

# CH4 - THORIQULHAQ

*by* Thoriqulhaq Jibril Al Qudsy

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## **CHAPTER 4**

### **REQUIREMENT ANALYSIS AND DESIGN**

#### **4.1 Introduction**

This chapter describes the Power Plants Performance Monitoring System (P3MS) requirements and design for PT PLN (Persero) UP3 Pamekasan. Analyses of essential functional and non-functional requirements gathered during the design process are being incorporated into this chapter. These requirements comprise essential design elements. Various diagrams, such as use case diagrams, sequence diagrams, and activity diagrams, are drawn to represent each use case in greater detail in order to visualize the functional requirements. In addition to that, the design of the system architecture, the design of the database, and the design of the interface will each be briefly described in this chapter.

#### **4.2 Requirement Analysis**

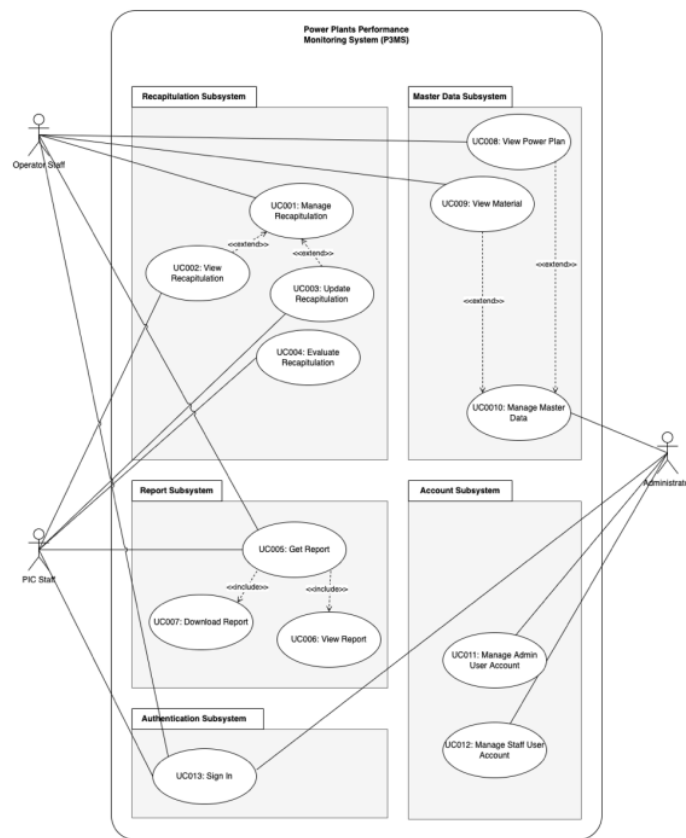
The functional and non-functional requirements of the Power Plants Performance Monitoring System (P3MS) for PT PLN (Persero) UP3 Pamekasan are discussed in this section. These requirements were gathered from the stakeholders of the system.

##### **4.2.1 Functional Requirement**

The functional requirements for the proposed system, which is the Power Plants Performance Monitoring System (P3MS) for PT PLN (Persero) UP3 Pamekasan, describe the features that the system ought to have and the manner in which those features ought to be carried out. It is essential to have a good understanding of the functional requirements in order to identify the primary features and functionalities of the system.

#### 5 4.2.1.1 Use Case Diagram

In a use case diagram, the key features and functions of the proposed system are represented graphically. The use case model of the Power Plants Performance Monitoring System (P3MS) for PT PLN (Persero) UP3 Pamekasan illustrates and describes the relationship between the system and the actors that make up the system. The use case Figure 4.1 presents a diagram of the Power Plants Performance Monitoring System (P3MS) for PT PLN (Persero) UP3 Pamekasan.



1  
Figure 4.1 Use Case Diagram of P3MS

#### 4.2.1.2 Actor Description

There are three actors involved in the Power Plants Performance Monitoring System (P3MS) which are Operator Staff, PIC Staff and Administrator. The following table will provide a detailed description of each actor.

Table 4.1 Actor Description

No	Actor Name	Description
1	Operator Staff	This user helps the company to manage user accounts, including staff and the administrator itself. Also, manage master data, including managing units, managing power plants, and managing the material.
2	PIC Staff	This user has access to recap and submit all the power plants. performance statistic data to the system. Besides creating a recapitulation, they can view, update, and delete it. In the end, they can get the generated report either downloaded to an excel file or viewed directly from the website.
3	Administrator	This user has access to evaluate all the recapitulations that were already submitted by operator staff, either rejected or approved. Besides evaluating a recapitulation, they can view and update the recapitulation directly if it is felt that there is no need for more revisions from the operator staff. In the end, they can get the generated report either downloaded to an excel file or viewed directly from the website.

### 4.2.1.3 Use Case Description

For each of the use cases depicted in Figure 4.1 above, a brief description of how the user can interact with the system's functionalities is provided in this section. Following is a description of each of the use cases.

Table 4.2 Use Case Description

Use Case ID	Use Case Name	Description
UC001	Manage Recapitulation	Allow the operator staff to create a new recapitulation or view, update, and delete an existing recapitulation.
UC002	View Recapitulation	Allow the PIC staff to view a list of requested recapitulations.
UC003	Update Recapitulation	Allow the PIC staff to update the requested recapitulations.
UC004	Evaluate Recapitulation	Allow the PIC staff to evaluate the requested recapitulations, whether they are approved or rejected.
UC005	Get Report	Allow operator staff and PIC staff to get the generated report results.
UC006	View Report	Allow operator staff and PIC staff to view the generated report results.
UC007	Download Report	Allow operator staff and PIC staff to download the generated report results.
UC008	View Power Plan	Allow the administrator to add a new power plant or view, update, and to delete an existing power

		plant.
UC009	View Material	Allow the administrator to add new material or view, update, and delete existing material.
UC010	Manage Master Data	Allow the administrator to add a new chosen master data or view, update, and delete an existing chosen master data.
UC011	Manage Admin User Account	Allow the administrator to add a new admin user account or view, update, and delete an existing admin user account.
UC012	Manage Staff User Account	Allow the administrator to add a new staff user account or view, update, and delete an existing admin staff account.
UC013	Sign In	Allow all users to authenticate their account credentials before being able to access the main system features.

#### 4.2.1.4 Use Case Specification

In order to understand better how the user interacts with the system, a use case specification provides a detailed description of each use case. For each use case, a unique ID, use case name, description, related actors involved in the use case, normal flow and alternative flow to show the steps to perform a task, pre-condition, post-condition, and related requirements are included. The use case specification for UC001: Manage Recapitulation is presented in Table 4.3. Appendix A provides more information about the use case specification.

**Table 4.3** Use Case Specification of UC001: Manage Recapitulation

<b>Use Case ID</b>	UC001
<b>Use Case Name</b>	Manage Recapitulation
<b>Description</b>	This use case allows the operator staff to create, view, update, and delete the recapitulation.
<b>Actor(s)</b>	Operator Staff
<b>Pre-conditions</b>	User must be logged in to the system as an operator staff with a valid login credential.
<b>Normal Flow</b>	<ol style="list-style-type: none"> <li>1. The operator staff redirects to the staff dashboard page after successfully logging in.</li> <li>2. The operator staff clicks on the “Input Recapitulation” button.</li> <li>3. The system will redirect the operator staff to the input recapitulation page.</li> <li>4. The operator staff chooses the power plant type.</li> <li>5. The operator staff chooses the power plant name.</li> <li>6. The operator staff chooses the date input.</li> <li>7. The operator staff chooses the recapitulation type.</li> <li>8. The system will display a recapitulation form based on the chosen recapitulation type.</li> <li>9. The operator staff input all required fields on the recapitulation form.</li> <li>10. The operator staff clicks on the “Submit” button. If the operator staff clicks on the “Cancel” button, AF1 will be performed. If the operator staff clicks on the “Save” button, AF2 will be performed. If the form is not fully full-filled or the required fields are blank, EF 1 will be performed.</li> <li>11. The system saves all the information inputted by the operator staff to the database.</li> <li>12. The system will redirect the operator staff to the recapitulation history page and display new recapitulation information.</li> <li>13. If the operator staff clicks on the “Edit” button, AF3 will be performed.</li> <li>14. If the operator staff clicks on the “Delete” button, AF4 will be performed.</li> </ol>
<b>Alternative Flow</b>	<ol style="list-style-type: none"> <li>1. Cancel recapitulation’s input <ol style="list-style-type: none"> <li>1.1. The system will redirect the operator staff to the staff dashboard page.</li> </ol> </li> </ol>

	<ol style="list-style-type: none"> <li>2. Save recapitulation's input               <ol style="list-style-type: none"> <li>2.1. The system will redirect the operator staff to the recapitulation history page.</li> </ol> </li> <li>3. Update Recapitulation               <ol style="list-style-type: none"> <li>3.1. The system will display a recapitulation edit form.</li> <li>3.2. The operator staff updates the specific field that needed to be updated.</li> <li>3.3. The operator staff clicks on the "Update" button. If the form is not fully full-filled or the required fields are blank, EF 1 will be performed.</li> <li>3.4. The system saves all the information inputted by the operator staff to the database.</li> <li>3.5. The system will redirect the operator staff to the recapitulation history page and display new recapitulation information.</li> </ol> </li> <li>4. Delete Recapitulation               <ol style="list-style-type: none"> <li>4.1. The system displays a confirmation dialogue.</li> <li>4.2. The operator staff continues by clicking the "Yes" button.</li> <li>4.3. The system deleted selected recapitulation data from the database.</li> <li>4.4. The system will reload the recapitulation history page.</li> </ol> </li> </ol>
<b>Exception Flow</b>	<ol style="list-style-type: none"> <li>1. Required fields in the recapitulation form are empty or the form is blank.               <ol style="list-style-type: none"> <li>1.1. The system displays an error message.</li> <li>1.2. Continue NF9 / AF3.2 .</li> </ol> </li> </ol>
<b>Post Conditions</b>	<ol style="list-style-type: none"> <li>1. The operator staff has successfully created a new recapitulation.</li> <li>2. The operator staff has successfully viewed the existing recapitulation.</li> <li>3. The operator staff has successfully updated the existing recapitulation.</li> <li>4. The operator staff has successfully deleted the existing recapitulation.</li> </ol>
<b>Related Requirement</b>	-



#### 4.2.1.5 Sequence Diagram

A sequence diagram depicts the relationships between the various components of a system. It shows the sequence of messages exchanged when a task is completed by the user who is involved in the conversation. For more complete and details of the sequence diagram can be found in SRS Appendix A.

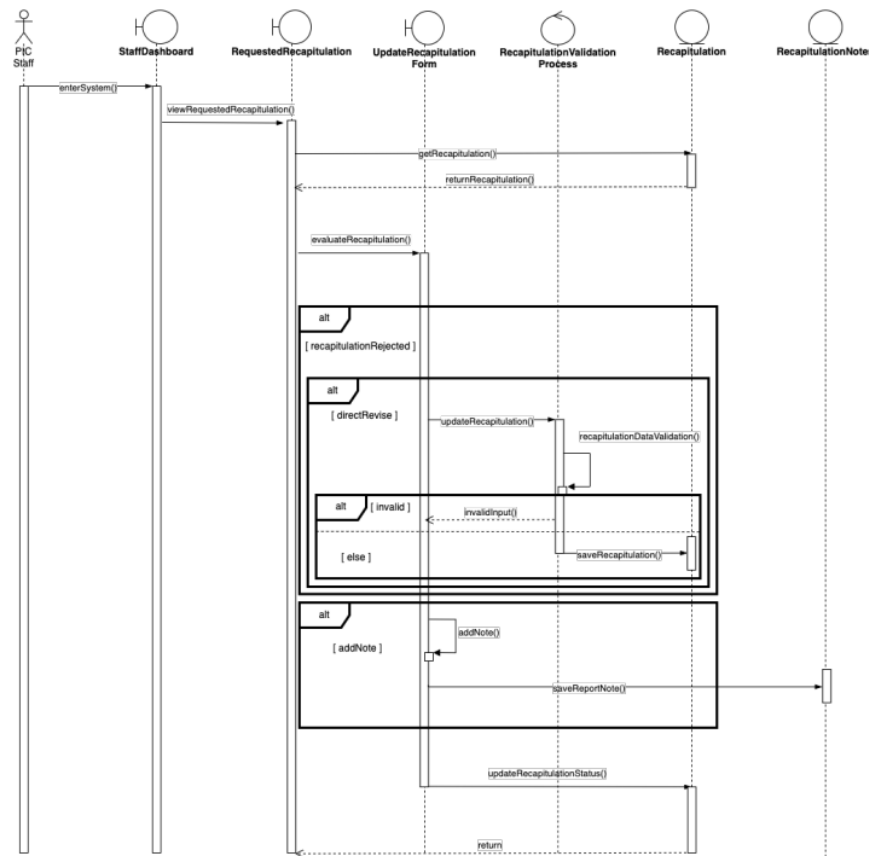


Figure 4.2 Sequence Diagram of P3MS

#### 1 4.2.1.6 Activity Diagram

The activity diagram illustrates the workflow of a particular function or task by outlining the specific steps that must be taken in order to move from one activity to the next. Figure 4.3 is a representation of the activity diagram for the UC001: Manage Recapitulation procedure. For more complete and details of the activity diagram can be found in SRS Appendix A.

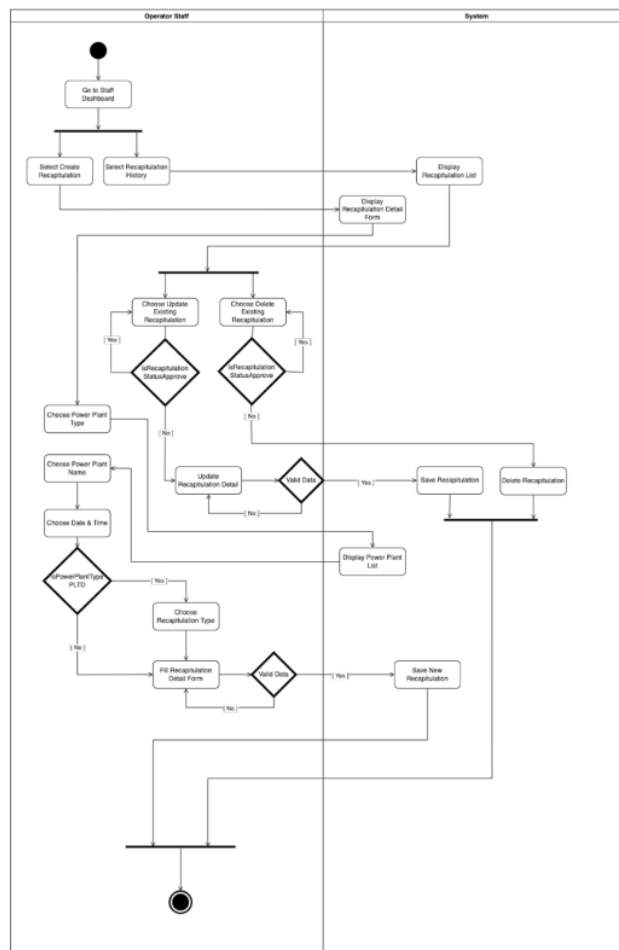


Figure 4.3 Activity Diagram of P3MS

#### 4.2.2 Non-Functional Requirement

When describing the system's capabilities and constraints, non-functional requirements can help the system work better. Instead of providing an explanation of how the system operates, non-functional requirements describe the tasks that the system must be able to complete. The following is a list of the non-functional requirements that must be met by the Power Plants Performance Monitoring System (P3MS) for the PT PLN (Persero) UP3 Pamekasan.

- I. Security - The system shall only permit specific tasks to be performed by authorized users with varying levels of access. Aside from that, the information contained within the system is kept safe and secure by limiting authorized access to the end-user of PT PLN (Persero) UP3 Pamekasan for the purpose of this project as well as any future business that makes use of this particular system.
- II. Portability - Since the system is web-based, the user should be able to access it through any web browser that is currently operational and has a reliable connection to the internet. Examples of such web browsers include Google Chrome, Mozilla Firefox, Microsoft Edge, Apple Safari, and Opera.
- III. Maintainability - System developers must maintain the system in order to detect potential flaws and correct them by modifying the relevant module. Regular testing of the system is required in order to ensure the system's continued high level of quality and functionality.
- IV. Availability: Users should be able to access the system at any time and from any location, and the system should be accessible 24 hours a day. Users should be able to access the system during standard business hours.

### 4.3 Project Design

In terms of architecture, this system follows the Model-View-Controller (MVC) design pattern. Model, view, and controller are the three interconnected parts of this architecture model's conceptualization of implementation code. Data storage and retrieval from a database are handled by a component called the model that serves as a bridge between the view and controller. For the end user, views are the interfaces that serve as visual representations of the entire system. Using the user interfaces, the end-user can input data, and then the system will display the corresponding result. It is the job of the controller to call the appropriate functions in the model and then carry out the necessary tasks. Following that, the pertinent information or result is then transferred before being presented by the user interfaces in View.

In the process of developing the Power Plants Performance Monitoring System (P3MS), the MVC architecture design pattern is an extremely important component. This is especially true for the system's implementation and maintenance. As a result of breaking the code into separate models, developers can easily make changes to the code without affecting other models. MVC makes it easier for developers to understand the code for different functions and apply good practices of code arrangement and management because it clearly shows the separation of codes. Figure X.X illustrates the architecture design of the Power Plants Performance Monitoring System (P3MS).

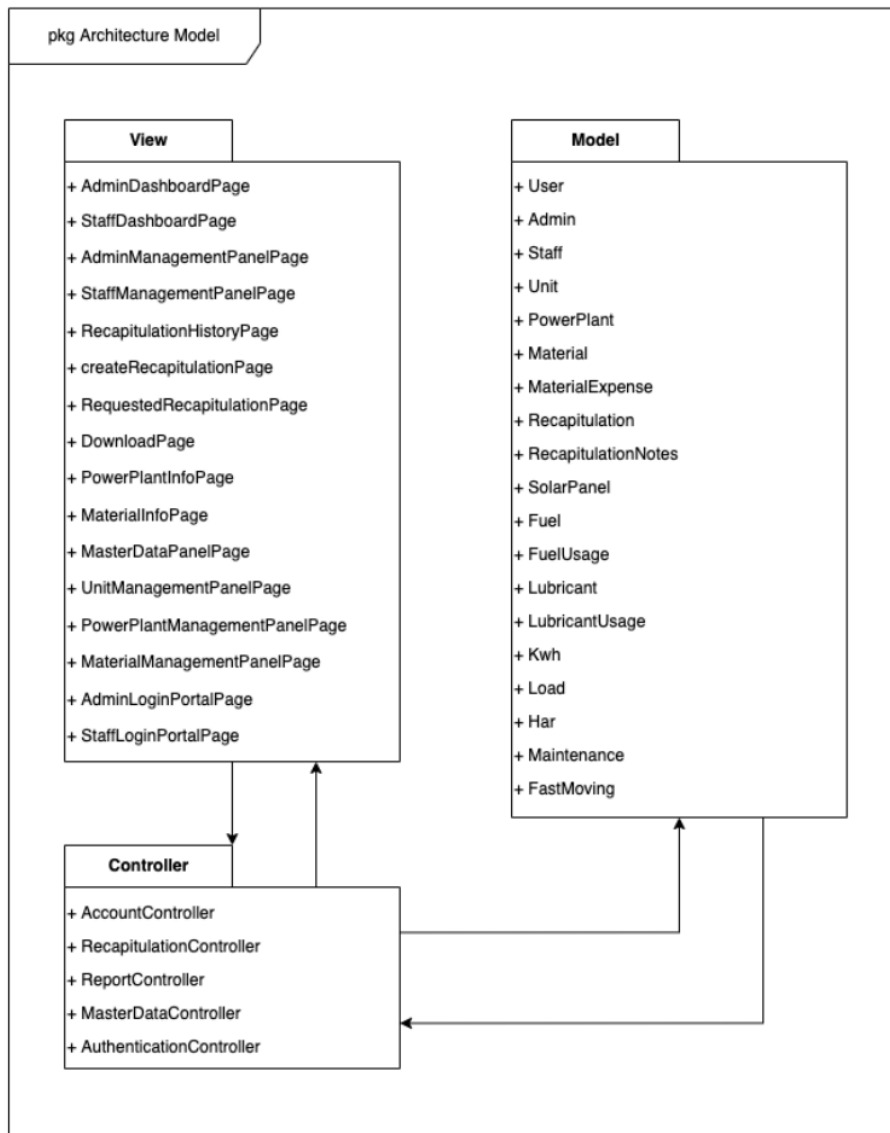


Figure 4.4 Architecture Diagram of P3MS

#### 4.4 Database Design

This section explains how the Power Plants Performance Monitoring System (P3MS) for PT PLN (Persero) UP3 Pamekasan database was designed for the use of proposed system. In the process of developing, designing, and implementing a system, one of the most important roles played is that of database design. The data of this system can be well organized by using good database design principles.

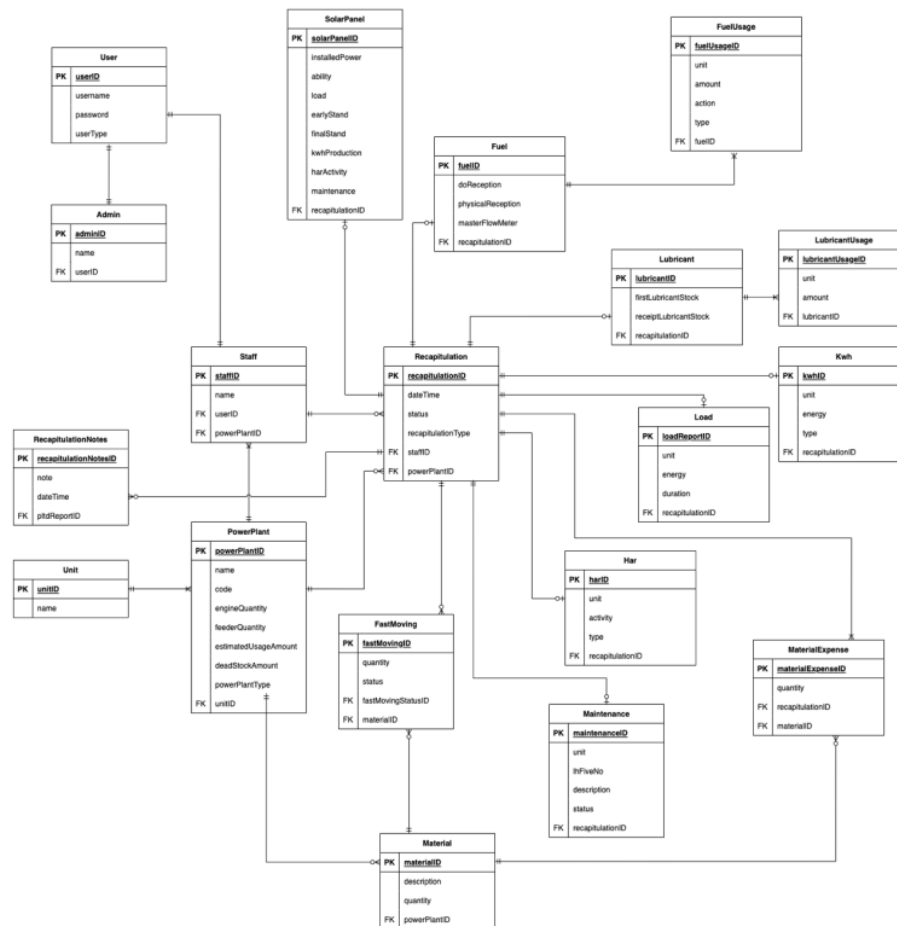


Figure 4.5 Entity Relationship Diagram (ERD) of P3MS

#### 4.4.1 Data Dictionary

A data dictionary contains information regarding the data stored in a database. Table 4.4 displays data dictionaries for the Recapitulation table and Table 4.5 displays data dictionaries for the Power Plants table. The SDD, which can be found in Appendix B, contains the entirety of the system's data dictionary.

Table 4.4 Data Dictionary for Recapitulation Table

Field Name	Datatype	Constraint	Description
Recapitulation Table			
recapitulationID	BIGINT	Primary Key	Unique ID for Recapitulation
dateTime	TIMESTAMP	Not Null	Date and time of the report insertion
status	BIGINT	Not Null	The report status whether it is on progress, submitted, approved or rejected
recapitulationType	BIGINT	Not Null	The recapitulation type
staffID	BIGINT	Foreign Key	The ID of the staff who make this report
powerPlantID	BIGINT	Foreign Key	The ID of power plant who have this report

**Table 4.5** Data Dictionary for Power Plant Table

Field Name	Datatype	Constraint	Description
PowerPlant Table			
powerPlantID	BIGINT	Primary Key	Unique ID for PowerPlant
name	VARCHAR	Not Null	Name of the power plant
code	CHAR	Not Null	The power plant code identifier
engineQuantity	INT	Not Null	The number of engine under the power plant
feederQuantity	INT	Not Null	The number of feeder under the power plant
estimatedUsageAmount	INT	Not Null	Amount of estimated usage
deadStockAmount	INT	Not Null	Amount of dead stock
powerPlantTypeID	BIGINT	Not Null	The power plant type
unitID	BIGINT	Foreign Key	The ID of unit

## 4.5 Interface Design

This section demonstrates the interface design that is being used by the Power Plants Performance Monitoring System (P3MS) for PT PLN (Persero) UP3 Pamekasan. This section will include the design of the page's navigation, which will demonstrate how the page is organized. In addition to that, the user interface design that is shown to the end-user will also be included.



#### 4.5.1 Page Navigation

This There are three distinct user roles that are utilized within this system which are the administrator, the operator staff, and the PIC staff. Figures 4.6, 4.7, and 4.8, respectively, show examples of how to navigate pages according to the various user roles that can be assigned to a user account.

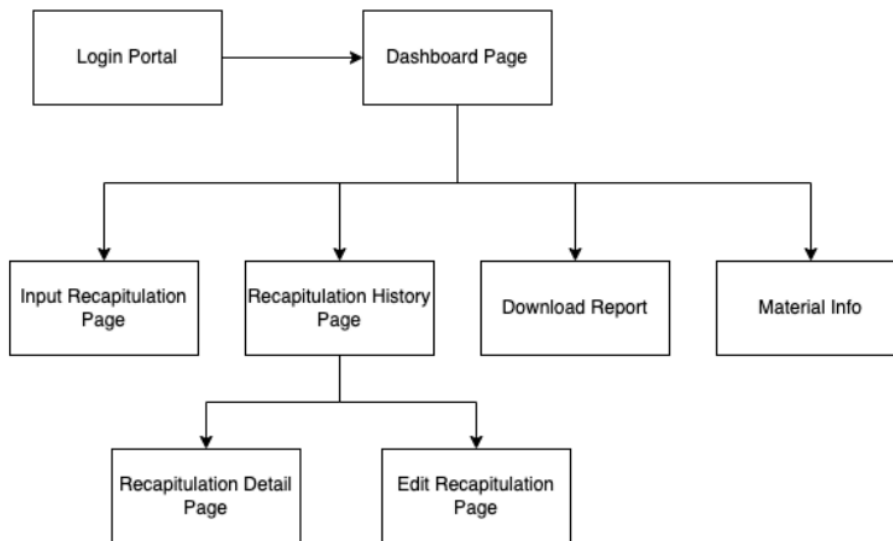


Figure 4.6 Page Navigation of Operator Staff in P3MS

The operator staff will be taken directly to the dashboard page of the system once they have successfully logged in to the system. From the dashboard page, the operator staff has the option to navigate to the pages that allow them to manage input recapitulation, view recapitulation history, download reports, and view material information.

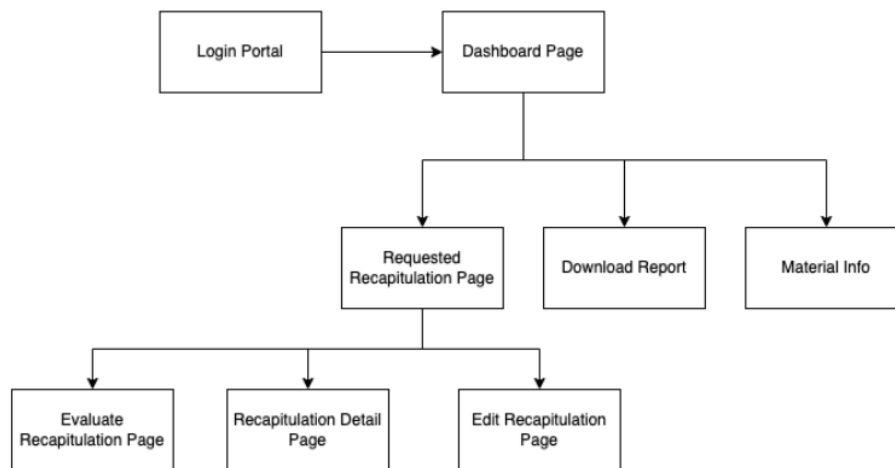


Figure 4.7 Page Navigation of PIC Staff in P3MS

The PIC staff will be taken directly to the dashboard page of the system once they have successfully logged in to the system. From the dashboard page, the PIC staff has the option to navigate to the pages that allow them to manage requested recapitulation, download reports, and view material information.

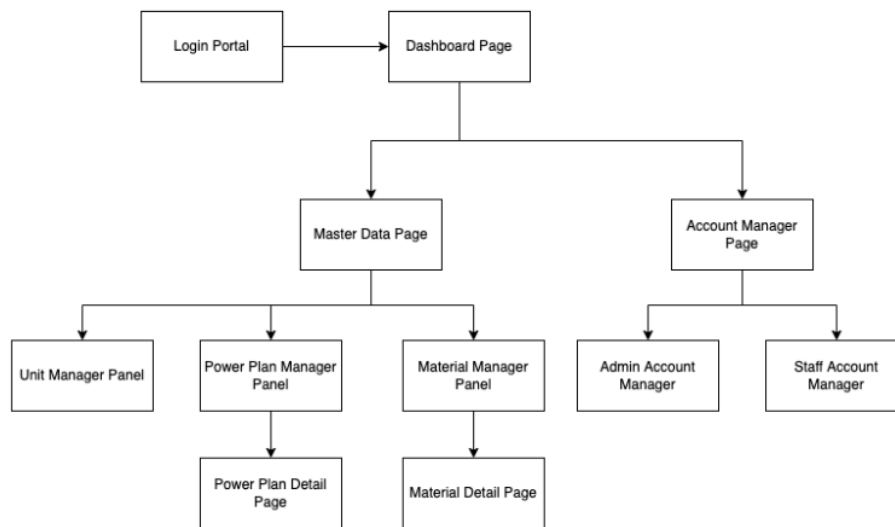


Figure 4.8 Page Navigation of Administrator in P3MS

The administrator will be taken directly to the dashboard page of the system once they have successfully logged in to the system. From the dashboard page, the admin has the option to navigate to the pages that allow them to manage master data or accounts.

#### 4.5.2 User Interface Design

The Some examples of the user interface design of Power Plants Performance Monitoring System (P3MS) are shown in Figure 4.8, Figure 4.9, Figure 4.10, Figure 4.11, and Figure 4.12. . Refer to the System Description Document (SDD) located in Appendix B for further information regarding the user interface design of the Power Plants Performance Monitoring System (P3MS).

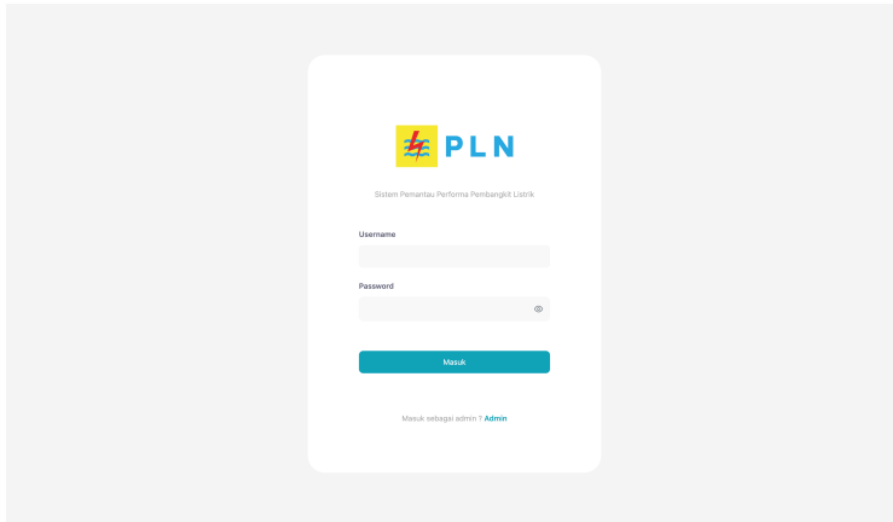


Figure 4.9 Staff Login Portal of P3MS

There are two types of login portals, one for staff and one for administrators. An example of a staff login can be seen in the figure above. In order to access the system's main features, users must first enter their username and password on this page.

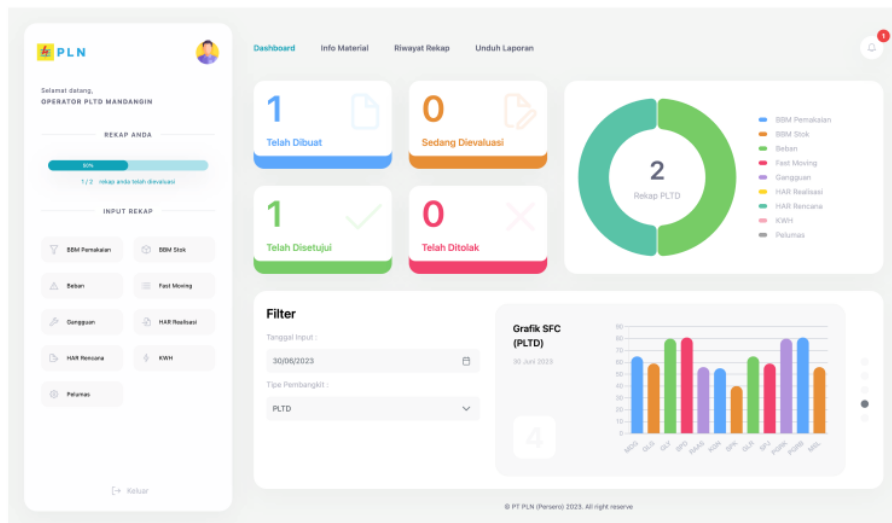


Figure 4.10 Operator Staff Dashboard Page of P3MS

After successfully logging into the system, a dashboard page shown in the figure above will appear. Users can select the activity they wish to perform using this page. In addition to that, a generated report presented in the form of a bar chart is included here. After that, they can swipe to the right or left to view the other bar chart, and they can also make some simple sorting decisions based on the date or the type of power plant.

PLN

Selamat datang,  
OPERATOR PLTD MANDANGIN

REKAP ANDA

100%

1 / 2 rekap anda telah diinputkan

INPUT REKAP

SDM Penyaluran

SDM Dstn

Bekas

Past Mining

Donggahan

HAR Realisasi

HAR Rencana

KWH

Perawatan

[+] Keluar

Input Rekap (PLTD)  
HAR Realisasi

Batal Simpan

Informasi Dasar

Nama Pembangkit

Tanggal Input

PIB

PIB

Hasil Rekap

UNIT

PIB

KEGIATAN HAR

Tulis disini ...

0 / 150

MATERIAL HAR

PIB

0

BIH

Material


Jumlah

Data tidak ditemukan

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Figure 4.11 Input Recapitulation Page of P3MS

As one of its main features, input recapitulation is a necessary step before a report can be generated. This is where the staff operator will make a summary of the results of the analysis in the field.



Selamat datang,  
PIC PLTD MANDANGIN

REKAP MASUK

100%

1/2 Rekap sudah dilakukan evaluasi

Evaluasi Rekap (PLTD)  
Deban

Kembali Koneksi

1

Rekap Dibuat

Pembangkit  
PLTD MANDANGIN

2

Sedang Dievaluasi

Tanggal  
2023-06-07 09:56:56

3

Telah Dievaluasi

Hasil Evaluasi  
-

Beban

Mesin 1	:	10 KW	Mesin 1	:	60 JAM
Mesin 2	:	20 KW	Mesin 2	:	70 JAM
Mesin 3	:	30 KW	Mesin 3	:	80 JAM
Mesin 4	:	40 KW	Mesin 4	:	90 JAM
Mesin 5	:	50 KW	Mesin 5	:	100 JAM

Jam Operasi Beban

Tutup

Setuju

[-] Ralat

Figure 4.12 Evaluate Recapitulation Page of P3MS

After successfully recapitulating the various types of tigers. All data will be processed. However, before being processed, the recap will be analyzed and evaluated by the PIC staff to ensure the accuracy and suitability of the input results. This is where it is as you can see in the figure above.

Selamat datang,  
OPERATOR PLTD MANDANGIN

BEKAP ANDA

1/2 rekap anda telah diupload

INPUT REKAP

BMM Persiapan BMM Sisa

Bahan Fast Moving

Gonggan H&B Reklamasi

H&B Rencana KWH

Pelumas

Dashboard Info Material Riwayat Rekap Unduh Laporan

Tipe Pembangkit: PLTD Nama Pembangkit: PLTD MANDANGIN Tipe Laporan: Beban

Tanggal Mulai: 01/06/2023 Tanggal Akhir: 30/06/2023

LAPORAN - PLTD MANDANGIN  
PERIODE: 01/06/2023 s.d 30/06/2023

JAM / TANGGAL	BEKAP (MTR)					JAM OPERASI (MTR)					DIBUAT
	1	2	3	4	5	1	2	3	4	5	
09:55 01/06/2023	10	20	30	40	50	60	70	80	90	100	21/06/2023

Unduh

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Figure 4.13 Download Page of P3MS

Then finally after all the process, the staff can download the generated report by fill-in the sort field the click download button.

## 4.6 Chapter Summary

This chapter provides a description of the system design and requirements of the Power Plants Performance Monitoring System (P3MS) for PT PLN (Persero) UP3 Pamekasan. These requirements include both the functional and the non-functional requirements. Use case diagrams, sequence diagrams, and activity diagrams are the three types of UML diagrams that are drawn to illustrate the functionalities of the system. Additionally, the design of the system architecture, the design of the database, and the design of the interface are all discussed in this chapter.



# CH4 - THORIQULHAQ

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