Prototype of Fan Radiator Control System Diesel Machine Using Max6675 Type Transmitter and Type-K Thermocouple Sensor Based On Arduino Uno

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***Abstract*—** This study aims to produce a Control System that can operate the radiator fan based on the temperature or temperature of the cooling water, this control system is made as an optimization in order to support the dynamism of the operator's work. The prototype of the automatic radiator fan control system is expected to be able to provide time efficiency and work effectiveness for the operator. The method in this study uses the prototype method. In this research, data collection techniques used are field studies, observations and literature studies. Tool testing is carried out using comparative testing and function tests documented with the minutes of testing. The final results of this study are in the form of Prototype of the Diesel Engine Radiator Fan Control System based on temperature or temperature.

***Keywords*—** Thermocouple Sensor Type-K And Transmitter Type MAX6675, Control System, Radiator Fan.

I. INTRODUCTION

PT. PLN (PERSERO) The Mahakam Generation Control Implementation Unit is one of the PLN units in East Kalimantan which oversees 5 power plant centers. One of them is Samarinda's ULPLTD (Karang Asam) located in Samarinda city. ULPLTD Samarinda (Karang Asam) is one of the plants that keeps its generating units reliable and continues to operate in order to meet the electricity supply needs of Samarinda city every day. Thus, the machines in the Karang Asam PLTD are operated non-stop 24 hours and only stop during the maintenance schedule. In addition, to meet the very significant operation needed, for optimal work of diesel engines, diesel engines have a cooling system that is very important meaning for the durability of an engine, when running the engine will become hot, because the combustion process in the cylinder, the engine is too heat, in addition to being easily damaged, also the energy output is less than the maximum, so it needs a cooling Radiator unit that is very optimal in maintaining diesel engine performance.

Based on observations during conducting research activities, the diesel engine operator operates the radiator fan by looking at the temperature on the engine panel whether the temperature at the engine reaches a high operating temperature of the cooler or not when the temperature at the engine reaches a high temperature for cooling operation, then the operator will walk to the radiator panel, and operate the radiator fan one by one and vice versa when the engine temperature is low then the radiator fan will standby one by one manually.

How to operate the radiator fan conducted at Samarinda ULPLTD (Karang Asam) needs to be made more optimal in order to support the dynamics of the work. While the technical operations carried out are still manual, take longer, because they have to see the temperature on the engine panel first for the operation of the radiator fan.

Thus, to facilitate the operation of the radiator fan, an automatic radiator fan prototype for Samarinda based ULPLTD will be made

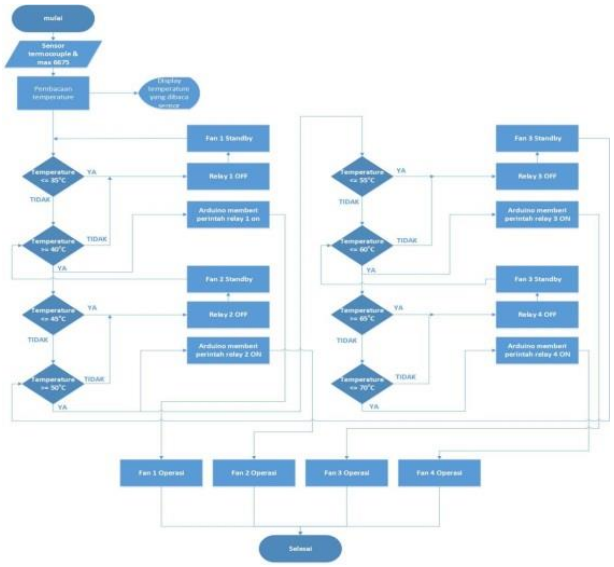
Arduino Uno with the Thermocouple sensor, it is hoped that managers and staff can consider this prototype so that it can be implemented in diesel generating units.

II. RESEARCH METHODS

Prototype Diesel Engine Radiator Fan Control System Using Max6675 Type Transmitter And Arduino-based Type-K Thermocouple Sensor, this research is about controlling the Fan Radiator automatically using Arduino as well as the Max6675 Type Transmitter input and Thermocouple Type-K sensors to control Operations and Standby based on temperature. The design of the system uses Flowcharts and Wiring Diagrams as one of the ways to make this control easier.

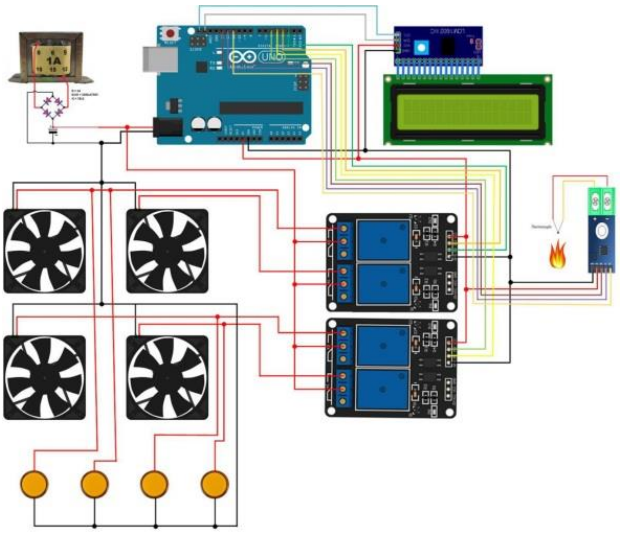
1. Flowchart of radiator fan control as follows:
    1) Start.
    2) The sensor and transmitter read the temperature.
    3) Temperature reading process, displaying the temperature read on the LCD (Liquid Crystal Display).
    4) Temperature reads, if the temperature is equal to or less than 35 then, relay 1 off and fan 1 standby.

5) If the temperature is equal to or more than 40 then, relay 1 on and fan 1 operate.
6) If the temperature is equal to or less than 45 then, relay 2 is off and fan is 2 stand by.
7) If the temperature is equal to or more than 50, relay 2 on and fan 2 operate
8) If the temperature is equal to or less than 55, relay 3 is off and fan is 3 stand by.
9) If the temperature is equal to or more than 60, relay 3 on and fan 3 operate.
10) If the temperature is equal to or less than 65 then, relay 4 is off and fan is 4 stand by.
11) If the temperature is equal to or more than 70 then, relay 4 on and fan 4 operate.
12) Done.



Picture 1. Flowchart Prototype Fan Radiator control system

2. The following radiator fan control wiring diagram, Power Supply + 12V DC connected to arduino as a power supply for arduino, LCD (Liquid Crystal Display) connected to I2C Module, I2C Module connected to arduino, Thermocouple Type-K sensor connected to MAX6675 transmitter, MAX6675 transmitter is connected to Arduino, Relay module is connected to Arduino and Relay Module is connected to Fan and indicator lights. Where are pins on the LCD to I2C pins, on I2C pins vcc to 5V pins, GND pins to GND pins, SLC pins to SCL pins, SDA pins to Arduino SDA pins, Thermocouple sensors are connected to MAX6675 transmitters at pins + and -, at the transmitter MAX6675 SO pin to pin 11, CS pin to pin 12 Arduino, on Relay module 1 pin vcc to pin 5V, GND pin to GND pin, pin IN1 to pin 2, pin IN2 to pin 3 Arduino, on Relay module 2 pin vcc to pin 5V, GND pin to GND pin, pin IN1 to pin 4, pin IN2 to pin 5 Arduino, Then 1 cable (red color) of each fan and indicator lights are connected to the relay NO connector, the relay COM connector is paralleled to Power Supply + 12V DC. And 1 cable (black) is parallel to all lights up to the -12V DC Power Supply.



Picture 2. Automatic Curtain Control Device Prototype

III. RESULTS AND DISCUSSION

1. The Process of Working Tools

The workflow of the radiator fan control system is a Type-K Thermocouple Sensor starts to do temperature readings, then the data from the Type-K Thermocouple Sensor will be read by the Max6675 Transmitter to change from analog to digital signal which will be input into Arduino and then will display the readable temperature to LCD (Liquid Crystal Display), if the temperature reaches more than or equal to 40ºC then Fan 1 will operate and vice versa if the temperature reaches less than or equal to 35ºC then Fan 1 will standby, if the temperature reaches more than or equal to 50ºC then the Fan 2 will operate and vice versa if the temperature reaches less than or equal to 45ºC then Fan 2 will standby, if the temperature reaches more than or equal to 60ºC then Fan 3 will operate and vice versa if the temperature reaches less than or equal to 55ºC then Fan 3 will standby , if the temperature reaches more than or equal to 70ºC then Fan 4 will operate and conversely if the temperature reaches less than or equal to 65ºC then Fan 4 will standby.

Picture 3. Standby Control System

Picture 4. Fan Indicator Lights 1 Is On

Picture 5. Fan Indicator Lights 2 Is On

Picture 6. Fan Indicator Lights 3 Is On

Picture 7. Fan Indicator Lights 4 Is On

IV. CONCLUSION

To create a control system tool, the first stage is to design a control system, starting with designing block diagrams, wiring diagrams and flowcharts, then making hardware for tools that are controlled based on block diagrams, and wiring diagrams afterwards making program code for uploaded to Arduino based on the flowchart created, and after these stages can be carried out controlling the control system tools, complete. With the design of the Arduino, based radiator fan control system it can make it easier to implement the tool on the radiator control panel, so as to ease the workload of the operator, who previously had to look at the engine control panel first before going to the radiator control panel to turn on the radiator fan one by one the workers no longer need to operate the radiator fan manually, just simply monitoring it routinely. The prototype control system uses the Thermocouple Type-K sensor, the Thermocouple Type-K sensor starts to read the temperature, then the data from the Sensor is input into Arduino and then displays the temperature reads to the LCD, if the temperature reaches 40ºC then Fan 1 will operate and conversely if the temperature reaches 35ºC then Fan 1 will Standby, if the temperature reaches 50ºC then Fan 2 will operate and vice versa if the temperature reaches 45ºC then Fan 2 will Standby, if the temperature reaches 60ºC then Fan 3 will operate and vice versa if the temperature reaches 55ºC then Fan 3 Standby will, if the temperature reaches 70ºC then Fan 4 will operate and

vice versa if the temperature reaches 65ºC then Fan 4 will standby.

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