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TWO-WHEELER SAFETY SYSTEM

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Abstract - *In two-wheeler there are no engine safety system, like four-wheeler engine safety system. So, I am developing two-wheeler engine safety system, which includes engine overheating. With the help of relay. So, whenever the engine will overheat to the specific temperature at that time relay will cut the ignition wires and the engine will stop. And the indication light will blink. From the help of that light the rider will know there is some problem in engine and the service is needed.*

***Key Words*: Safety System, Materials, Working, Installation, Analysis and Future Scope**

1. Introduction

Four-stroke (also four-cycle) engine is an internal combustion (IC) engine in which the piston completes four separate strokes while turning the crankshaft. A stroke refers to the full travel of the piston along the cylinder, in either direction. The four separate strokes are termed. Intake: Also known as induction or suction. This stroke of the piston begins at top dead center (T.D.C.) and ends at bottom dead center (B.D.C.). In this stroke the intake valve must be in the open position while the piston pulls an air-fuel mixture into the cylinder by producing vacuum pressure into the cylinder through its downward motion. The piston is moving down as air is being sucked in by the downward motion against the piston. Compression: This stroke begins at B.D.C, or just at the end of the suction stroke, and ends at T.D.C. In this stroke the piston compresses the air-fuel mixture in preparation for ignition during the power stroke (below). Both the intake and exhaust valves are closed during this stage. Combustion: Also known as power or ignition. This is the start of the second revolution of the four-stroke cycle. At this point the crankshaft has completed a full 360-degree revolution. While the piston is at T.D.C. (the end of the compression stroke) the compressed air-fuel mixture is ignited by a spark plug (in a gasoline engine) or by heat generated by high compression (diesel engines), forcefully returning the piston to B.D.C. This stroke produces mechanical work from the engine to turn the crankshaft. Exhaust: Also known as outlet. During the exhaust stroke, the piston A, once again, returns from B.D.C. to T.D.C. while the exhaust valve is open. This action expels the spent air fuel mixture through the exhaust valve.

1.1 Aim and Objective

To develop a two-wheeler engine safety system to prevent two-wheeler engine from breakdown. In India 95% of the two wheelers using a mechanical injection system i.e. carburettor. No safety system used in two-wheeler like electronic fuel injection which is mostly used in car and high range bikes. In the current era some of the manufacturers used to indicate only oil indication and service due reminder. So, we are going to develop the "Two-wheeler Engine Safety System". Once the engine gets damaged, it cannot give performance like before. It causes increase in fuel consumption, emissions, etc. which are hazardous for environment. It reduces operating life of an engine. We are going to modify by using different types of sensors which can detect the engine problems like the four-wheel vehicle engine safety system detects like engine temperature & engine oil level etc. for the two-wheeler.

2. What is safety system in Two-Wheeler?

2.1 Overheating in I.C Engine

Engine overheating causes a major issue for motorcyclists during long rides and also while stuck in traffic for long hours. There are certain that cause the Motorcycle engine to overheat and irritate you with the heat you cannot tolerate. Motorcycles with air cooled engines are the most to suffer. Liquid cooled engines have coolant running in and out of the engine keeping them cool and a radiator fan to keep the radiator from heating up and failing to cool the engine efficiently. Let

us first investigate the causes of why most motorcycles suffer from overheating.

- Initial: When you crank up your motorcycle to leave for work every day, please do not over rev the motorcycle start as soon as you start it. Keep the engine at idle for a few minutes and let the engine oil do its job. This process is called engine warm up and doing this will keep your motorcycle's engine healthy.
- Engine oil check: Always keep your engine oil at check to overcome engine overheating. Low engine oil will lead to inadequate cooling of the engine. Engine oil must be changed at correct intervals for a healthy engine life. For an air-cooled engine, the engine oil must be changed for every 3000 kms to keep the engine running healthily.
- Riding at high speeds for a long time: Riding at high speeds for a long time means keeping the engine revving high. Revving the engine high for a long time will keep the pistons moving and the combustion of fuel takes place without a break. It's best to stop the engine and let it cool for about 10-15 minutes and carry on while taking break intervals thereafter.

2.2 Abnormal Combustion in I.C Engine

The main reason for abnormal combustion is inappropriate air fuel ratio. The adequate ratio of air fuel for normal combustion in a S.I. engine is 14:1 any ratio above or below this will lead to knocking or abnormal combustion. The process of knocking is different from pre ignition, where ignition is initiated before the actual timing which leads to knocking.

- Fuel condition including quality, quantity and other attributes.
- Engine Cooling efficiency
- Engine scantling
- Suction air quality and quantity
- Atmosphere in which engine is operating

2.3 Mass air flow

It is okay to drive a vehicle with less air flow for a short period of time but driving with it for an extended period can overheat the engine and cause internal engine damage.

- Dirty, obstructed
- Vacuum leak
- Clogged or improperly installed air filter

2.4 Oil level

Oil waste is highly dependent on the operating mode. Running the engine at conditions close to nominal followed by fold increased oil consumption. Urban cycle of running with frequent engine braking leads to oil sucking through the valve guides

- Poor quality oil
- Increased wear of piston assemblies
- Loss of oil rings mobility
- Valve stem seals don't work
- Defective crankcase ventilation
- Oil leaks
- Oil release into the exhaust pipe through the turbine
- Oil release in the cooling system

3. Materials

- Arduino Nano Board
- K-Type Thermocouple
- Buck Converter
- Relay
- Jumper Wires
- Display
- I2C Converter

4. Working

- Power is supplied to the Nano board through the buck converter from the vehicle battery.
- Buck converter step down the voltage and ampere because Nano board can be damage if more voltage is supplied.
- Nano board programmed, when temperature rises above certain Nano board consumes around 40-50 mA power and vehicle battery supplies around 4 to 9 Ah power it can be harmful for the Nano board.
- Thermocouple is fixed on the fins; thermocouple sense the temperature of the engine and sends data to the Nano board.
- Temperature as per the model and manufacturer, it sends the data to the relay.

- Relay will open so that the power from ignition so the current will not pass from it and the vehicle will stop.
- Nano board send data to display so that driver can see the temperature. We have divided in to three different temperature: - normal temperature, operating temperature and warning temperature.
- Relay will close when the temperature of the engine will be lower than the certain limit of it as per the model and the manufacturer.

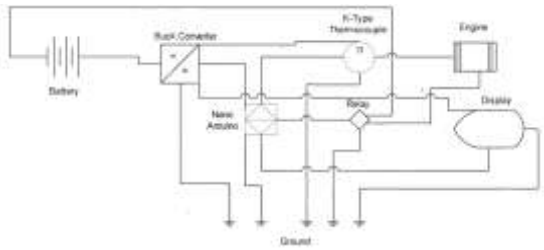

Fig -1: Circuit Diagram

5. Installation of System

5.1 K-Type Thermocouple

Fig -2: Fixing of Thermocouple

- So, I have installed the thermocouple at the engine head as shown in figure.
- I have installed thermocouple in the bolt so that the atmospheric can be neglected during running condition.
- Bolt is fixed between two fins so that the temperature can be measure easily.
- Bolt is 6mm diameter and the threads of the thermocouple are by default so that we can fix easily

5.2 Display

- Hereby, we have installed the display at the steering as shown in figure.
- We have fixed the display in the box so that it can be protected during the rainy season and can be protected from the dust and foreign particles.
- Water can damage whole system, so we have insulated the box to neglect the water particles.

Fig -3: Fixing of Display

5.3 Circuit Box

- Circuit box containing an Arduino Nano Board, Relay, Buck Converter and Bread Board.
- The Arduino Nano Board, Relay, Buck Converter and Bread Board are fixed on the PC Board.
- We have fixed Arduino Nano Board, Relay, Buck Converter and Bread Board in the one box for compacting the system so that it can be occupy less space for the installation.
- And the reason is to protect Arduino Nano Board, Relay, Buck Converter and Bread Board from the water particles in the rainy season and dust and foreign particles.
- We must protect Arduino Nano Board, Relay, Buck Converter and Bread Board because these things are electronic.

6. Analysis

Sr. No.	Vehicle Speed (km/hr)	Time (min)	Temperature (Celsius)
1.	25-35 (Slow)	30	81
2.	40-50 (Moderate)	30	93
3.	60-70 (High)	30	112

Table -1: Analysis of Project

6.1 Analysis of Different Vehicle

Table -2: Analysis of Honda Shine

Sr. No.	Vehicle Speed (km/hr)	Time (min)	Temperature (Celsius)
1.	25-35 (Slow)	30	83.5
2.	40-50 (Moderate)	30	96
3.	60-70 (Fast)	30	114

Sr. No.	Vehicle Speed (km/hr)	Time (min)	Temperature (Celsius)
1.	25-35 (Slow)	30	85
2.	40-50 (Moderate)	30	98
3.	60-70 (Fast)	30	115

Table -3: Analysis of Bajaj Pulsar 180

7. Advantages and Disadvantages

7.1 Advantages

- **Increasing the engine life:** By using this system, the life of the vehicle engine can be increase. If the temperature increase, there is chance of wear of vehicle engine. But, by using this system we can reduce wear rate of the engine so that we can increase the engine life.
- **Maintains the emission level:** If the vehicle engine is wearing out there is certain harmful gases are exhausted from the engine. There are some harmful gases affects the Ozone layer like Oxides of Carbons, Oxides of Sulphur, and Hydrocarbon.
- **Reduces Maintenance:** If the engine temperature increases, possibility of wear out the engine parts. If the engine parts wear out, the maintenance cost will be high for repair it or replace it.
- **Fuel Economy:** It increases the fuel economy also suppose if the temperature of the vehicle engine the engine will be burn out. As much as the oil level is less the less the fuel economy. And in the current era fossil fuels are less.
- **System can be customized:** The system can be customized for the specific vehicle by changing the data of system. There are different temperature ranges for different vehicles.
- **Avoids breakdown:** Vehicle engine can be damage if the temperature increases above the certain limit. Engine parts should be damage if the oil burns as told in above point.
- **Avoids abnormal combustion:** Chances of abnormal combustion if the temperature rises above certain limit. As the temperature rises engine parts can be wear out. And if the engine parts wear out there is chances of abnormal combustion.

7.2 Disadvantages

- **Water can damage the system:** During heavy rainwater can be penetrate into the system and it can damage the system. All parts are electronic so that, there is a chance of damage the battery of the vehicle due to short-circuit. Also, it can be damaging the electrical part of the vehicle.
- **Wiring:** Fault in wiring system can cause short-circuit which leads to the failure of the system.

8. Future Scope: More Parameters can be Improved

In future, I am looking forward to developing system for better engine safety, like to add the oil levelling, knock detection and mass air flow.

8.1 Oil Levelling

To measure the oil level of the vehicle engine we are looking to use the “Non-contact Type Liquid Level Sensor”. It can be fixed at the outer portion of the oil sump.

Fig -4: Non-Contact Type Liquid Level Sensor

This system can be called Radar Level Measurement. In radar level measurement, microwaves are transmitted by the antenna system of the radar sensor to the measured product, reflected by the product surface,

and received back by the antenna system. The time from emission to reception of the signals is proportional to the level in the vessel.

8.2 Mass/Air Flow Sensor

A mass (air) flow sensor (MAF) is a sensor used to determine the mass flow rate of air entering a fuel-injected internal combustion engine. The air mass information is necessary for the engine control unit (ECU) to balance and deliver the correct fuel mass to the engine. Air changes its density with temperature and pressure. In automotive applications, air density varies with the ambient temperature, altitude and the use of forced induction, which means that mass flow sensors are more appropriate than volumetric flow sensors for determining the quantity of intake air in each cylinder.

Fig -5: Mass/Air Flow Sensor

There are two common types of mass airflow sensors in use on automotive engines. These are the vane meter and the hot wire. Neither design employs technology that measures air mass directly. However, with additional sensors and inputs, an engine's ECU can determine the mass flow rate of intake air.

When a MAF sensor is used in conjunction with an oxygen sensor, the engine's air/fuel ratio can be controlled very accurately. The MAF sensor provides the controller predicted air flow information (the measured air flow) to the ECU, and the oxygen sensor provides closed loop feedback in order to make minor corrections to the predicted air mass. Also see manifold absolute pressure sensor (MAP sensor).

8.2 Buzzer

Fig -6: Buzzer

In future I am looking forward to develop the buzzer system so that the rider can be able to know about the temperature of the vehicle. Buzzer buzzes when the temperature rises above the certain temperature of the specific vehicle.

A buzzer is an audio signalling device, which may be mechanical, electromechanically or piezoelectric. Typical uses of buzzers includes0 alarm devices, timers, confirmation of user input such as mouse click or keystroke.

9. Conclusion

So hereby, I have concluded that the system I am developing which is useful to increase the operating life of the two-wheeler engine. I am developing the system by using different K-Type Thermocouple, Arduino Nano Board, Relay, Buck Converter and Display. All the readings are from the searched based and from the literature reading. The modern feature in Automobile will design the vehicles with the help of modern and advanced technology which provides comfort, safety, complete automotive emission standards. These features make the passenger journey comfortable and safe.

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