DEVELOPMENT OF MONITORING APPLICATION TEMPERATURE AND MATERIAL COLD STORAGE AT PT DIRGANTARA INDONESIA (Persero) BASED ON ANDROID

Jajang Maolana Yusup[1], Eko Budi Setiawan[2]

[1,2] Informatic Engineering, Universitas Komputer
Jl. Dipatiukur No. 112 Bandung, Jawa Barat 40132
E-mail : jmyusup@gmail.com[1], eko@email.unikom.ac.id[2]

ABSTRACT

The Department of Composite Bonding is one of the production parts in PT Dirgantara Indonesia which handles the making of parts with composite materials.Composite is included in the special process, because in it there are materials that require special treatment, including when the material is not used, should always be stored in cold storage.And each material has a different age if it is inside and outside of cold storage.Cold storage temperature should always be maintained at a temperature of-180C.If there is a rise in temperature then the material in cold storage will be reduced in age, it should always be a dick at all times.In addition to the access of material age is still limited to certain people, in this case only Quality Assurance (QA).So there is a hard time getting that information. For remote temperature monitoring use the dht22 sensor connected with a microcontroller Wemos D1R2, and the system will notify you when the temperature is outside the requirement.In addition, the application can facilitate the calculation of material life and the treatment.

Kata kunci : dht22, *cold storage,* komposit, wemos D1 R2, otoklap

1. INTRODUCTION

1.1 Background of Problem

PT Dirgantara Indonesia (Persero) is one of the state-owned enterprises (BUMN) engaged in aerospace.Pt. Indonesian Aerospace has a key competence in the development and design of aircraft, the manufacture of aircraft structures, assembly, and maintenance for small to medium size civilian and military aircraft [1].

The Department of Composite Bonding is one of the production parts in PT Dirgantara Indonesia which handles the making of parts with composite materials.Composite is included in the special process, because in it there are materials that require special treatment, including when the material is not used, should always be stored in cold storage [2].And each material has a different age if it is inside and outside of cold storage [2].

Based on the results of interviews on the employees of PT Dirgantara, especially Quality Assurrance (QA) produce some very important points including Cold storage should always be maintained temperature below-180 Celsius, with the age of the material will be longer, otherwise if the material is outside the cold storage or the temperature in the cold storage does not meet the specified requirement, then the material is maximum of 240 hours or can be less depending on the type of material.For that cold storage temperature should always be controlled. On weekdays, there are employees who maintain and take action if the temperature in cold storage is outside the requirement [3].But when the holidays, no employees are assigned to keep the temperature of the cold storage is not controlled.

Cutting age Data and material identities are included in a label stored in material packaging.The cutting time will be reduced and begin to count when the material exits and re-enters into cold storage.The absence of a system that contains the age of material causes the employees who will wear materials should come directly to the material place and check each material.

The remaining material used in the making part will be returned to cold storage with the remaining age of cutting data to be used in the future production process.While the material used in the making part, the life of the cut will continue to be reduced until the part is heated (curing) in an otoklap.So if the cutting age is exhausted, but not yet heated, then the part is considered defective and cannot be worn on board.For the heating process itself can not be done suddenly because it requires preparation and the process takes approximately 8 hours.So heating time should be spent from the previous day. The age of material cutting is only directed by Quality Assurance (QA) in a book and the operator who will check it should ask him first.Because of the lack of people who know the endless age of material, sometimes there is sudden information that comes from QA about material age information and must be done warming, even sometimes cause material to be damaged.

To perform temperature monitoring of the cold storage used dht22 sensors that are connected to Wemos D1 R2 for subsequent monitoring via Android devices [4].All functions involved with cold storage such as warehouse, operator, QA and

maintainance are users of Android smartphones.Android is a Linux-based open source operating system designed for touch screen mobile devices such as smartphones and computer tables [5].In addition, there will be a notification to the smartphone if there is a temperature deviation from the specified requirement.

Based on the problems that have been described above, a system that can monitor the temperature condition and data processing of the material.Then the application is built that can solve the problem. With Android-based, apps can be accessed from anywhere and by anyone.In this case, not only by the warehouse officer but the operator, quality assurance and Maintenance section can access it.

1.2 Composite

Composites are a type of new material that is engineered consisting of two or more materials in which the properties of each ingredient differ from each other both chemical and physical properties and remain separate in the final result of such materials (composite materials).With the difference from the constituent material, the composite material must be firmly bonded, so it is necessary to add the wetting agent [2].The objectives of the establishment of composites are as follows:

1. Improve the specific mechanical properties and specific properties
2.Simplify design that is difficult to manufacture
3. Flexibility in design that can save cost
4.Make the material lighter

1.3 *Cold storage*

Cold storage is a cooling machine tool that accommodates objects that will undergo a cooling process.Cold storage units are commonly used in everyday life to cool or preserve food.The use of cold storage in the industry is to cool the raw material or finished material from a product.One of the goals of cold storage is to extend the storage life by cooling down [6].

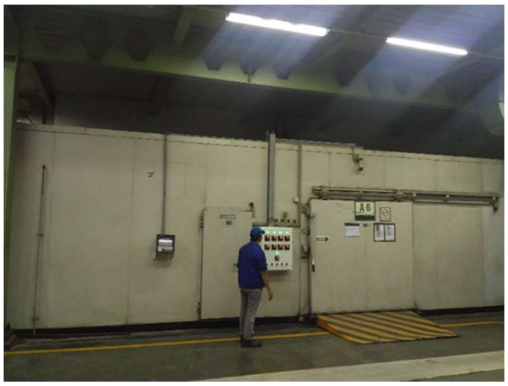

Figure 1. *Cold storage* Bonding Composite

Cold storage has a difference with other refrigeration tools. The difference is that cold storage has a larger dimension or can be said as a big freezer considering storage capacity, loading and unloading path needs Distribution needs of air flow around the product.

1.4 The Purpose

The purpose of this application development is as follows:

1. Can perform cold storage temperature monitoring in real time from anywhere in order to do faster action if the temperature does not meet the set requirement.
2. Facilitate the longevity of material cutting and choosing the right materials to be used as needed
3. Facilitate the operator to access material age information before heating.

1.5 Research methods

The stages of research used in designing this application, among others, can be seen in the following figure:

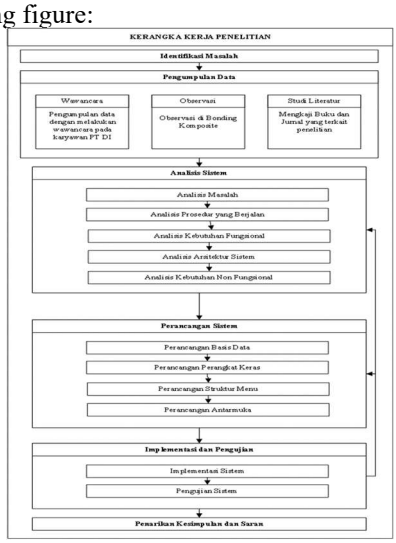

Figure 2. Research Methods

2. AND DISCUSSION

2.1 Problem analysis

The temperature of cold storage of composite materials should be maintained according to requirement.During holidays, employees are not in the workplace, they are not controlled in real time.It can cause material damage without preventive measures and faster countermeasures.

The age of the composite material used is only available on labels attached to each material.Operator, QA, and warehouse officers struggle to do the check.In addition, the lack of information time-age material that often poses problems.

1.6 Analysis of walking procedures

The use of composite materials at PT Aerospace Indonesia has the procedures and some functions involved.The procedure can be seen in Figure 3

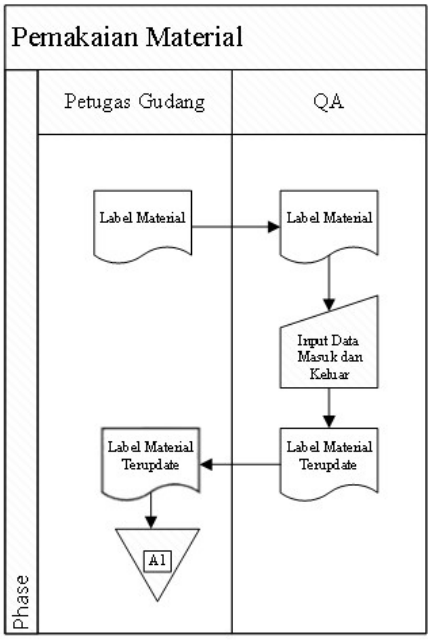

Figure 3. Flowmap Material usage

1.7 System Architecture Analysis

The system to be built is the temperature monitoring application and the composite material Umumur the system will use the dht22 sensors and Microcontrolller Wemos R1 D2 as temperature-sending AIDS.The system architecture can be seen in the following image 4:

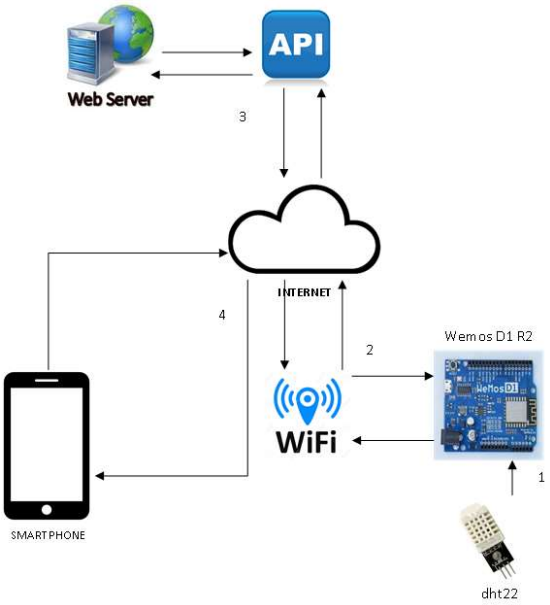

Figure 4. Arsitektur Sistem

The following analysis of data flows and explanations of each stage for the analysis of system design architecture is shown in Figure 4:

1. The DHT22 sensor is a sensor used to measure the humidity rate and ambient air temperature.The output of this system is digital data. The DHT22 has a good level of accuracy with a relative error of 4% temperature measurement and 18% humidity.
2. Wemos D1 R2 connected to internet via WiFi to further perform temperature checking in accordance with the desired time span the data is sent to the API, where in this API there is also a database to store every value of the sensor.
3. The reading Data from the DHT22 sensor is sent to the API, and then forwarded to the Web server to be processed.
4. The application on the smartphone can display the temperature sent by the appliance through the API.In addition to the smartphone there is a material usage menu.

2.4 Analysis of used technology

Technological analysis is a process of analysis aimed at knowing what technology to use and how it works in the system to be built.The technology used in the system to be built is as follows:

1. Sensor dht22

The DHT22 is a sensor used to measure moisture and temperature in the surrounding environment [7].This sensor has a higher level of precision compared to similar sensors such as DHT11.The output of the DHT22 sensor is a digital signal.

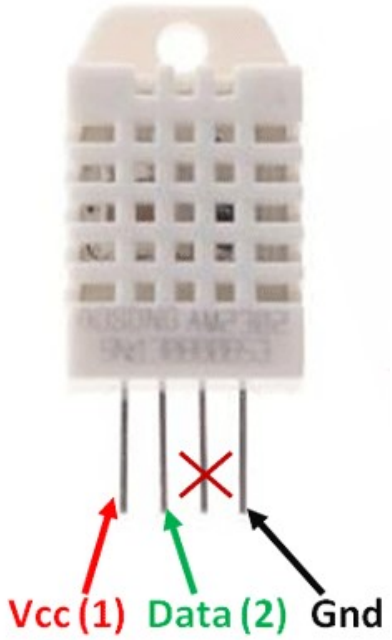

Figure 5. Sensor dht22

Tabel 1 Spesifikasi dht22

Model	DHT22
Power supply	3.3-6V DC
Output signal	digital signal via single-bus
Sensing element	Polymer capacitor
Operating range	humidity 0-100%RH; temperature -40~80Celsius
Accuracy	humidity +-2%RH(Max +-5%RH); temperature <+-0.5Celsius
Resolution or sensitivity	humidity 0.1%RH; temperature 0.1Celsius
Repeatability	humidity +-1%RH; temperature +-0.2Celsius
Humidity hysteresis	+-0.3%RH
Long-term Stability	+-0.5%RH/year
Sensing period	Average: 2s
Interchangeability	fully interchangeable
Dimensions	small size 14*18*5.5mm; big size 22*28*5mm

For the dht22 sensor temperature reading range is at a temperature of-40 to 80^0 C, while for in cold storage The maximum temperature reaches-24^0

C based on the maximum maintenance of the maintenance party, so it can be concluded that the temperature reading of the dht22 sensor meets Needs of the system to be created. Sensor.

2. Wemos D1 R2

Wemos D1 R2 is a microcontroller device that can connect sensors in this study DHT22 in order to be able to send data to the system [8].The way it works is Wemos has a pin that is connected directly to the sensor to further capture the data by using the WiFi embedded in Wemos D1 R2 that is connected to the Internet and then taken to the built API.

Figure 6. Wemos D1 R2

3. Fire Cloud Messaging (FCM)

Fire Cloud Messaging is a push server solution for Android apps.The push server is meant to be a feature we use if our server applications want to trigger mobile apps.Google provides an FCM facility that can be used for both Android and iOS apps [9].Advantages of unlimited Upstream or Downstream FCM, overcoming the queue and shipping aspects [10].

Fire cloud messaging technology is used in this application to provide notification message if cold storage temperature exceeds the specified requirement, above-18^0 C.

4. Quick Respons (QR) Code

QR code is a type of two-dimensional matrix code that serves to store certain information.One of the tools that can read QR codes is the camera on a Smartphone.In this study QR code will be used on the application to help the user get the detailed information of the composite material

When the user checks the information of the material in cold storage, the user directs the barcode reader available in the application to the material QR code.In addition, QR code readings are used during the material use process, where the user does not have to write the material number.The QR code will accommodate a material number.

1.8 Use Case Diagram

Use case diagram is created to describe the processes that exist in Systemand show the actors involved in the system.

Use case of a temperature monitoring and material age application diagram can be seen in the following figure 7.

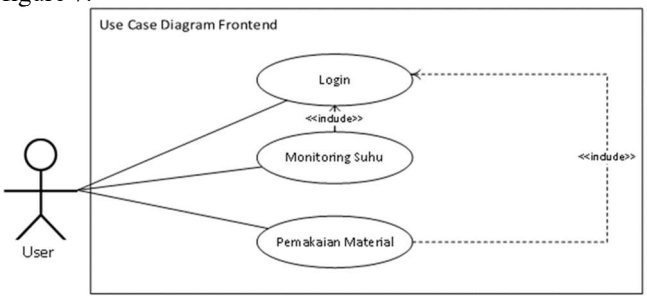

Figure 7. Use Case Diagram

1.9 Class Diagram

The diagram class is used to describe what classes are involved in system development.Class monitoring application Diagrams temperature and age of cold storage material can be seen in the following figure 8

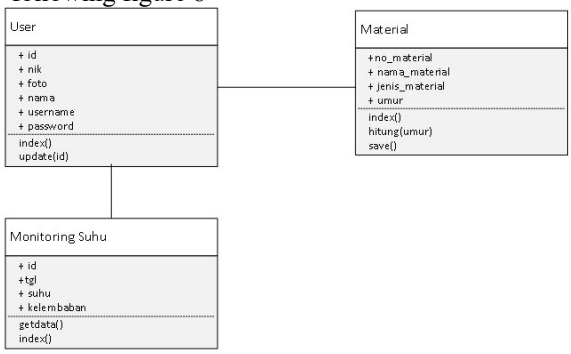

Figure 8. Class Diagram

1.10Interface Design

The interface design illustrates the display plan of the application to be built, and serves to facilitate the implementation of the system.The design of the temperature monitoring application interface and cold storage material can be seen in the following image:

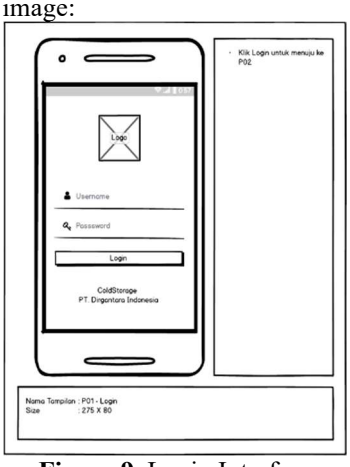

Figure 9. Login Interface

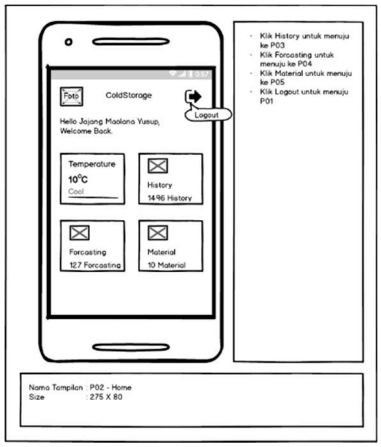

Figure 10. Home Interface

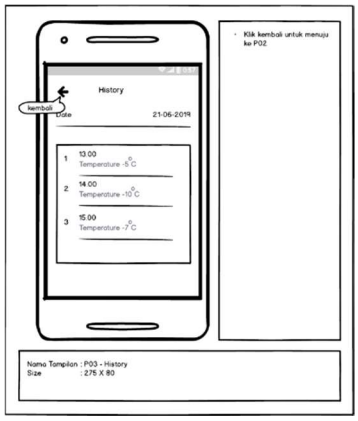

Figure 11. History of temperature Interface

2. CONCLUSION

Based on the results of the design, then the design of the temperature monitoring application and the age of material cold storage is in accordance with what is expected to proceed to the implementation and testing phase.

BIBLIOGRAPHY

[1] K. Pratama and E. B. Setiawan, "Rancang Bangun Aplikasi Monitoring Polusi Udara Berbasis Android dengan Fitur Forecasting di PT Dirgantara Indonesia," 2017.

[2] N. Nayroh, "Teknologi Material Komposit," 2013.

[3] J. S. F. Santamaria, Manufacturing of Aramide Fiber Composite Material Structures (Laminate and Sandwich), CASA, 1998.

[4] D. Hermawan and E. B. Setiawan, "Prototype of Gas Warning Monitoring Application Using Mobile Android Smartphone : A Case Study," *IJNMT,* vol. 4, no. 1, pp. 17-24, 2017.

[5] Surawijaya Surahman and Eko Budi Setiawan, "Aplikasi Mobile Driver Online Berbasis Android Untuk Perusahaan Rental Kendaraan," *ULTIMA InfoSys*, vol. VIII, pp. 35 - 42, Juni 2017.

[6] M. R. Rahmat, "Perancangan *Cold storage* untuk Produk Reagen," *Jurnal Ilmiah Teknik Mesin,* vol. 3, 2015.

[7] A. H. Saptadi, "Perbandingan Akurasi Pengukuran Suhu dan Kelembaban Antara Sensor DHT11 dan DHT22," *JURNAL INFOTEL,* vol. 6, no. 2, 2014.

[8] T. Kusuma and M. T. Mulia, "Perancangan Sistem Monitoring Infus Berbasis Mikrokontroler Wemos D1 R2," *Konferensi Nasional Sistem Informasi,* 2018

[9] D. R. A. Yogiswara, "Penerapan Web Service dan Firebase Notification pada Pengembangan Aplikasi Gerakan Nasi Bungkus Jember Berbasis Android," *Jurnal Informatika Polinema,* vol. 4, no. 2, Februari 2008.

[10] A. O. Ramadhan, H. Tolle and L. Fanani, "Pembangunan Modul Penunjang Pembelajaran di Kelas Untuk Aplikasi Brawijaya Messanger Dengan Platform Firebase," Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer, vol. 2, pp. 1630-1637, 2018.