PROTOTYPE MONITORING WASTE WATER TREATMENT BASED PHARMACEUTICAL INDUSTRY INTERNET OF THINGS (CASE STUDY:PT. OTTO PHARMACEUTICAL INDUSTRIES)

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ABSTRACT

Prototype development monitoring at wastewater treatment plant-based pharmaceutical industry factory built IOT aims to assist and facilitate waste PT.OTTO officers in the monitoring and control at the WWTP. To achieve the goal, this study uses the stage in the form of data collection and software development. Data collection is done by way of literature studies, interviews, and direct observation in PT.OTTO. As for software development using prototyping methods. This research can monitor the condition of alcohol, ammonia, water temperature, and pH in wastewater as well as doing the watering lowering the pH and temperature regulation in the WWTP. Deficiencies contained in this study include WWTP observed pH scale is not accurate enough, and the lack of consistency. That's because electricity is obtained by the pH sensor is not stable. Generally, this research could help officials PT.OTTO waste monitoring and controlling the conditions of the WWTP in peroses end, although there are some shortcomings.

Keywords : The monitoring system, control system, WWTP, Internet of things, Prototyping.

1. PRELIMINARY

Industrial activity has become an inseparable part of life, so as to provide a positive impact for humans and also may have a negative impact in the form of environmental damage caused by waste management is not good [1], waste is the waste from a production process which does not have economic value. The industrial waste is divided into three, namely solid waste, waste gas, waste water. The liquid waste is the result of industrial waste containing soluble particles and settles well contain toxic chemicals or not. in general, liquid waste is dumped in rivers around the residence community and often residents use the river for their daily activities. PT. OTTO PHARMACEUTICAL INDUSTRIES is one of the companies that produce pharmaceutical industry wastewater.

THEORETICAL BASIS

Liquid Waste Liquid Waste Industries is a waste product resulting from a production process in an industry in liquid form. Number of wastewater bigger scale than domestic waste or household scale, and has an impact on the environment outweigh the domestic waste. Liquid waste should have limits the processing of waste or the so-called quality standards. Quality standards are parameters for measuring the quality of waste water. These parameters are grouped into three, namely organic parameters, physical characteristics, and specific contaminants. Organic parameters consist of total organic carbon (TOC), chemical oxygen demand (COD), biochemical oxygen demand (BOD) and oil. The physical characteristics of the waste water can be seen from the parameter of total suspended solids (TSS), pH (acidity), temperature (Celsius), turbidity (turbidity), odor and reduction potential [2]. Standard wastewater treatment outcome or the so-called quality standards for the industry has been established by the Ministry of Lingkuhan Life. In this study as a reference parameter to be used is that of the physical characteristics, namely pH, temperature and turbidity. Chapters written with Times New Roman font size 12, while for section using a size 10 and both are in bold.

2.1 **Internet Of Things (IOT)**

Internet of Things(IOT) is a concept that aims untukmemperluas benefit from Internet connectivity that are connected continuously. As for capabilities such as data sharing, remote control, and so on, as well as the objects in the real world [4], Examples of foodstuffs, electronics, collectibles, any equipment, including all living things are connected to local and global networks through an embedded sensor and is always active. Basically, the Internet of Things refers to objects that can be uniquely identified as virtual representations in an Internet-based structure. The term Internet of Things was originally suggested by Kevin Ashton in 1999 and became famous through the Auto-ID Center at MIT [9]. Figure 2.13 shows the concept of the Internet of things.

3 ANALYSIS AND DESIGN SYSTEM

3.1Analisis Problems

Analysis of the problem is the assumption of the problem which will be described in the monitoring and control system construction of waste water treatment literacy-based internet of things. Analysis of problems of the current system at this time are:

1. The layout of the WWTP are generally quite far away from the office so troublesome plant operators to always standby at the site of the WWTP.
2. Water quality monitoring is still done manually by going directly where the processing and disposal of masi done manually pressing the tap discharge into water bodies.

3.2 Analysis of the Current System

Analysis of the system running is steps illustrate the current system and aims to give a more detailed picture of the workings of the system that is currently running.

Similar systems 3.2.3Analisis

Analysis of similar systems intended to analyze the functionality and workflow systems that already exist in this study. It bertujan to sort functionality and workflow that will be adopted in the system under study is based on the benefits that have been generated from the system being analyzed and are looking for the uniqueness of the system established in this study.

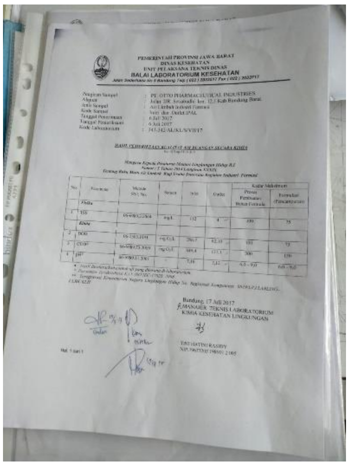
3.2.4 Analysis of WWTP

WWTP in PT.OTTO using shelter shaped like a box-shaped pool and there is a water pump as well as the use of iron buffer for employee safety. In Figure 3.5 displays pictures of bath PT.OTTO padaa sewage treatment outcome.

Picture 1 WWTP PT.OTTO

3.2.5 Data Analysis WWTP

WWTP in PT.OTTO have data on shelters that contain ingredients pH, COD, BOD, TSS result of waste treatment facility that has been in peroses with several stages in wastewater treatment can be measured by the content of which are in the tub wastewater treatment outcome. In Figure 3.6 displays an image of the data tub PT.OTTO padaa sewage treatment outcome.



Picture 2 WWTP PT.OTTO

3.3 Quick Plan

At this stage the design of prototype sisitem media monitoring and Controlling livestock farming earthworms. Prototype were adjusted according to pre-defined system and created as a reference of the actual incident.

3.3.1 Analysis system to be set up

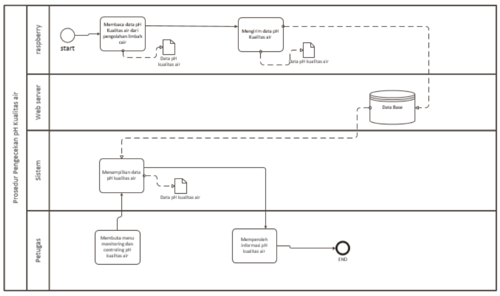
The analysis system built that stage that provides an overview system built and aims to provide a more detailed picture of the workings of the system to be built.

3.3.1.1 Monitoring procedures wastewater treatment water pH

PH monitoring procedures wastewater treatment is a procedure for monitoring the state manager pH of the water in the sewage treatment process. The process that takes place is as follows:

1. raspberry read data pH waste water quality and transmit the data to a web server to be stored in the database.
2. Business open a menu of monitoring the pH of the water quality in the system.
3. The system displays data from a database pH of the water quality on the web server.
4. Then the manager informed the pH of the water quality.

In the figure 3-7 shows BPMN media pH monitoring procedure livestock cultivation of earthworms to be built.



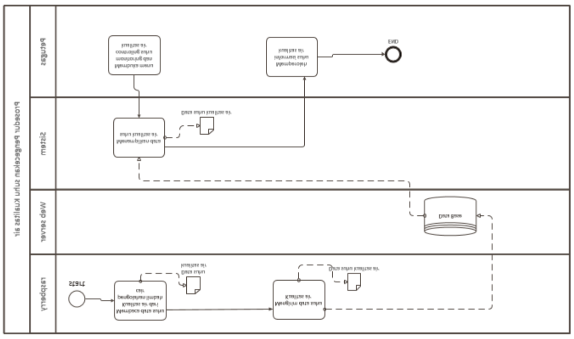
Picture 3 BPMN pH Monitoring water quality Built

1.2.1.2. Water Temperature Monitoring Procedures wastewater treatment

The temperature of the water quality monitoring procedures are procedures for managers to monitor the ambient temperature. The process that takes place is as follows:

1. raspberry read temperature data of water quality and transmit the data to a web server to be stored in the database.
2. Business open a menu of monitoring and Controlling the temperature in the system.
3. The system displays the temperature data from the water quality database on the web server.
4. Then managers obtain temperature information.

In Figure 3-8 shows a temperature monitoring procedure BPMN wastewater treatment will be built.

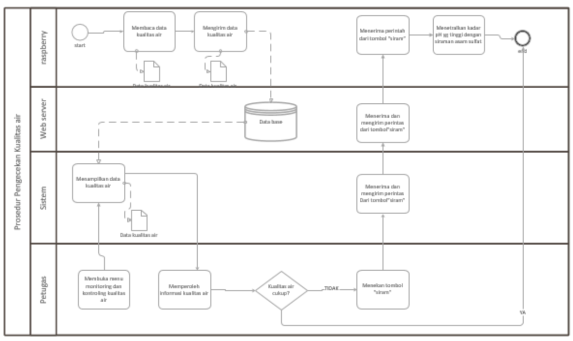

Picture 4 BPMN Monitoring water temperature treatment of wastewater Built

1.2.1.3. Wastewater disposal procedures that have been in if the

Procedures for disposal of water from the processing of waste is an ordinance on the disposal of wastewater managers do in order to meet the current procedures. The process that takes place is as follows:

1. raspberry read water quality data and transmit the data to a web server to be stored in the database.
2. Business open a menu of monitoring and Controlling water quality in the system.
3. The system displays the media livestock water quality data from existing databases on the web server.
4. Then managers obtain water quality information.
5. If the water quality information sewage treatment outcome is not in accordance with environmental standards, the manager of pressing the "flush sulfuric acid". If enough, then the manager does not need to press the "flush".
6. When a manager is pressing the "flush" the system receives the command of the "flush" and sends it to a web server.
7. Web servers received an order from the "flush" and send it to the raspberries.
8. raspberry take orders from the "flush" and doing the watering in the tank with the aid of a water pump.

In the figure 3-9 shows the procedure BPMN media watering livestock cultivation of earthworms to be built.



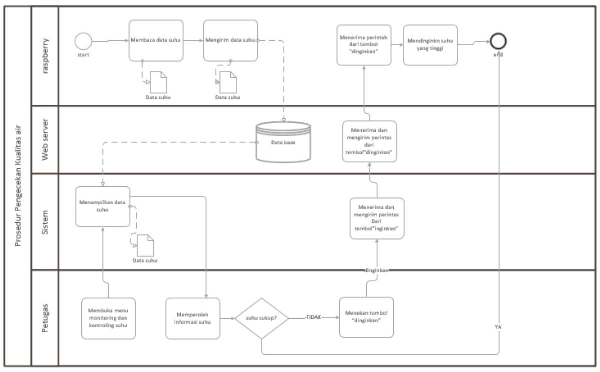
Picture 5 BPMN discharge water quality Built

1.2.1.4. Temperature Controlling procedures wastewater treatment

Procedure Controlling the temperature of the treatment of wastewater is a procedure for managers perform temperature control water quality in order to obtain an optimal temperature. The process that takes place is as follows:

1. Arduino reads the data and sends the data to a web server to be stored in the database.
2. Business open a menu of monitoring and Controlling temperature.
3. The system displays the temperature data from the database on the web server.
4. Then managers obtain temperature information.
5. If the temperature information does not match, then the manager of pressing the "chill". If it is appropriate, then the manager does not need to press the button.
6. If the manager of pressing the "chill" the system receives the command of the "chill" and sends it to a web server.
7. Web servers received an order from the "chill" and send it to the arduino.
8. Arduino received an order from the "chill" and perform cooling in livestock media with the aid of a fan.

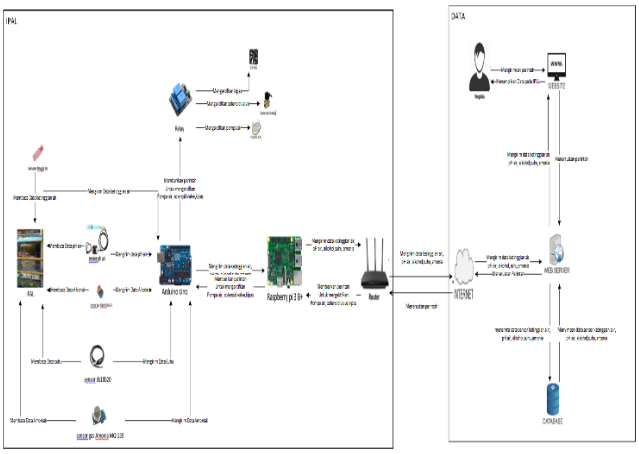
In the figure 3-10 shows the procedure BPMN media watering livestock cultivation of earthworms to be built.



Picture 6 Temperature Controlling BPMN Built wastewater treatment

3.2 System Architecture Analysis

Analysis of system architecture is a process to describe the physical system to be built and also the components pedukungnya. Here is an overview of the system architecture to be built as in Figure 3-11.



Picture 7 system architecture

4.IMPLEMENTASI

4.1.1. Hardware Implementation

In the hardware implementation will dijelas any hardware that is implemented for the development needs of the system.

4.1.1.1. Hardware Implementation Client

This section discusses the hardware on the client side that is used to run the IOT-based Monitoring WWTP. Details of hardware used can be seen in Table 4-1.

table 4-1, Hardware of the client for System Implementation

No.	Hardware	Specification
1	*processor*	Intel Celeron Quad Core
2	memory	2 GB
3	*Hard Drive*	500 GB
4	*Mouse*	USB
5	*keyboard*	*serial PS2*
6	Network	LAN

4.1.1.2. Server Hardware Implementation

This section discusses the hardware of the server used to run the monitoring system at the WWTP based IOT. Details of hardware used can be seen in Table 4-2.

table 4-2, Hardware from the server side for System Implementation

No.	Hardware	Specification
1	*Hard Drive*	300 MB
2	*Phtsical Memory*	512 MB

4.1.1.3. Hardware Implementation Microcontroller

Hardware microcontroller is a device that consists of a series of microcontrollers, sensors and modules. Specifications microcontroller devices can be seen in Table 4-3.

table 4-3, Hardware Microcontroller for System Implementation

No.	Hardware	Information
1	microcontroller	Arduino Uno
2	Sensor MQ-3	alcohol sensor
3	Raspberry Pi 3	Mini PC
4	sensor DS18B20	Water temperature sensor
5	Water pH Sensor	Water pH Sensor
6	Raspberry Pi 3	Mini PC
7	Relay module	Relay Module 4-channel
8	Sensor MQ-135	ammonia sensor
9	Water level	water level
10	Pomp water	Sprinkling
11	Fan	Cooling water temperature
12	solenoid valve	Disposal

4.1.2. Software Implementation

This section will explain the software used for monitoring the implementation of the WWTP based IOT.

4.1.2.1. Client Software Implementation

In order to run the monitoring system on IPALA Based IOT, the computer of the client side is used is tepasang software is required. In Table 4-4 below can be seen the implementation of the software on the computer.

table 4-4, Software implementation of the client side

No.	Software	Specification
1	Operating system	Windows 10 64 bit
2	browser	Google Chrome

4.1.2.2. Server Software Implementation

In order to menjalanakan monitoring system at the WWTP based IOT needed some software from the server side. Further information about the software on the server side can be seen in Table 4-5.

table 4-5, Software Implementation on the server side

No.	Software	Specification
1	Operating system	Linux
2	web Server	Apache 2.4.37
3	Programming language	PHP 7.2.13
4	DBMS	MySQL 7.5.25

4.1.3. implementation interface

Implementation of the design interface is implmenetasi antaramuka on the Quick Modeling Design. Implementation of the interface can be seen in Table 4-8.

table 4-6, implementation interface

No.	Menu	Description
1	Main page	The start page when entering the system manager.
2	Weather alcohol	The page used alcohol managers to view data on the WWTP.
3	Weather temperature	Pages that use the manager to see the water temperature data in the WWTP.
4	Weather pH	The page used to look at the data manager pH of the water at the WWTP.
5	controlling page	Pages that use the manager to see the status of pumps, fans, and disposal. Managers can activate or deactivate the pump, fan, or disposal through this page.
6	active Pump	Managing keys used to change the pump status becomes active.
7	Off Pump	Managing keys used to change the pump status becomes inactive.
8	automatic Pump	Managing keys used to change the pump status becomes automatic.
9	active Disposal	The keys are used to change the status of the disposal of the manager becomes active.
10	Off disposal	The keys are used to change the status of the disposal of the manager becomes inactive.
11	automatic disposal	The keys are used to change the status of the disposal of the manager becomes automatic.
12	active fans	Managing keys used to change the status of the fan becomes active.
13	Disabled fans	Managing keys used to change the fan status becomes inactive.
14	automatic fan	Managing keys used to change the status of the fan becomes automatic.

4.1.4. Implementation System Architecture

Implementation of the system architecture is implmenetasi system architecture design of the Quick Plan. Implementation of the system architecture can be seen in Table 4-9.

table 4-7, Implementation System Architecture

subject	Description	Information
Temperature Sensor DS18B20	Transmit water temperature data WWTP	Corresponding
sensor alcohol	Transmitting data to arduino uno alcohol WWTP	Corresponding
Water pH Sensor	Transmitting data WWTP water pH to arduino uno	Corresponding
ammonia sensor	Displaying data Data ammonia wastewater to the Arduino Uno	Corresponding
Arduino Uno	Transmit temperature data, alcohol, ammonia, and pH of the water to raspberry pi 3	Corresponding
Raspberry pi 3	Transmit temperature data, alcohol, ammonia, and pH of wastewater through the Internet	Corresponding
Internet	Transmit temperature data, alcohol, ammonia, and pH of wastewater to the web server	Corresponding
web Server	Repuest do save and temperature data, temperature data Transmitting, alcohol, ammonia, and pH to the database	Corresponding
Manager	Giving request or command to website	Corresponding
website	Giving request or command to the web server	Corresponding
database	Provide temperature data command, alcohol, ammonia, and pH to the webserver	Corresponding
web Server	Transmit temperature data, alcohol, ammonia, and pH to website	Corresponding
website	Menampil temperature data, alcohol, ammonia, and pH to the manager	Corresponding
web Server	Forward orders through the Internet connection manager	Corresponding
Internet	Forward orders of the manager through the web server	Corresponding
Raspberry pi 3	Receive and transmit orders to arduino Uno manager	Corresponding
Arduino Uno	Give orders to relay to activate or deactivate the water pump, fan or disposal	Corresponding
Water pump	Enabled or disabled by relay	Corresponding
warmer	Enabled or disabled by relay	Corresponding
Fan	Enabled or disabled by relay	Corresponding

5.pengujian

5.1 testing fans

The fan is a device used to reduce the temperature water in the WWTP. Tests carried out by the initial condition of the fan is the fan is turned off. Furthermore, the fan is activated through the system by pressing the button is active, the fan will be active. In the picture shown condition of the fan 4-9 in an active state.

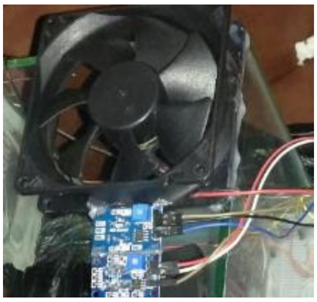


Figure 4-1, testing fans

Based on test results conducted on the fan, it can be concluded that the fan can work properly.

5.2 Testing Selenoid Valve

The fan is a tool used to remove water processing results in the WWTP. Tests carried out by the fan initial condition that the solenoid valve is turned off. Furthermore, the fan is activated through the system by pressing the button is active, the fan will be active. In the image shown in the condition of the solenoid valve 4-9 in an active state.

Figure 4-2, Testing Selenoid valve

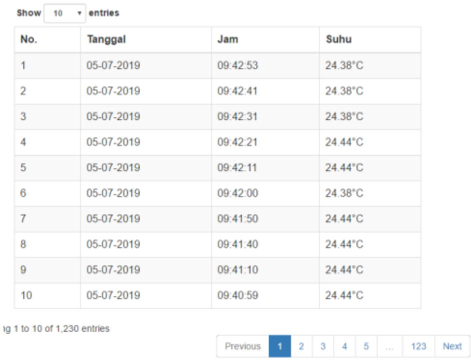
Based on test results conducted on the solenoid valve, it can be concluded that the solenoid valve can work properly.

5.2.1 testing Accuracy

Testing accuracy is a test conducted to determine how accurate the results obtained from the sensor.

5.2.2 Testing Accuracy Sensor DS18B20

DS18B20 sensor accuracy testing was conducted to determine how accurate the results obtained from these sensors. Testing is done by entering the sensor into the water. The results of testing the water temperature sensor DS18B20 can be seen in Figure 4-10



Show 10 entries

No.	Tanggal	Jam	Suhu
1	05-07-2019	09:42:53	24.38°C
2	05-07-2019	09:42:41	24.38°C
3	05-07-2019	09:42:31	24.38°C
4	05-07-2019	09:42:21	24.44°C
5	05-07-2019	09:42:11	24.44°C
6	05-07-2019	09:42:00	24.38°C
7	05-07-2019	09:41:50	24.44°C
8	05-07-2019	09:41:40	24.44°C
9	05-07-2019	09:41:10	24.44°C
10	05-07-2019	09:40:59	24.44°C

ng 1 to 10 of 1,230 entries

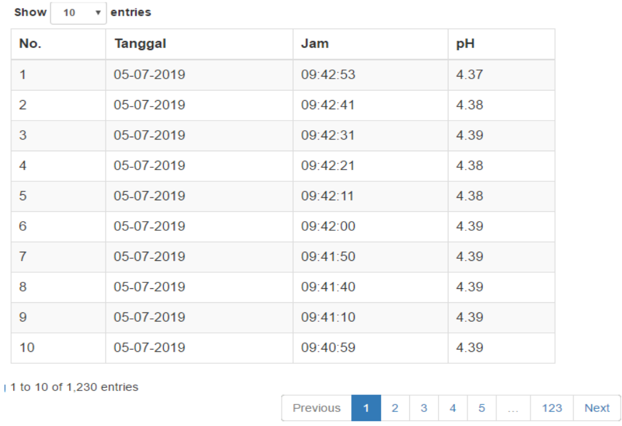
Previous 1 2 3 4 5 ... 123 Next

Figure 4-3, Results Accuracy Sensor DS18B20

Based on test results in Figure 4-10 DS18B20 sensor, then dipeoleh resulted in a number of the smallest temperature is -127C and the number of the biggest temperature is 75C. Thus, given their fairly accurate sensor readings it is because these sensors more quickly respond to changes in water temperature.

5.2.3 Accuracy testing water pH Sensor

Water pH sensor accuracy testing was conducted to determine how accurate the results obtained from these sensors. Testing is done by giving fluids of different pH levels. The results of testing the water pH sensor can be seen in Figure 4-11



Show 10 entries

No.	Tanggal	Jam	pH
1	05-07-2019	09:42:53	4.37
2	05-07-2019	09:42:41	4.38
3	05-07-2019	09:42:31	4.39
4	05-07-2019	09:42:21	4.38
5	05-07-2019	09:42:11	4.38
6	05-07-2019	09:42:00	4.39
7	05-07-2019	09:41:50	4.39
8	05-07-2019	09:41:40	4.39
9	05-07-2019	09:41:10	4.39
10	05-07-2019	09:40:59	4.39

1 to 10 of 1,230 entries

Previous 1 2 3 4 5 ... 123 Next

Figure 4-4, Results of water pH Sensor Accuracy

Based on the results of testing water pH sensor in the figure 4-11, then the results obtained in the form number is the smallest pH 4 and pH biggest number is 12. Thus, given their sensor readings are 5.6 This is because the electric power obtained by the sensor unstable.

Table 1. Table parameters of the test algorithms

Parameter	Value
maximum Recurrence	10, 50, 100
The ratio of Learning	0.1, 0.5, 1
minimal Error	0.1, 0:01, 0001

Both images or tables writing sequence starting from 1, not by chapter. While writing formulas or equations may follow the rule as follows:

6 COVER

6.1Kesimpulan

Berdasarkan results of testing software and hardware that has been made, it could be concluded as follows:

1. The system has been built to monitor the condition of alcohol, temperature, ammonia and pH in wastewater,
2. The system has been built can make settings such conditions WWTP discharge end of the tube and temperature regulation,

6.2 Suggestion

Systems that have been made still needs to be developed further to kedepanya, so that the system has been built to work better, As for suggestions on the development of the system built is as follows:

1. The system can provide information on wastewater pH conditions with more accurate and consistent.
2. The system can carry out the disposal and find out how the water that has been though that dumped into water bodies.
3. Extra functions on the system to be able to make arrangements with the wastewater pH conditions more quickly and accurately.

The system can perform the monitoring and control of all parts of the WWTP effluent treatment.

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