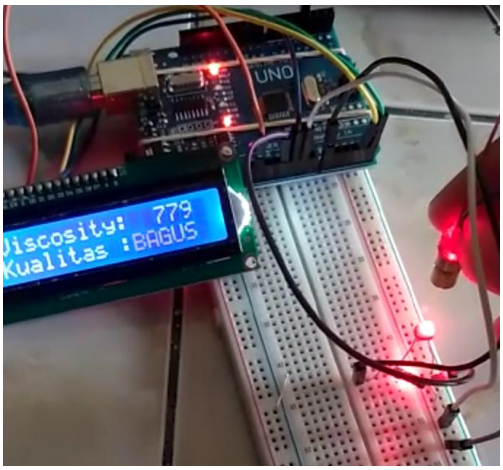

Fig. 3. Display on LCD

If the quality of the oil is still suitable for use, the LDR sensor gets the light produced by the laser. From these five types of oil, data is obtained that the *gear box* represents the engine rotation in a two-wheeled vehicle that rotates for a duration of twenty minutes with a minimum speed of 210 RPM.
RPM and a maximum speed of 720 RPM have good categories. The medium and poor quality of oil is not obtained because the rotation duration is only twenty minutes. The minimum limit of 210 RPM is due to the analogy of a two-wheeled vehicle engine moving slowly and the 720 RPM figure is analogous to moderate movement. Although ideally engine rotation for motorbikes, for example matic, is in the range of 1300 - 1400 RPM. The higher the RPM of the engine, the harder the engine works so that in a motorized vehicle engine, many engines burn and drain the vehicle's fuel. The engine rotation speed is proportional to the gear ratio [15].
The duration of twenty minutes cannot represent the movement of a vehicle engine with a longer movement. So that the suggestions for further research include: the rotation duration of the gear box is made longer with RPM in the 200-700 range so that the feasibility category of medium and bad oil can be obtained and the duration is kept constant at twenty minutes but with an RPM that is more than 700 RPM.

CONCLUSION

Based on the research that has been done, it is found that the LDR sensor can measure the level of oil viscosity whose value is converted to electrical resistance. The quality of the five types of oil is good and fit for use with a range of 200-700 RPM rotated for a duration of twenty minutes.

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