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Design Of Overheat Detection Device On Vehicle Engine Through Monitoring Water Temperature Or Cooling Oil

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ABSTRACT
Currently, there is a cooling system in vehicle engines that uses additional cooling which warns the driver that the engine's working temperature has exceeded a predetermined threshold, but not for older vehicles or those that still use a CDI (Capacitor Discharge Ignition) system that only relies on the cooling system. through the fins on the machine. To overcome the problems described previously, research was carried out. The result of this research is a tool or device that can detect excessive heat in a vehicle engine using the DS18B20 sensor. The temperature sensor results are processed using a NodeMCU ESP8266 Lolin microcontroller to obtain information about engine temperature. This tool provides a warning system with fan commands and an LCD that shows the condition of the engine's working temperature at that time. With this tool, overheating of the engine can be prevented.

***Keywords**: Overheating, DS18B20 sensors, cooling system*

INTRODUCTION

The development of technology in the automotive field, especially on motorbikes, is so fast that it encourages humans to always learn. To find out more deeply about the cooling system and based on the final project made in the manufacture of temperature monitoring tools, the author took the title “Design of Overheat Detection Tools in Vehicle Engines Through Monitoring Water Temperature or Cooling Oil”, the problem raised in writing this final project is to find out the construction and workings and analysis of the temperature that occurs in the components of the cooling system on the vehicle engine. The cooling system is a circuit on the motor to overcome the occurrence of overheating in the engine so that the engine can continue to work optimally, if the cooling and lubrication system is disrupted, the engine components associated with heat due to combustion will experience excessive temperature rise and tend to change the sift and shape of the engine components.

Engine overheating often occurs in vehicles that operate in hard-working engine conditions such as high CC motorcycles, trucks, pick-ups, public transportation or buses. These vehicles usually operate in hard-working engine conditions continuously and for a long duration. In addition, overheating can also be caused by a poor engine cooling system such as a broken fan or a lack of water in the radiator caused by leaking water in the radiator system or negligence of the vehicle user filling the water in the radiator. This research proposes the design of a tool to protect against overheating in the engine using a Ds18b20 sensor and then processing using a Ds18b20 sensor.

Ds18b20 sensor is then processed using Nodemcu Esp8266 Lolin and the information will be displayed via LCD. If the temperature has reached a certain point the system will turn on the fan located on the radiator. This tool can later be used on vehicles that do not yet have a safety system like this, be it a car, motorcycle, truck, or bus provided that the engine already uses a cooling system in the form of a radiator.

METHOD

In this research, the system development method used is the waterfall method. Waterfall is a method with an application development process which emphasizes a method with an application development process which emphasizes sequential phases. For the development model, it can be analogized to going up the stairs, where each stage is done sequentially from top to bottom. These stages are the process of planning system requirements, system and software modeling, implementation and coding, and finally the testing stage.

a. System Requirements Analysis
b. System design
c. Coding and Implementation
d. System testing

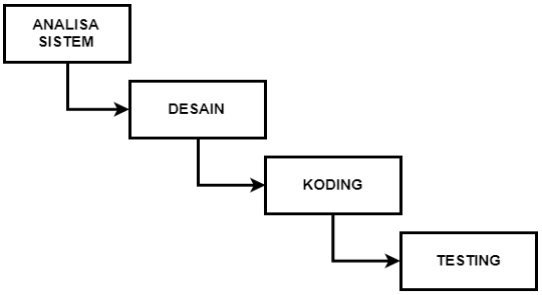

Figure 1. Waterfall method

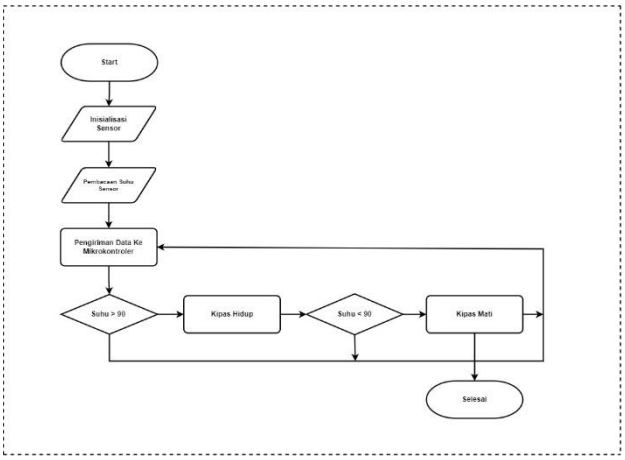

Figure 2. The flowchart of the machine

The Flowchart system of the entire tool is:

a. Start: The system is started and the sensors are initialized to start measurement.
b. Sensor Initialization: Temperature sensors for water and oil are initialized to ensure they are ready to read data.
c. Sensor Temperature Readings: Temperature data from the water and oil sensors are read at regular intervals.
d. Data Transmission to Microcontroller: The read temperature data is sent to the microcontroller for further processing.
e. Data Processing: The microcontroller processes the received temperature data, and compares it with the predetermined threshold to detect overheating.
f. Overheating Status Checking: Checks whether the water or oil temperature exceeds the threshold. If yes, the fan will turn on. otherwise, the status is normal.
g. Data Transmission to Monitoring System: Temperature and status data (normal or overheated) are sent to the monitoring system.
h. Display Data: Temperature and status data is displayed on the LCD.
i. Reading and Processing Loop: The data reading and processing process repeats continuously.

j. Stop: The system stops when it is turned off.

This flowchart helps in understanding the workflow of the overheat detection tool, starting from reading sensor data to activating the fan and displaying data on the monitoring system.

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RESULT AND DISCUSSION

In this section, the research results are explained and at the same time, a comprehensive discussion is provided. Results can be presented in numbers, graphs, tables, and others which make the reader understand easily. The discussion can be divided into several sub-chapters.

Tool Set Design

Here is the circuit scheme of the tool :

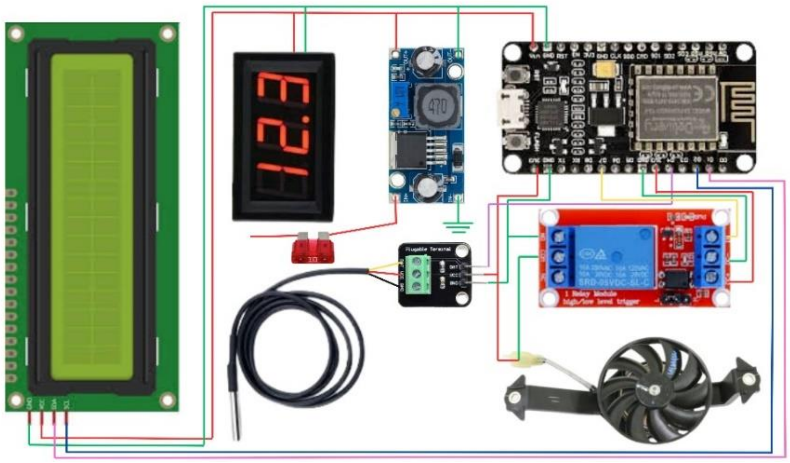

Figure 3. The flowchart of the machine

a. NodeMCU ESP8266 microcontroller: Controls all components and runs the monitoring program.
b. DS18B20 Sensor: As a temperature measuring sensor.
   DATA is connected to pin D4.
   VCC is connected to the 3V pin.
   GND is connected to pin G.
c. Relay Module: As an automatic switch.
   DC+ is connected to the 3V pin.
   DC- is connected to pin G.
   IN is connected to Pin D7.
d. Lm2596: As a microcontroller power supply.
   IN+ is connected to the ignition key output.
   IN- to the battery ground.
   Out+ is connected to Pin 3V.
   Out- is connected to pin G.
e. LCDI2C: serves to display temperature data.
   VCC is connected to the VIN pin.
   GND is connected to pin G.
   SCL is connected to pin D2.
   SDA is connected to pin D1.
f. DC Voltmeter: functions to display the voltage issued by the LM2596.
   + and Data are connected to Out+ LM2596.
   - connected to Out- LM2596.
g. Fuse: as a power safety, connected to the ignition output and IN + LM2596.
h. Fan Radiator: As a helper cool water or oil in the radiator.

+ connected to + battery.
- connected to COM relay output.

Tool Design Results

In this system, there is a 12V battery or battery, ds18b20 temperature sensor, esp8266 NODEMCU, LED lights, lm2596 module, fan, 16x2 inch lcd i2c, battery voltmeter, and contact breaker. The ignition key becomes the beginning of the running of this tool, + the ignition key output will be connected to the lm2596 step-down module. Before connecting to the lm2596 module, it would be nice to add a 10A fuse just in case there is an unstable power surge. The ds18b20 sensor functions as a temperature sensor. Information from the temperature sensor is processed using NODEMCU esp8266 and the data output is displayed on i2c 16X2 Inch. The radiator fan functions to help cool the liquid in the radiator when the temperature read by the ds18b20 temperature sensor has reached a predetermined temperature. DC voltmeter serves to determine the voltage issued by the lm2596 module. The battery functions as a power source for the system.

Here are the results of the tool design :

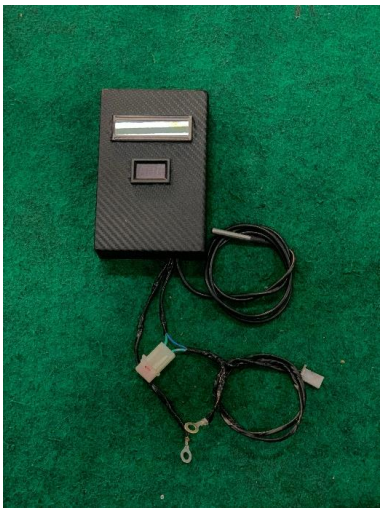

Figure 4. Product Design Results

CONCLUSIONS

This project, designed to create an overheat detection device for vehicle engines by monitoring the temperature of the cooling water or oil, is an important innovation in the automotive world. The following are some of the conclusions that can be drawn from this project:

a. Engine Overheating Protection System using ESP8266 Lolin with DS18b20 temperature sensor for temperature reader has been realized.
b. Can turn on the fan at 90ºC and turn off the fan at 85ºC automatically.
c. By integrating this temperature monitoring technology, this project not only improves vehicle efficiency but also improves vehicle engine safety and reliability. This overheat detection device can be applied to various types of vehicles, not only to motors, to ensure safe and optimal operation.

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