

PPA PREVENTIVE FIRE SYSTEM

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ABSTRACT

Fire incidents are something that every company must be aware of, because they can cause material and non-material losses. To deal with fires, a fire prevention and control system is needed. This system emphasizes preparation to prevent fires and can handle fires. However, the existence of a fire prevention and control system does not guarantee that a fire will not occur unless the fire prevention and control system is implemented well. Fire prevention program from PT PPA is a very important program to maintain the security, safety and successful operation of company facilities. Companies in the fuel storage area. The PPA preventive fire system is a digitalization program for detecting early indication of a series of fires. In principle, the PPA preventive fire system takes temperature readings in the fuel storage area which can then provide notifications or alerts to stakeholders in the fuel storage area using a certain algorithm so that they can provide messages via SMS (Short Message Service), WhatsApp Message and E-Mail. . Implementation of this system is an important step in mining work areas as the first preventive measure in the event of a fire.

KEYWORDS Digitalization, Fire, Preventive Fire System



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INTRODUCTION

PT Putra Perkasa Abadi was founded in 2002 (Pagi et al., 2024). PPA is a mining contractor that specializes in heavy equipment rental, providing earthmoving & mining services (Bisara, 2023). As one of the largest coal mining contractors in Indonesia, PPA has broad competence and deep understanding in terms of coal mine safety and operations (Pagi et al., 2024). The following are the services provided by the PPA group:

1. Specializes in heavy equipment rental and mining services.
2. Stripping the soil layer (overburden removal) (Yusyanti, 2017).
3. Coal and mineral mining (coal & mineral mining).
4. Port management.

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5. Coal transportation and road maintenance (coal hauling and road maintenance)

In these operational activities PT. PPA requires fuel to move quite a lot of units, for the SKS jobsite itself, 140,000 liters of diesel fuel is used in 1 week or approximately Rp. 3,830,826,000 in one week, from this nominal amount, employees at the job site are required to always maintain the safety of themselves and company assets (Saputri & Rohmah, 2023). So, to prevent losses in the fuel storage area, we are making improvements aimed at increasing safety, which is called the PPA Preventive fire system which is implemented in the fuel storage area (Novitasari, 2015).

The PPA Preventive fire system is a heat/temperature detection system using a digital information system-based circuit, so that when used in high temperature conditions it will function to provide information to users via short messages. Messages here are set to use a certain algorithm so that you can provide messages via SMS (Short Message Service), WhatsApp Message, and E-Mail (Ardiyanto et al., 2021).

In addition to the PFS fire prevention system, it functions to provide regular reports on the temperature and humidity conditions of the surrounding area so that it is hoped that employees can take precautions based on the temperature data read by the PFS (Ariyani & Supriyono, 2017). Thus, this research aims to determine the temperature of the ignition point before the chain of chemical reactions in the fire pyramid reacts, so that it will be easier to carry out preventive and corrective actions and prevent fires that cause losses (Hasriana, 2019).

RESEARCH METHOD

The method used is descriptive analysis (Moleong, 2010). This method is used to analyze, describe and summarize various conditions, and situations from various data collected from observations on the problem under study at the time of the study (Arifudin, 2019). The approach used is a qualitative approach. According to Computer & Jikem, (2022) defines qualitative approach as an approach based on the philosophy of post positivism, used to examine the natural condition of objects (as opposed to experiments) where the researcher is the key instrument (Tanamal et al., 2023). Triangulation collection techniques, data analysis is inductive / qualitative and qualitative research results emphasize meaning rather than generalization. The research instruments are DHT 22 Heat Sensor, NodeMCU ESP8266 Module, Arduino Buzzer Speaker, Male to Female Jumper Cable, Micro USB Data Cable, and Arduino BreadBoard (Nugrahadi & Adi, 2021).

RESULT AND DISCUSSION

The PPA Preventive Fire System was created to prevent and control fires in the fuel storage area with the aim of emphasizing fire prevention. PPA Preventive Fire System used to identify the temperature and humidity conditions of the surrounding area before the chemical reaction chain in the fire pyramid reacts, so that it will be easier to carry out preventive and corrective actions and prevent losses. PPA fire preventive system (PFS) uses a series based on a digital information

system, so that when used under certain conditions (abnormal temperatures), it will function to provide information to users via messages, the messages here are set using a certain algorithm so that they can provide messages via SMS (Short Message Service), Whatsapp Message, and E-Mail. As we know in the theory of the fire pyramid (tetrahedron), the fire pyramid is the supporting elements for fire where these elements are heat, fuel and oxygen. For combustion to take place, a fourth component is needed, namely a chemical chain reaction. A chemical reaction chain is an event where the three elements react chemically with each other, so that what is produced is not just incandescence but a flame or combustion event.

Equipment

The equipment used in this improvement is hardware that does not require large electrical energy, so it does not pose a new danger to the implementation process, here is the hardware used in this improvement:

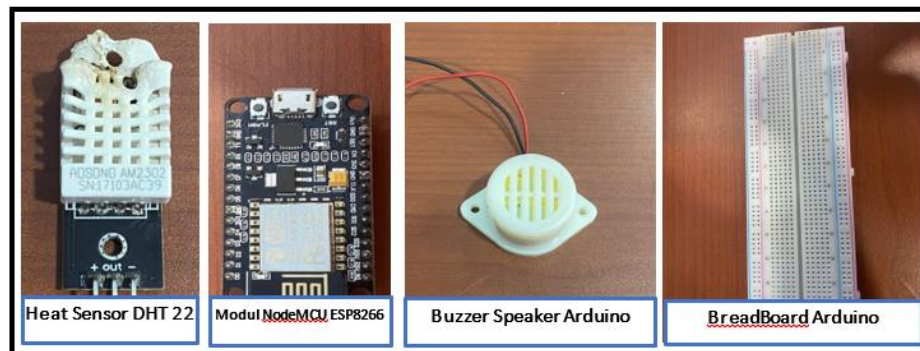


Figure 1 PPA fire preventive system (PFS)

The functions of the above tools are:

1. DHT22 : Heat dan Humidty sensor
2. MQ-2 : Smoke, LPG, dan Co2 Sensor
3. NodeMCU module ESP8266: an electronic board based on a ESP8266 chip with the ability to run microcontroller functions and also an internet connection (WiFi).

The next step of the installation is the installation of the equipment and installation in the fuel storage area, the purpose of installation in the fuel storage area is a preventive action before the chemical reaction that causes the fire occurs, with a digital temperature reading.

PFS installation

From the equipment above, installation is then carried out (figure 2) or arranged to function, after which it is installed in the fuel storage area (figure 3). In the fuel storage area, there are 10 installation location points in order to cover all areas that have the potential to cause fire or excessive hot temperature conditions.



Figure 2 Installation of PFS tools



Figure 3 The red dot is the location of the sensor installation in the fuel storage area

Software

This *improvement* is very closely related to software (*software*) as shown below (4) is an example of *software* used to input data read from hardware installed in the *fuel storage area*, the application below has been adjusted *to the coding system* that will be read, so that it can adjust *to the output* that is desired. In figure 4 one of the reading examples in the Arduino IDE 2.0 application.

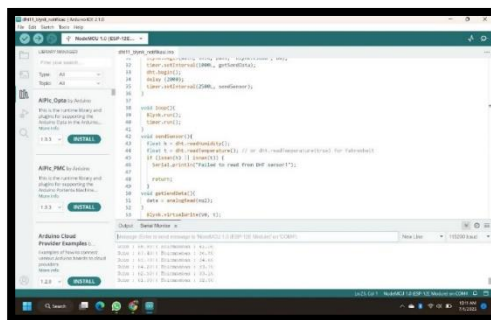


Figure 4 Server temperature and humidity readings Using the Arduino IDE 2.1.0 application

Mobile Notifications

After reading in the Arduino system to make it easier for users to read the actual temperature conditions in our fuel storage area using the Blynk application (Figure 5), the application can be updated in realtime according to the PFS temperature reading in the fuel storage area (Suyanto, 2003).

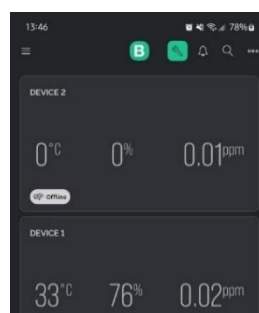


Figure 5 Temperature and humidity readings on a cellphone using the blynk application

Abnormal temperature notification

In the final series of PFS this is to provide information if there is an abnormal temperature condition, we make notification settings if the temperature reaches 70o then a notification will appear, figure 6 is an example of a notification if an abnormal temperature occurs, the notification appears on Email, Telegram, and the Blynk application itself (Isnaini, 2009).

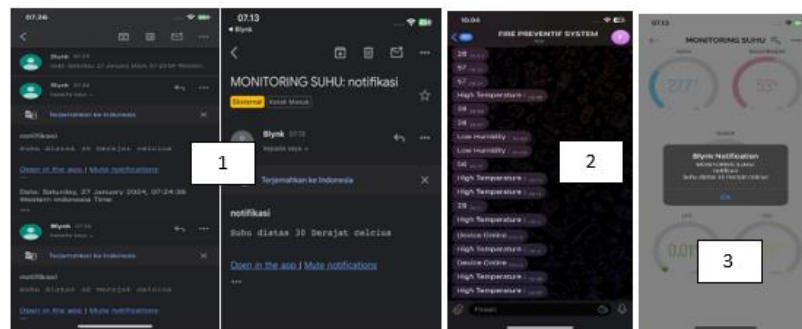


Figure 6 Temperature notifications on email (1), telegram (2), and blynk app (3)

CONCLUSION

Based on the results of the study, it was found that the Preventive Fire System is very important and useful for the company. In this digital era, Information and Communication Technology (ICT) has introduced tools such as the Preventive Fire

System that utilizes certain algorithms in order to provide messages via SMS (Short Message Service), Whatsapp Message, and E-Mail so that in its use when under certain conditions (abnormal temperatures), it will function to provide information to the user.

The application of this system can certainly optimize to improve prevention and reduce material and non-material losses in fire incidents. This shows that the Preventive Fire System using a series based on digital information systems has a positive impact on improving safety and operational sustainability. Thus, the implementation of advanced technology like this is an important step for mining contractor providers to carry out fire prevention and suppression.

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