Designing testing service at baristand industri Medan’s liquid waste laboratory

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Abstract. Baristand Industri Medan is a technical implementation unit under the Industrial and Research and Development Agency, the Ministry of Industry. One of the services often used in Baristand Industri Medan is liquid waste testing service. The company set the standard of service is nine working days for testing services. At 2015, 89.66% on testing services liquid waste does not meet the specified standard of services company because of many samples accumulated. The purpose of this research is designing online services to schedule the coming the liquid waste sample. The method used is designing an information system that consists of model design, output design, input design, database design and technology design. The results of designing information system of testing liquid waste online consist of three pages are pages to the customer, the recipient samples and laboratory. From the simulation results with scheduled samples, then the standard services a minimum of nine working days can be reached.

1. Introduction
The minimum standard of services is a public policy governing the type and quality of basic services which is a mandatory affairs entitled areas of each citizen is obtained by a minimum. The minimum standard of services is the policy of the government initiated simultaneously with the local governance reform based on Law Number 22 of 1999 on the Regional Government. This policy in Government Regulation Number 25 Year 2000 about the authority of the Government and the authority of the province as an autonomous region dated 6 May 2000 on the explanation of Article 3 paragraph (2) stating that "the implementation of authority required a minimum service in accordance with the specified standard Provinces based on the guidelines set by the Government".

Baristand Industri Medan is a technical implementation unit under the Industrial and Research and Development Agency, the Ministry of Industry. Baristand Industri Medan have services for testing that has been implementing the minimum standard of services. Baristand Industri Medan specifies the standard services for at least nine working days for testing services. One of the services often used in Baristand Industri Medan is liquid waste testing service.

2015, 89.66% on testing services liquid waste does not meet the specified standard of the company. The cause is many samples so that must be scheduling of the coming of the samples. The sample recipient does not know the situation in the laboratory so that when samples come, they still makes standard service nine working days counted from the date the sample is received by the sample
recipient. Therefore needs to be done in the schedule coming samples, in addition, to avoid accumulation, samples can not be too long in laboratory because it can be damaged and there are also some test parameters such as temperature parameters, turbidity, pH and dissolved oxygen that must be done when the sample is received.

These problems can be solved by designing testing so that customer knows the schedule delivered samples and took a certificate by time.

2. Literature Review

2.1. Liquid Waste Testing

The testing is the determination of one or more of the characteristics of an object the assessment according to the procedure. The procedure itself is a particular way to implement an activity or process. The testing is usually applied to the ingredients, products or process according to the procedure. Meanwhile, a laboratory is the place of scientific research, experiments or measurements scientific training done.

Liquid Waste is a joint or a mixture of water and pollutants carried by the water in the dissolved state is wasted from domestic (offices, house, and trade), the source of industry and on time mixed with the ground water surface water or rain water. The ground water surface water and rain water on certain conditions in as the components of the liquid waste, because on the liquid waste collection channel system already cracks, natural water can combine with the other liquid waste components and must be considered the effort treatment.

Polluted water is not always a pure water, but is the water that does not contain specific foreign materials in the number of exceeds the limit set so that the water can be used as normal for specific purposes, for example drinking water (water leading, well water), swim/recreation (swimming pool, sea water on the beach), bath (water leading, well water), the life of water animals (river water, lake), irrigations and the necessity of industry.

2.2. The Source And Type Of Contaminant In The Liquid Waste

Source of contaminant physical e.g. temperature, pH value, color, smell and total slurries. The source a contaminant of organic chemical compounds e.g. protein, carbohydrates, protein, fat, oil, lubricants, BOD COD, alkalinity. Contaminant reduction chemical compounds inorganic for example heavy metals, N, P, chlorida, sulfur, hydrogen sulfite, and gas dissolved in the liquid waste. If the value of BOD high means there are advantages of organic compounds. Oxygen concentration (Dissolved Oxygen) dissolved in water free of industrial pollutants or contaminants of 7.59 mg/L.

2.3. The Following Waste Water Parameters

Some parameters that can be used related to the waste water:

1. Total solid.
2. The content of organic matter.
3. The inorganic content (eg. P, Pb, Cd, Mg).
4. Gas content (eg. O2, N, CO2).
5. The content of bacteria (eg. E. Coli).
6. pH.
7. Temperature.
8. The measurement of the oxygen concentration in the Waste Water.

Here are some of the parameters that are used to measure the oxygen content in the waste water:

- Chemical Oxygen Demand is the amount of oxygen required to oxidize organic materials found in water with perfect.
- Biochemical Oxygen Demand (BOD) is the amount of oxygen required by bacteria to perform the process decompositions aerobic against organic substances from the solution, under certain temperature conditions (generally 200C) and certain time (generally five days).
The measurement result of BOD is \( \text{mg/L} \). The needs of BOD vary between 100-300 \( \text{mg/L} \). When the results show numbers more than 300 \( \text{mg/L} \), BOD said strong, while when less than 100 \( \text{mg/L} \) called the weak.

2.4. Information System

There are various definitions of the information system, but basically, the information system is a virtual system that allows the management of controlling the operation of the physical system of the company. Other definition, the information system is a collection of components that are related to each other, gather (or get), processing, save, and distribute information to support decision making and control in an organization. While according to Romney, "A system is an entity consisting of two or more component or subsystem that interact to achieve a goal". Activities that occur on the information system, namely:

1. Input.
   A collection of raw data from within the organization or from the environment outside the organization that is then processed in one information system.

2. Processing.
   The transfer of the manipulation and analysis of the raw input element of the form is more useful for users.

3. Output.
   The distribution of information that has been processed to members of the organization and to each of the activity where the output will be used.

4. Feedback.
   The output is returned to the members of the organization of stakeholders as well as to the activities in the organization to help evaluate or improve input.

Components of the information system are designed with the aim to be communicated to the user, not to advanced programs. Information system components that are designed is model, output, input, database, and technology.

Service activities and laboratory testing in general is to meet the standardization, where all types of ingredients, products, and the process are by certain standards that are assigned to maintain the quality a product/service in the community/consumers.

Some review of journals according to the study among other things done by:

Sundari (2016) do research "Information System Web-based Health Services". The problem faced is the ministry of health clinic patients are not effective and efficient due to record patient data is still done manually. The results of this research are designing e-service on the clinic.

Hamidah et al (2016) do research "Lecturer Scheduling Information System Case Study : STMIK Atma Luhur", the purpose of this research is designing information system that can help the academic party in arranging lecture scheduling. The results of the research are the design of the information system of the teaching of Atma Luhur.

Other research was done by Novia et al (2013) namely "Designing Information Service System Web-based library at the University of XYZ", the purpose of this research is the improvement of library services process is done to simplify operation on the process in the library using the Business Process Improvement. The results of the research are to increase capacity.

Based on the study review the journal, then research will be done in improving services for testing with performing design services for web-based online testing.

3. Research Methodology

The structure of the system for the design of liquid waste testing services consist of:

1. Input.
   The inputs from the structure of the service system testing the liquid waste consist of:
   a. Register data.
Register data is data that must be filled by customers who do not have a username and password to log in.

b. The test application data.
   This data is data that must be selected invoked to request testing services.

c. Payment Confirmation data.
   This data is charged if the customer has to pay to the account holder Baristand Medan Industry.

2. The process.
   The process that happens on this system is the result of input, consisting of:
   a. The prompt to log in.
      The prompt to log in do with how to send links to email if a user has to register.
   b. Calculate the total payment.
      Calculate the total payment based on the selected subscriber test parameters.
   c. Calculate the estimation finished testing.
      Calculate the end time test based on the test parameters selected subscriber.
   d. Payment verification.
      Payment verification is done by matching data payment confirmation with the current account.

3. The output.
   The output from the input process pass the structure of this system are:
   a. Username and password.
   b. The total payment.
   c. Testing time is complete.
   d. The date between samples and SPPC.

   The method of research done on this research is designing service system testing the liquid waste through activities namely:

   1. The Model Design
      The model design on the service system testing of liquid waste consists of physical system and logical model. The design of the physical system with a system flow chart of the design of request test liquid waste by customer, verify payment confirmation, schedule of the coming of the sample by the recipient, the start of testing and status of testing by the laboratory.
      a. A physical system for the process of liquid waste test request by the customer is designed where the test request data to the database and directly into the web pages that can be accessed online by sample recipient.
      b. A physical system for payment verification process and schedule of the coming of the sample by sample recipient is designed where data payment confirmation by the customer to the database and directly enter to the web pages that can be accessed online by sample recipient. After the payment process state successfully, sample recipient inputs the date on which customer's samples come to the database and directly into the web pages that can be accessed online by the customer.
      c. The physical system to start date process and testing in laboratory is designed where if samples have been delivered to the laboratory and the laboratory testing start date input to the database and directly into the web pages that can be accessed online by the customer. The lab also gives the command is complete if the test is done to the database and directly into the web pages that can be accessed online by the customer and sample recipient to schedule the coming of the next customer.

   On the designing logical model will be made DFD model namely model Data Flow Diagram. Data Flow Diagram that will be made is for the service of testing liquid waste Baristand Industri Medan consists of DFD level 0 can be seen in Figure 1 and DFD level 1 can be seen in Figure 2.
Figure 1. DFD Level 0 Information Service System Service of Testing Liquid Waste Baristand Industri Medan

Figure 2. DFD Level 1 Information Service System Service of Testing Liquid Waste Baristand Industri Medan
2. The Output Design
   Output needed each user can be seen in Table 1. up to Table 3.
   a. Print out the form testing.

   **Table 1. Print Out Form Testing**

   | No. SPPC | Test Parameter | Group | Date of Coming Samples | Date of Samples is Tested | Estimates of Due Date | Payment Status | Testing Status | Description |
   |----------|----------------|-------|-------------------------|---------------------------|-----------------------|----------------|---------------|-------------|

   b. Print out form customer data

   **Table 2. Print Out Form Customer Data**

   | No. SPPC | Customer Name | Test Parameter | Group | Date of Coming Samples | Date of Samples is Tested | Estimates of Due Date | Payment Status |
   |-----------|---------------|----------------|-------|------------------------|--------------------------|----------------------|----------------|

   c. Print out form testing status.

   **Table 3. Print Out Form Testing Status**

   | No. SPPC | No. Testing | Test Parameter | Group | Date of Coming Samples | Date of Samples is Tested | Estimates of Due Date | Payment Status | Testing Status |
   |-----------|-------------|----------------|-------|------------------------|--------------------------|----------------------|----------------|---------------|

3. Input Design
   The input design displays form to input data. The form can be seen in Figure 3. up to Figure 8.

   **Figure 3. Register Form**
Figure 4. Login Form

Figure 5. Testing Request Form
Figure 6. Payment Confirmation Form

Figure 7. Verify Payment and Date of Coming Samples Form
4. Database Design
The database is a collection of data or information that are organized systematically related
with some data processing and provision of information that is stored in the computer
hardware and use the software to comprehend. At this stage consists of two of the design files
and design ERD. Files are required on the service system testing the liquid waste Baristand
Industri Medan can be seen in Table 4 up to Table 8.

**Table 4. Table User**

| Field Name      | Data Type     |
|-----------------|---------------|
| name            | varchar(255)  |
| Address         | varchar(255)  |
| timezone        | varchar(255)  |
| Phone           | varchar(255)  |
| username        | varchar(255)  |
| email           | varchar(255)  |
| password        | varchar(255)  |
| role            | varchar(255)  |
| remember_token  | varchar(100)  |
| created_at      | timestamp     |
| updated_at      | timestamp     |

**Table 5. Table Testing**

| Field Name       | Data Type     |
|------------------|---------------|
| name             | varchar(255)  |
| role             | varchar(255)  |
| number_testing   | varchar(255)  |
| date of coming samples | date             |
| finish_date      | date          |
| testing_date     | date          |
| sample_type      | varchar(255)  |
| status           | int(11)       |
| many_sample      | int(11)       |
| status_payment   | int(11)       |
### Table 6. Table Testing Parameter

| Field Name                  | Data Type |
|----------------------------|-----------|
| estimates of the due date  | int(11)   |
| estimates of the due date  | date      |
| user_id                    | int(10) UN|
| created_at                 | timestamp |
| updated_at                 | timestamp |

### Table 7. Table Payment

| Field Name                  | Data Type |
|----------------------------|-----------|
| type_payment               | varchar(255) |
| name_bank                  | varchar(255) |
| number_account             | varchar(255) |
| name_owner_account         | varchar(255) |
| date_transfer              | date      |
| total_transfer             | int(11)   |
| testing_id                 | int(10) UN|
| user_id                    | int(10) UN|
| created_at                 | timestamp |
| updated_at                 | timestamp |

### Table 8. Table Testing Time

| Field Name | Data Type |
|------------|-----------|
| type       | varchar(255) |
| Group      | varchar(255) |
| cost       | int(11)    |
| max_hour_a_day | int(11) |
| time_cost  | int(11)    |
| created_at | timestamp  |
| updated_at | timestamp  |

ERD (Entity Relationship Diagram) is a network model that uses the structure of the data stored in the database. The relationship of the entities can be seen in Figure 9.

1. **Technology Design**
   Technology design consists of 3 parts are hardware, software and brainware.
   a. **Hardware**
      In this section, computer hardware technology used consists of the inputs and output processing tools provided by the customer and Baristand Industri Medan.
      - Input that is used is in the form of keyboard and mouse Logitech.
      - The appliance used is the CPU (Central Processing Unit) brand processor with Intel Core 2 Duo, RAM (random access memory) 2GB DDR2.
      - The output that is used is the monitor LG 19” screen display as in the form of soft copy and printer in the form of hardcopy.
b. Software
Software used is programming language PHP and MySQL. The steps in the design of the website is:

- Create a sketch design.
  At this stage the designer does not create a sketch of the design.
- Create a layout design.
  At this stage, the designer makes the layout of the design took the data from google for the Industry Ministry logo.
- Share your Figures in small pieces.
  At this stage, the designer does not cut the Figure because the Figure that is used in the design is not too big.
- Create animation.
  At this stage, animation made for using CSS program and javascript.
- Create HTML.
  After designing the layout, the next step is to place the keys and the writings.
- Programming and Script.
  On this design, the programming language that is used is a hypertext preprocessor (PHP) and the database used is the MySQL.
- Evaluation and Test.
  At this stage did trial against the program whether a link on each page is running properly.
- Upload the HTML.
The website files and then is uploaded to the homepage domain where all people have access to this website anywhere and anytime as long as a connection to the internet.

- The promotion of the Homepage.
  At this stage, the website promoted to the customers Baristand Industri Medan.

c. Brainware
  Brainware be those who know the technology and able to operate the technology. In this case the customer, the sample recipient and laboratory as users. IT staff is an admin who set up a website to uploaded and as maintenance website.

4. Result
The results of design divided into three pages for the general user which includes the customer remains and new customers, the sample recipient, and laboratory. The page view which is designed in the form of this website is as follows:

1. Home Page
   The initial view home page when users open website Baristand Medan is like in Figure 10.

2. Register Page
   Register page is the page for general users that want to register as a customer Baristand Industri Medan to order the liquid waste testing through the website. The page register can be seen in Figure 11.

![Figure 10. Home Page](image)
3. **Login Page**
   The login page is the page for general users who have registered as a customer Industry Baristand Medan. The login page can be seen in Figure 12.

4. **Page to Request Testing**
   Page to request testing is the page for customer request liquid waste testing and select test parameters. Page to request testing can be seen in Figure 13.

5. **Payment Confirmation Page**
   Payment confirmation page is the page for the customer to confirm if you have to transfer the cost of testing to the account number of Baristand Industri Medan. Payment confirmation page can be seen in Figure 14.

6. **Testing Service Page**
   Testing service page contains information about the customer test request. Testing services page can be seen in Figure 15.
Table 1. Test Parameters

| Sample     | Liquid Waste |
|------------|--------------|
| Total of Sample | 1            |

| A                  | B                  | C                  | D                  | E                  |
|--------------------|--------------------|--------------------|--------------------|--------------------|
| Smell              | Fluoride (F)       | Mercury (Hg)       | Total Plate Count  | Boron              |
| BOD                | Oil & Fat          | Alkalinity         | E. Coli            |                   |
| Electrical Conductivity | NH3, N | Arsen (As)        | Total Coliform     |                   |
| Turbidity          | Nitrate (NO3)      | Cadmium (Cd)       |                   |                   |
| Oksigen (O2)       | Nitrite (NO2)      | Chromium (Cr)      |                   |                   |
| Dissolve Solids    | Total Nitrogen     |                   |                   |                   |
| pH                 | Phosphate (PO4)    | Cobalt (Co)        |                   |                   |
| Taste              | Cyanide (CN)       | Cadmium (Cd)       |                   |                   |
| Temperature        | Sulfate (SO4)      | Potassium (K)      |                   |                   |
| Total Suspensi Solid | Calcium (Ca) |                   |                   |                   |
| Color              | Magnesium (Mg)     |                   |                   |                   |
| Organic            | Manganese (Mn)     |                   |                   |                   |

**Figure 13.** Page to Request Testing

**Figure 14.** Payment Confirmation Page
7. Customer Data Page
   Customer data page is the page that displays the customer data that has been doing test request liquid waste and payment confirmation. Customer data page can be seen in Figure 16.

8. Testing Status Page
   The testing status page is the page that displays test data that are being tested in the laboratory. In this page there is display waiting time for samples that have not been tested, waiting time to schedule next customers so the accumulation of samples in a laboratory can be avoided. The testing status page can be seen in Figure 17.
**Figure 16.** Customer Data Page

**Figure 17.** Testing Status Page
After the design of the testing services web-based liquid waste finished, then conducted a test to see how long the test can be completed. From 173 customer data liquid waste on 2015 taken sample 10 percent of customer data namely 17 customers. Customer data that has been done trial can be seen in Table 9.

**Table 9. Data Of Testing Time After Online System**

| No. | Company                                    | Test Parameters                      | Testing Time (Working Days) |
|-----|--------------------------------------------|--------------------------------------|----------------------------|
| 1   | PT. Sari Incofood Corporation               | BOD, pH, TSS, COD                    | 5                          |
| 2   | PT. Aroma Mega Sari                         | BOD, pH, TSS, COD                    | 5                          |
| 3   | PT. Sentra Daya Madani                     | pH, TSS, Fat                         | 5                          |
| 4   | PT. Wipolimex Raya                         | BOD, pH, TSS, COD, NH3-N, N. Total   | 5                          |
| 5   | PT. Agrindo Indah Persada                  | TSS, N. Total, Zn, Pb, Cd, pH, BOD, COD, Fat | 8                          |
| 6   | PT. Damai Abadi                            | TSS, pH, Cr, Cu, Cd, Pb              | 4                          |
| 7   | PT. Sinar Mulia                            | TSS, pH, Cd, Cr, Ni, Zn, CN, Pb, Cu  | 4                          |
| 8   | PT. Adei Crumb Rubber                      | TSS, pH, BOD, COD, NH3-N, N. Total   | 5                          |
| 9   | PT. Nippon Indosari Corpindo, Tbk           | TSS, pH, BOD, COD, NH3-N, Fat        | 6                          |
| 10  | PT. Batanghari Tebing Pratama              | TSS, pH, BOD, COD, NH3-N, N. Total   | 5                          |
| 11  | PT. Smart, Tbk                             | BOD, COD, TSS, Fat, Fosfat (PO4), pH | 5                          |
| 12  | PT. Mabar Feed Indonesia                   | TSS, pH, BOD, COD, NH3-N             | 5                          |
| 13  | PT. ANJ                                    | pH, TSS, BOD, COD, Fat, N. Total     | 8                          |
| 14  | Kantor Kes. Pelabuhan Kl’s I Medan         | TSS, pH, BOD, COD, Fat               | 5                          |
| 15  | PT. Bridgestone Sumatera Rubber            | pH, TSS, BOD, COD, N. Total, NH3-N   | 5                          |
| 16  | PT. Olaga Food                             | TSS, pH, BOD, COD, Fat               | 5                          |
| 17  | PT. Indojaya Agrinusa                      | pH, Bau, Color, Taste, Temperatur, CaCO3, | 1                          |

The scheduling data of samples come to the next customers can be seen in Table 10.

**Table 10. The Scheduling Data of Samples**

| No. | Company                                    | Test Parameter                      | Date of Coming Samples | Estimates of the Due Date | Testing Time (Working Days) |
|-----|--------------------------------------------|--------------------------------------|------------------------|---------------------------|----------------------------|
| 1   | PT. Sari Incofood Corporation               | BOD, pH, TSS, COD                    | 01/07/15               | 08/07/15                  | 5                          |
| 2   | PT. Aroma Mega Sari                         | BOD, pH, TSS, COD                    | 06/07/15               | 13/07/15                  | 5                          |
| 3   | PT. Sentra Daya Madani                     | pH, TSS, Fat                         | 09/07/15               | 16/07/15                  | 5                          |
| No. | Company                           | Test Parameter                          | Date of Coming Samples | Estimates of the Due Date | Testing Time (Working Days) |
|-----|----------------------------------|----------------------------------------|------------------------|---------------------------|----------------------------|
| 4   | PT. Wipolimex Raya               | BOD, pH, TSS, COD,NH3-N, N. Total TSS,N.Total,Zn, Pb, Cd,pH, BOD,COD, Fat | 15/07/15              | 22/07/15                  | 5                          |
| 5   | PT. Agrindo Indah Persada        | TSS, pH, Cr, Cu, Cd, Pb               | 21/07/15              | 31/07/15                  | 8                          |
| 6   | PT. Damai Abadi                 | TSS, pH, Cr, Cu, Cd, Pb               | 24/07/15              | 30/07/15                  | 4                          |
| 7   | PT. Sinar Mulia                 | TSS, pH, Cr, Cu, Cd, Pb               | 29/07/15              | 04/08/15                  | 4                          |
| 8   | PT. Adee Crumb Rubber            | TSS, pH, BOD, COD, NH3-N,N. Total     | 04/08/15              | 11/08/15                  | 5                          |
| 9   | PT. Nippon Indosari Corpindo, Tbk| TSS, pH, BOD, COD, NH3-N,Fat          | 07/08/15              | 17/08/15                  | 6                          |
| 10  | PT. Batanghari Tebing Pratama    | TSS, pH, BOD, COD, NH3-N,N. Total     | 12/07/15              | 19/08/15                  | 5                          |
| 11  | PT. Smart, Tbk                   | TSS, pH, BOD, COD, NH3-N,Fat          | 17/08/15              | 24/08/15                  | 5                          |
| 12  | PT. Mabar Feed Indonesia         | TSS, pH, BOD, COD, NH3-N              | 20/08/15              | 27/08/15                  | 5                          |
| 13  | PT. ANJ                          | pH, TSS, BOD, COD, Fat,N. Total       | 25/08/15              | 08/09/15                  | 8                          |
| 14  | Kantor Kes. Pelabuhan Kls I Medan| TSS, pH, BOD, COD, Fat               | 08/09/15              | 15/09/15                  | 5                          |
| 15  | PT. Bridgestone Sumatera Rubber  | pH, TSS, BOD, COD, N. Total,NH3-N     | 11/09/15              | 18/09/15                  | 5                          |
| 16  | PT. Olaga Food                   | TSS, pH, BOD, COD, Fat,pH, Bau, Color, | 16/09/15              | 23/09/15                  | 5                          |
| 17  | PT. Indojaya Agrinusa            | Taste,Temperatur, CaCO3,              | 21/09/15              | 22/09/15                  | 1                          |

5. The Conclusion
1. The identification of the problem is done with an interview that the problem is not achieving standard services because of many samples will be tested while limited laboratory capacity.
2. Laboratory capacity is not possible plus, so done the schedule coming samples with doing designing testing services.
3. Based on the results of the simulation can be concluded that with the existence of the online testing services and schedule coming samples then the minimum standard of services testing liquid waste Baristand Industri Medan can be achieved is less than nine days.

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