

INDUSTRIAL INTERNSHIP REPORT

**MAINTENANCE OF COAL FEEDER IN CFB PLTU
(CIRCULATING FLUIDIZED BED)
IN PLN Ltd, TELUK SIRIH GENERATION SECTOR**

*Submitted as One of the Requirements for Settlement
Industrial Internship Program*



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**MECHANICAL ENGINEERING VOCATIONAL EDUCATION
FACULTY OF ENGINEERING
UNIVERSITAS NEGERI PADANG**

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FACULTY APPROVAL

*The Report was Submitted as One of the Requirements for Settlement
Industrial Internship Program Faculty of Engineering UNP*

Semester.....

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Head of Industrial Relations Unit

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FOREWORD

Praise the authors say for the presence of ALLAH SWT who has bestowed His grace and gifts so that the author can carry out Industrial Internship at PLN Ltd, Teluk Sirih Generation Sector and successfully completed the preparation of the Industrial Internship report entitled Maintenance of Coal Feeder at CFB (Circulating Fluidized Bed) PLTU at PLN Ltd, Teluk Sirih Generation Sector. This report is prepared based on the experience the author has gained during the Industrial Internship in the Boiler Maintenance Section at PLN Ltd Teluk Sirih Generation Sector from September 6th 2018 - October 19th 2018. During the writing of this thesis the author received a lot of guidance, advice, motivation and assistance from various parties, either directly or indirectly. For that, with all humility the writer would like to thank:

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8. to the author while implementing the Industrial Internship.
9. Mr. I Nyoman Buda, as the Manager of PLN Ltd Teluk Sirih Generation Sector.
10. Mr. Mudrika, as the Maintenance Assistant of PLN Ltd Teluk Sirih Generation Sector.
11. Mr. Sartoni, as Assistant Finance, HR and ADM of PLN Ltd Teluk Sirih Generation Sector.
12. Mr. Rizki Putra, as the Supervisor of Turbine and Boiler Mechanics of PLN Ltd Teluk Sirih Generation Sector.
13. Mr. Muhammad Joffy Nurhadi, as the Mechanical Maintenance Field Advisor of PLN Ltd Teluk Sirih Generation Sector.
14. To all staff and employees of PLN Ltd Sektor Pembangkitan Teluk Sirih, whose names the author cannot mention one by one, thank you very much for your cooperation.
15. Both parents and families who have provided support to the author both morally and materially as well as prayers so that the author can complete this report.
16. Unnamed comrades in arms who are involved in implementing Industrial Internships at PLN Ltd Teluk Sirih Generation Sector.

Striving for this report is to be structured in such a way, but there is still the possibility of errors and confusion, therefore the authors really hope for input in the form of criticism and suggestions from readers for the perfection of this report. Finally, the author would like to thank and hope that this article is useful for readers, especially for the author himself.

Padang, March 2020
Author

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CHAPTER I

INTRODUCTION

A. Background

Industrial Internship is an academic requirement that must be met by every student who will complete his undergraduate education in the Department of Mechanical engineering Vocational Education, Faculty of Engineering at Universitas Negeri Padang.

Industrial Internship was held with the aim of providing opportunities for students to observe firsthand the process of carrying out work activities in the field, and also to provide opportunities to apply academic knowledge, as well as compare with reality in the field. Besides, Industrial Internship can also be used as a means of adding and broadening insights and improving ways of thinking in a more logical, analytical and conceptual direction.

In accordance with the applicable provisions, every student who will carry out Industrial Internship is required to find a practice location and at the same time make a report on the results of Industrial Practice in accordance with the construction concentration expertise program and ongoing activities at the location.

To fulfill this, the Industrial Internship place at PLN Ltd Teluk Sirih Generation Sector. The Industrial Internship place was chosen because it was in accordance with the expertise program and the knowledge that had been obtained while in college, in fact there were still many new sciences that needed to be learned.

B. The Description of Company

1. History of the Company

PT PLN Pembangkitan South Sumatra (PLN KITSBS) is a unit of PT PLN which is a reorganization of PT PLN South Sumatra Generation and Distribution which was founded in 1997. PLN KITSBS was established based on the Decree of the Board of Directors of PT PLN

Number 177.K / 010 / DIR / 2004 concerning the Organization of PT PLN Pembangkitan Southern Sumatra.

The purpose of establishing PLN KITSBS in accordance with the Decree of the Board of Directors Number 368.K / GM-KITSBS / 2012 as one of the generation units of PT PLN is to seek the generation and supply of electricity in sufficient quantity and quality and to conduct business in accordance with sound economic principles, pay attention to the interests of stakeholders and increase customer satisfaction.

PLN KITSBS now has a capable power capacity of 2765 MW. The main office of PLN KITSBS is located at Jalan Demang Lebar Daun Number 375 Palembang and has 10 (ten) Generation Sectors with work areas spread across the Provinces of South Sumatra, Bengkulu, Jambi, West Sumatra and Bandar Lampung, namely:

- a. Community Generation Sector;
- b. Bandar Lampung Power Sector;
- c. Bukit Asam Power Sector;
- d. Bengkulu Generation Sector;
- e. Bukit Tinggi Power Sector;
- f. Ombilin Generation Sector;
- g. Tarahan Generation Sector;
- h. Jambi Generation Sector;
- i. Sirih Bay Power Sector;
- j. Sebalang Power Sector;

PLN Ltd Pembangkitan Southern Sumatra The Teluk Sirih Generation Sector is one of the nine generation sectors that supply electricity to southern Sumatra. The organization of PT PLN Sektor Pembangkitan Teluk Sirih, was established based on the Decree of the Directors of PLN Ltd Number: 618.K / DIR / 2012 on December 12, 2012. PLTU Teluk Sirih was established on an area of \pm 40 ha, which is located at Geographical coordinates: 01 ° 04'32 "LS and 100 ° 22'36" BT.

Contract No. 436.PJ / 041 / DIR / 2008 which was signed on May

9, 2008 by PLN Ltd with a consortium between PT. Industrial Engineering and China National Technical Import & Export Cooperation with Effective Date on 18 October 2008. Amendment to contract No. A.01 / 2011 (Extention of Time) which was signed on December 30, 2011 by PT PLN with a consortium between PT. Industrial Engineering and China National Technical Import & Export Cooperation with an Effective Date on April 18, 2011. The contract value of the Teluk Sirih PLTU Construction Implementation Unit is USD179,024,152. - and IDR 673,609,315,309. -, this value includes 10% VAT.

The source of funds for the Teluk Sirih PLTU is the Association of Regional Banks (ASBANDA) and the China Development Bank (CDB). PT PLN appointed PT PLN Jasa Engineering, which since June 1, 2010 changed its name to PT PLN Electrical Engineering Center (PUSENLIS), to carry out inspection work and engineering approval (design review) PLTU Teluk Sirih (2 x 112 MW) refers to the Letter of Assignment of the Director of Generation and Primary Energy No. 00511/432 / DITKIT / 2007 dated December 28th, 2007.

The construction implementation unit for the Teluk Sirih PLTU (2 x 112 MW) is located in Teluk Sirih RT 01 / RW 04, Teluk Kabung Tengah Village, Bungus Teluk Kabung District, Padang City, West Sumatra, ± 30 km south of Padang City Center. Currently PLTU Teluk Sirih is one of the largest power plants in Indonesia, where PLTU Teluk Sirih consists of two units:

a. Unit I

Unit 1 was built for 30 months and completed on October 23, 2012, unit one produced 1x112 mw of electrical energy.

b. Unit II

Unit 2 was built for 33 months and completed on January 22th, 2013, unit 2 also produces electricity of 1x112 mw.

2. Location of the Teluk Sirih PLTU



Figure 1.1 Location of the Teluk Sirih PLTU



Figure 1.2 PLTU Teluk Sirih sector

3. Meaning of Logo

The shape, color and meaning of the official Company symbol used are those listed in the Attachment to the Decree of the Board of Directors of the State Electricity Company No. 031 / DIR / 76 Date, June 1, 1976, regarding the Standardization of the State Electricity Company Symbol.

Description of the PLN Ltd:

a. Vertical Rectangular Plane

Symbolizes that PLN Ltd is a container or organization that is perfectly organized. Yellow color represents enlightenment, as expected by PLN that electricity is able to create enlightenment for people's lives. Yellow also symbolizes the burning enthusiasm of every human being who works in this company.

b. Lightning or Lightning

Symbolizes the electric power contained therein as the main service product produced by the company. In addition, lightning also means the fast and precise work of the employees of PLN Ltd in providing the best solutions for its customers. The red color symbolizes the maturity of PLN as the first electricity company in Indonesia and the dynamics of the pace of the company and every individual company as well as the courage to face the challenges of the times.

c. Three Waves

It means the propagation of electrical energy that is flowed by the three main business fields involved, namely Generation, Distribution and Distribution which are in line with the hard work of the employees of PLN Ltd in order to provide the best service for its customers. It is given the blue color to show a constant impression (something that is constant) like electricity that is still needed in human life. In addition, blue also symbolizes the reliability of company people in providing the best service for its customers.

4. Company Profile

Company name : PT PLN Pembangkitan Sumatera Section
South of the Sirih Bay Generation Sector

Type of business : Generator

Address : Jl. Lintas Padang-Painan KM. 25 Bay
Central Kabung, Kec. Bungus Teluk Kabung, Padang

Telephone : (0751) 4680089

Fax : (0751) 4650091

Postal code : 25241

Date of Establishment : 18 October 2008

Surface area : ± 40 ha

a. Vision, Mission, Motto and Values

PLN Ltd Pembangkit Sumatera Selatan Part Sirih Bay Sector has the following vision and mission:

Vision:

"To become a leading and superior power generation company in Indonesia with world-class performance that rests on human potential".

Missions:

- 1) Running an electric energy generation business that is efficient, reliable and environmentally friendly.
- 2) Implement world-class generator governance supported by experienced and knowledgeable human resources.
- 3) Make culture company as guidance in implementation of duties and responsibilities.

Motto:

"Our Energy for a Better Life"

Values:

- 1) Mutual Trust
- 2) Integrity
- 3) Care
- 4) Learners (Continuous Learning)

b. Organizational structure of the company

The organizational structure in PT PLN Teluk Sirih Sector is an arrangement in which there are parts that support each other to achieve the company's goals. Where PT PLN Teluk Sirih Sector is led by a manager who is assisted by 5 Assistant Managers, namely:

- 1) *Assistant Manager of Engineering*
- 2) *Assistant Manager Operation*
- 3) *Assistant Manager Maintenance*
- 4) *Assistant Manager for Coal & Ash Handling*
- 5) *Assistant Manager for HR and ADM*

In carrying out their duties, each Assistant Manager is assisted by several Supervisors:

- 1) *Assistant Manager of Engineering*

Has the task of planning and evaluating the operation of maintenance of electricity generation? In carrying out its duties, the Assistant Manager of Engineering is assisted by functional staff.

- 2) *Assistant Manager Operation*

Having the task / task in implementing the operation of the power plant unit with the plans & procedures set out in carrying out its duties, the Operations Assistant Manager is assisted by 7 Supervisors, namely:

- a) Supervisor Operation Shift A
- b) Operation Shift Supervisor B
- c) Operation Shift Supervisor C

- d) Operation Shift Supervisor D
- e) Chemical Analysis Supervisor
- f) K3L Supervisor
- g) Operators Rendel Supervisor

3) *Assistant Manager Maintenance*

In carrying out its duties Assistant Maintenance is assisted by:

- a) Maintenance Supervisor Electricity and protection
- b) Maintenance Supervisor Controls and Instruments
- c) Mechanical Maintenance Supervisor
- d) Supervisor Rendel Har

4) *Assistant Manager for Coal and Ash Handling*

In carrying out its duties the Assistant Manager for Coal and Ash Handling is assisted by 3 Supervisors, namely:

- a) Supervisor Operation Coal & Ash
- b) Supervisor Maintenance Coal & Ash Handling
- c) Supervisor Primary Fuels & Energy

5) *HR & ADM Assistant Manager*

Has HR & ADM duties. In carrying out its duties the Assistant Manager for HR & ADM is assisted by 5 Supervisors, namely:

- a) HR & General Supervisor
- b) Budget & Finance Supervisor
- c) Accounting Supervisor
- d) Logistics Supervisor

c. *Teluk Sirih PLTU Work System*

PLTU Teluk Sirih is one of the large power plants in the Sumbagsel region with an installed power of 2 x 112 MW. PLTU (steam power plant) uses coal as its main fuel.

PLTU Teluk Sirih is a PLTU unit designed with the apIndustrial Internshipcation of Circulating Fluidized Bed

(CFB) technology in its boiler. The coal used by PLN in the Sirih Bay Sector is low rank coal. Low rank coal is a sub-bituminous coal with a calorific value of <5000 kCal / kg (adb) with reserves of around 20.22%.

The coalshed coal is transferred to the coal bunker using a conveyor, where before entering the coalbunker, the coal goes into the crusher to be reduced to a maximum size of 30 mm. From the coalbunker, the coal is transferred to the combustion chamber using the coalfeeder, then the coal is burned in the furnace.

The hot air from the combustion process is used to heat the water in the boiler tubes. Furthermore, high temperature water enters the drum and is separated between water and steam. The steam flows through superheater 1 and 2 to become further hot steam and the steam dries. The dry steam that has reached the desired pressure and temperature will be used to turn the turbine.

At the betel bay PLTU there are two turbines, namely the HP turbine and the LP turbine, the remaining steam turns the turbine HP again to turn the turbine LP. The turbine shaft is coupled with the generator shaft so that the rotating generator generates electricity and then the electricity is flowed to the transformer to increase the voltage, the electricity is ready to be distributed.

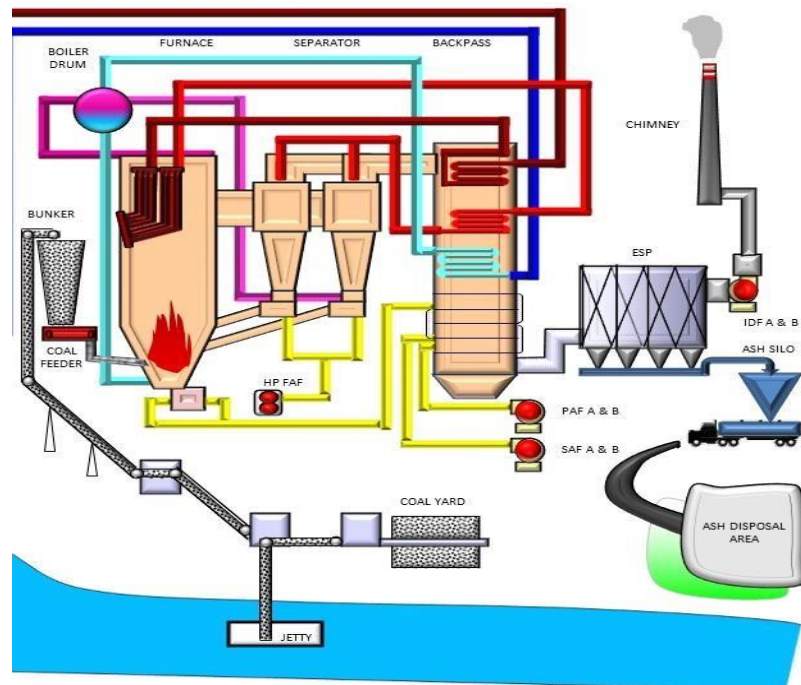


Figure 1.3 Cycle of the Teluk Sirih PLTU

5. Teluk Sirih PLTU Fluid Cycle

The working fluid cycle of PLTU Teluk Sirih is a closed cycle, that is, it uses the same fluid repeatedly. First the water is filled into the boiler to fill the entire surface area of the heat transfer. In this boiler, the water is heated with hot gas from the combustion of fuel with air so that it turns into steam. The steam produced by the boiler with a certain pressure and temperature is directed to do work in the turbine to produce mechanical power in the form of rotation.

The used steam exits the turbine into the condenser to be cooled by cooling water to turn into water. This condensate water is then used again as boiler filling water. Thus this cycle goes on continuously and over and over again.

The turbine rotation is used to rotate the generator which is directly coupled with the turbine so that when the turbine rotates, electrical energy is generated from the generator output terminal.

Even though the working fluid cycle is a closed cycle, the

amount of water in the cycle will experience a reduction. This reduction in water is caused by both intentional and unintentional leaks. To replace lost water, it is necessary to add water to the cycle. The criteria for this make-up water must be the same as the water in the cycle.

6. Main Equipment of PLTU Teluk Sirih

PLTU is a power plant consisting of the main components and installation of supporting equipment. The main components of the PLTU consist of four, namely:

a. Boiler

A boiler is a closed vessel that can form steam with a pressure greater than the atmosphere by heating the boiler water in it (wall tube) with heat radiation from the combustion of fuel in the furnace. Boiler at the Teluk Sirih PLTU is produced by Wuxi Huaguang Boiler Company with the UG-434 / 9.81-M model. PLTU Teluk Sirih is a PLTU unit designed with the apIndustrial Internshipcation of Circulating Fluidized Bed (CFB) technology in its boiler, where the use of low-calorie coal (Low-Rank Coal).

The combustion system in the CFB type boiler is heating the Inert Bed Material in the furnace to temperature 5200C by the lower burner in the wind box and the help of primary air out through the nozzle, after this temperature is reached, coal fuel is entered into the furnace and secondary air supply so that the bubbling process occurs continuously until *temperature* ± 9000C.

The burning coal will fly and circulate to the cyclone to be separated between fly ash and bottom ash. Fly ash will go to the backpass room while bottom ash will return to the furnace assisted by the supply of High Pressure Fluidized Air Fan (HP FAF) in the sealpot section. In the CFB type boiler there are 3 main parts, namely:

- 1) Furnace which serves as a place for the burning process of coal fuel.
- 2) Cyclone which functions to recirculate combustion material from the furnace to be returned to the furnace. Here also occurs the process of separating unburned coal and combustion bed material to be circulated to the furnace and flue gas to be forwarded to the electrostatic precipitator (ESP).
- 3) Back pass which functions as space for the use of heat contained in the flue gas. The main components in the Backpass: Finishing Superheater, Low temperature Superheater, Economizer, and Air Heater.

Characteristics of Betel Bay CFB Boiler:

- 1) Furnace temperature: 850-950 C
- 2) Size of coal supplied to boiler: 30 mm
- 3) Low calorie coal type 4000 kcal (low calorie coal: <5100)
- 4) Coal feed speed: 5-8 m / s
- 5) Combustion materials with a ratio of 1: 4 or 1: 6 are intended for combustion efficiency

b. Turbine

The steam turbine functions to convert the heat energy contained in the steam into mechanical energy in the form of a rotation. At the betel bay PLTU there are two turbines, namely the HP turbine and the LP turbine. Steam with high pressure and temperature flows through the nozzle so that its speed increases and points precisely to push the blade of the turbine mounted on the shaft. As a result, the turbine shaft moves to produce rotation (mechanical energy). The steam that has done work in the turbine, pressure and temperature drops until the condition becomes wet steam. The steam coming out of this turbine is then flowed into the condenser to be cooled so that it becomes

condensate water, while the rotating power generated is used to rotate the generator.

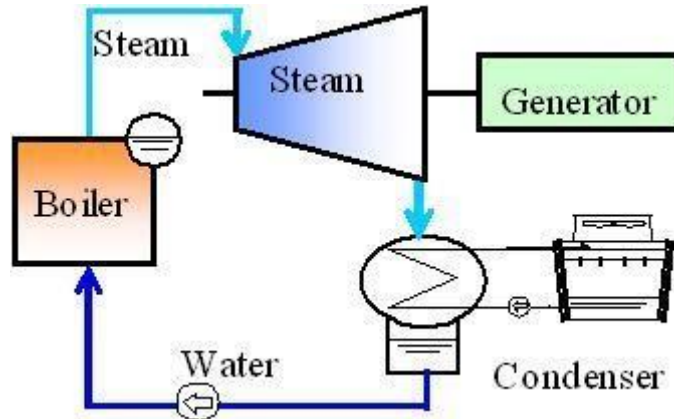


Figure 1.4 Steam Turbine Work Schematic

c. Condenser

The condenser is a device for converting steam into water. The change process is carried out by flowing steam into a room containing pipes (tubes). Steam flows outside the pipes while water as coolant flows in the pipes. Such a condenser is called a surface type condenser. The need for cooling water in the condenser is very large so that it is usually taken into account in planning. Cooling water is taken from sources with sufficient supIndustrial Internships, namely from lakes, rivers or the sea.

The position of the condenser is generally located under the turbine, making it easier for steam to flow out of the turbine to enter the condenser due to gravity. The heat transfer rate depends on the cooling water flow, the cleanliness of the pipes and the temperature difference between the steam and cooling water.

The process of converting steam to water occurs at saturated pressure and temperature, in this case the condenser is in a vacuum. Since the temperature of the cooling water is the same as the temperature of the outside air, the maximum condensate water temperature is close to the temperature of the

outside air. If the heat transfer rate is disturbed, it will affect pressure and temperature.

d. Generator

Generator at the Sirih Bay PLTU produced by Nanjing Turbine Generator co., Ltd with the model QFW-112-2, equipped with a coaxial AC exciter. The main purpose of activities at the PLTU is to produce electrical energy. The production of electrical energy is the target of the energy conversion process at the PLTU. The generator that is coupled directly with the turbine will produce an electric voltage when the turbine rotates.

The energy conversion process in the generator is by rotating the magnetic field in the coil. The generator rotor as a magnetic field induces a coil mounted on the stator so that a voltage occurs between the two ends of the generator coil. To make the rotor become a magnetic field, DC current flows into the rotor coil. This system of giving DC current to the rotor to become magnetic is called excitation.

7. Supporting Facilities

a. Administration building

The administration building for the Teluk Sirih PLTU is to the east of the unit. The building consists of three floors, the first floor is used for employees, the second floor is used for PLN employees and meeting rooms, and the third floor is used for a place to relax (keraokean, sports venue, etc.).

b. Islamic Prayer Room

There is one prayer room at the PLTU Teluk Sirih, located to the east of the administration building. This mosque is functioning well, marked by the presence of minimum congregational prayers at midday prayers.

c. Workshop

The workshop building at PLTU Teluk Sirih is in the west. It contains special and general tools used for the maintenance process of the unit.

d. Volleyball court

There is one volleyball court at the betel bay PLTU. The place is to the west of the administration building, which is used for sports for employees of the betel bay sector

e. Parking lot

There are two parking lots at PLTU Teluk Sirih, the first two to the west of Post 1 which are used for betel bay sector workers while the second is located near the administration building used for betel bay sector employees.

f. Firefighters

Carry out preventive and operational emergency overcoming fire hazards as well as rescue tasks.

C. PLI Activities Planning

1. Industrial Internship goals

In general, Industrial Internship aims to introduce writers to the world of work in companies and apply theories obtained in college to realities in the field. Specifically, Industrial Internship aims to:

- a. Apply the knowledge that has been obtained in lectures to the industrial world.
- b. know and understand the work system of PLN Ltd Teluk Sirih Generation Sector.

2. Problem

The system contained in the Teluk Sirih PLTU boiler is as follows:

- a. Coal Feeder System
- b. Furnace System
- c. Water & Steam System

- d. Flow & Gas System
- e. Fly & Ash System

In this report the authors limit the problems in the Maintenance of Coal Feeder at PLN Ltd Teluk Sirih Generation Sector.

3. Benefits

By knowing the maintenance and maintenance of the coal feeder at the Teluk Sirih PLTU, it can be done to solve the problems that arise and prevent the possibility of errors so that it can improve the performance of the equipment parameters and also increase the production of PLN Ltd Teluk Sirih Generation Sector.

4. Method of collecting data

Data and information as material for preparing reports on field work practices are obtained in several ways, namely:

- a. Field Observation

The author carefully observes firsthand the field that the writer is in during the Internship.

- b. Interview

The author conducts interviews and discussions with parties related to the field that the author is in to get the necessary data and information.

- c. Study of literature

The author studies reference books related to Maintenance Coal feeder at PLN Ltd Teluk Sirih Generation Sector.

D. Implementation of Industrial Internship Activities

First of all, the author registered himself with the Industrial Relations Unit (UHI) FT UNP and attended coaching (training) before Industrial Internship. Then contact the Industrial Internship coordinator to determine the supervisor during the Industrial Internship implementation. After that, the author contacted the company and submitted a request letter to implement Industrial Internship in the company. After everything is finished and

approved, the author is ready to implement Industrial Internship at PLN Ltd Teluk Sirih Generation Sector, Bungus Teluk Kabung, Padang.

The Industrial Internship implementation at PLTU Teluk Sirih, was carried out for two months starting from September 6th, 2018 to October 19th, 2018. Details of activities during Industrial Internship are:

1. The first day was an introduction to the staff and leaders of PLN Ltd Teluk Sirih Generation Sector.
2. Determination of the report title.
3. The implementation of Practical activities as well as data collection was carried out for 60 days, namely collecting data from all information on the observed topic.
4. Report consultation and compile reports.

CHAPTER III

DISCUSSIONS

A. Basic Theory of Maintenance

1. Definition of Maintenance

The definition of maintenance is a combination of various actions taken to maintain an item or repair it, until it reaches an acceptable condition. Another definition of maintenance is the activity of maintaining factory facilities and equipment and making necessary repairs or adjustments in order to achieve a state of production operation that is satisfactory and in accordance with planned.

a. Maintenance Purpose

Maintenance activities for equipment and machine facilities certainly have a purpose. These objectives are:

- 2) Extend the useful life of assets.
- 3) Ensure availability of equipment and operational readiness of equipment and equipment installed for production activities.
- 4) Helps reduce usage or deviations beyond limits and maintain capital invested for a specified time.
- 5) Pressing the level of maintenance costs as low as possible by carrying out maintenance activities effectively and efficiently.
- 6) Meet product needs and production plans on time.
- 7) Improve the skills of supervisors and operators through the training activities held.
- 8) Improve the safety and health of employees.

b. Types of Maintenance

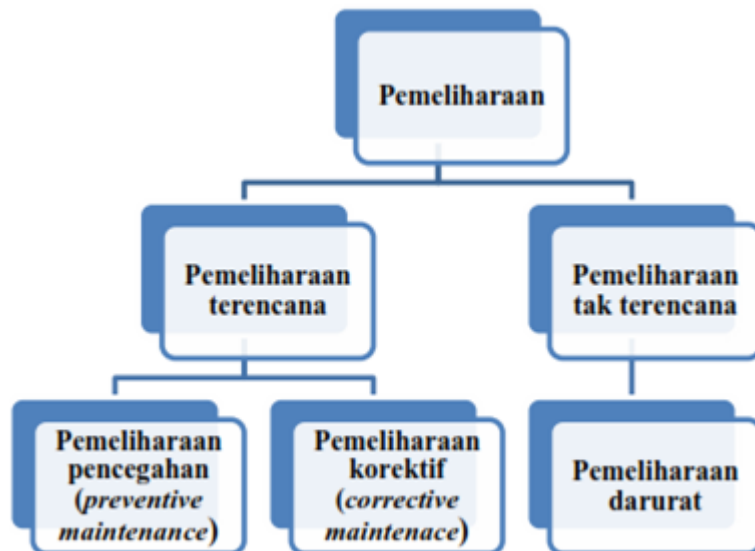


Figure 3.1 Maintenance Diagram

c. Planned Maintenance

Maintenance is carried out in an organized manner and in accordance with the Maintenance plan that has been previously made. This maintenance can be divided into two, namely:

- 1) Preventive Maintenance Is a maintenance and maintenance activity carried out to prevent emergence damage unexpected damage and discover conditions or circumstances that caused the production facility to suffer damage on time used in process production. Thus all the production facilities are earned
- 2) Maintenance prevention will be guaranteed smooth operation and will always be endeavored in a condition that is ready at all times. Based on this it is possible making a plan schedule Maintenance and more precise production plans and effective in dealing with production facilities that are included in the critical unit category.
- 3) Corrective Maintenance

Namely maintenance activities that are carried out after the system is damaged or can no longer function properly. These maintenance activities are often referred to as repair activities. At a glance, the cost

of repair maintenance will be less than holding preventive maintenance. This is true as long as the damage does not occur while the production facility / equipment is being operated, because if the damage occurs during the operation, in addition to the cost of repairing the damage, it is necessary to take into account the cost of delaying production. This damage will also contribute to the long life of the equipment. Therefore, preventive maintenance is considered more profitable than just carrying out repair maintenance alone.

d. **Unplanned Maintenance**

Unplanned maintenance is a form of emergency maintenance which can be defined as maintenance that needs to be done immediately to prevent more serious consequences, such as loss of production time, major damage to equipment and higher repair costs.

B. Coal Feeder System

The coal feeder is one of the main boiler equipment at the Teluk Sirih PLTU. Coal feeder is a tool that functions to supply coal from the banker to the furnace and regulates the amount of coal flow. Coal feeder has the task of regulating the amount of coal according to the desired needs, namely the amount of power to be generated from a PLTU system. PLTU Teluk Sirih has two units, where each unit has 2 fuel bankers and 4 coal feeders.



Figure 3.2 Example of Gravimetric Coal Feeder



Figure 3.3 Coal Feeder of the Teluk Sirih PLTU

Based on its type the Coal Feeder is divided into 2, namely: Gravimetric Coal feeder, namely setting the amount of coal based on the weight fraction, using a gravimetric sensor that can detect the weight of the coal passing through the conveyor.

1. Volumetric Coal Feeder, that is setting the amount of coal based on volume fraction.

The Teluk Sirih PLTU itself uses the Gravimetric Coal feeder type. Gravimetric coal feeder more preferred for use because of its ability to respond to changes in the density of coal used. The energy content of coal tends to depend on the density rather than the volume of coal, so that the gravimetric feeder will better control the energy supply that enters the boiler. *Coal feeder* has 2 gates, gate 1 is located at the end of the line conveyor when it enters the furnace and gate 2 is located at the sealing of the water so there is no back pressure when the unit turns off.



Figure 3.4 Specifications for Coal feeder PLTU Teluk Sirih

C. Maintenance Coal Feeder

1. Preventive Maintenance Coal Feeder

Preventive maintenance (preventive maintenance) is an obligatory activity or agenda carried out at the coal feeder of PLTU Teluk Sirih. Preventive maintenance is in the form of cleaning (cleaning dust or dirt in the coal feeder), checking periodically, replacing lubrication, and so on.

Preventive maintenance What I did to the Sirih Bay Coal Feeder during the activity there was bearing lubrication. Lubrication aims to reduce wear or friction as a result of direct contact between two friction metal surfaces and the heat caused by friction can be reduced. Lubrication of coal feeder bearings is carried out once every 2 months using a mobile grease 28 type lubricant.

The process is as follows:

- a. Tools and Materials
 - 1) Tang
 - 2) Grease pump
 - 3) Majun

- 4) Mobile grease type lubricants 28
 - 5) Brush
 - 6) Wire
 - 7) Hammer
 - 8) Screwdriver
- b. Work steps
- 1) Prepare and put on PPE
 - 2) Prepare the necessary tools and materials
 - 3) Clean the coal feeder from dust and dirt, especially on the cover bearing using a brush or rag
 - 4) Open the valve or cover the coal feeder roll bearing using a screwdriver and then clean the plaque / lubricant that is attached so that the new lubricant that is entered is not clogged using a rag
 - 5) Clean the cover or roll bearing cover using a rag to remove the remaining old lubricant.
 - 6) Filling grease pump with car type grease 28
 - 7) Pumping or filling new lubricant into the valve
bearing roll coal feeder
 - 8) Replace the coal feeder roll bearing cover or cover using a hammer
 - 9) Clean the residue or excess lubricant on the roll bearing using a cloth
 - 10) Perform all the steps above for all bearing rolls on the coal feeder. When finished, clean and collect tools and work materials back in place.



Figure 3.5 Nepel bearing roll for inserting grease

2. Corrective Maintenance Coal Feeder

Corrective Maintenance (repair maintenance), namely maintenance activities that are carried out after the system is damaged or can no longer function properly. The problems that exist in the Coal Feeder PLTU Teluk Sirih that require corrective maintenance include:

- a. Belt Break
- b. Damage to the drive pully gearbox
- c. Damage to coal feeder roller bearings
- d. Slip on the coal feeder belt

For the corrective itself, the first effort taken is to repair the damage, if it can no longer be repaired, the next effort is to replace the damaged component. Here I will describe Corrective maintenance, namely replacement of coal feeder roller bearings.

The process is as follows:

- a. Tools and Materials
 - 1) *Grease SHC 007*
 - 2) Majun
 - 3) Keys
 - 4) Key L Star 1 set

- 5) Hammer
 - 6) Corkscrew Lock 12
 - 7) Rubber Nail
 - 8) *Trackers*small
 - 9) *SKF Roller Bearings*6204
 - 10) Flat-head screwdriver
 - 11) Brass
- b. Work steps
- 1) Prepare and put on PPE
 - 2) Prepare Equipment
 - 3) Open the coal feeder roller bearing cover
 - 4) clean the remaining grease on the bearing
 - 5) For bearings that are damaged remove the bearing from the roller
 - a) to disassemble the bearing first bolt around
 - b) hold the roller, so that at the time of unloading the bearing don't fall
 - c) Remove the roller bearings using a small tracker
 - 6) Replace bearings with new ones
 - 7) Insert the bearing slowly, with the roller lifting, lock it with the roller lock that is in the coal feeder, hit it slowly
 - 8) After the bearing is installed, replace it and lock the bearing casing
 - 9) Apply enough grease on the roller bearings
 - 10) Close the bearing again
 - 11) When finished, clean and collect tools and work materials back in place

D. Innovations made on the Sirih Bay Coal Feeder

Since the operation of the Teluk Sirih PLTU, there have been several innovations made to the Teluk Sirih PLTU coal feeder which aims to improve

and maintain the coal feeder performance so that it is in accordance with the established production plan and also aims to overcome problems that arise in the initial construction of the coal feeder at the Teluk Sirih PLTU. . What I can describe in this report is as follows:

1. Blockage of the coal line outlet

- a. The cause, the blockage of the outlet line coal is one of the obstacles in the operation of the power plant, especially those that use low grade coal as fuel. this often happens when the weather is rainy and in addition the air around is humid. The condition that should be used is coal that is completely dry so that the operation process can run optimally and not experience blocking. Blocking that occurs continuously is a serious problem that must be addressed immediately. Moreover, blocking occurs at the line where coal enters the furnace.
- b. *Settlement*, To solve this problem, holes are made in the coal line outlet, because before the hole the operator overcomes the blocking.

2. Selfheating and Spontaneous Combustion in the Coal Feeder

- a. The reason is, this coal is prone to self-combustion where the temperature rises when exposed for a long time. This is due to oxidation which results in self heating and then self-combustion. If it occurs to self heating then there will be a decrease in the calorific value of coal and chemically, besides a decrease in chemical quality there is also a decrease in physical quality, especially in low rank coal.
- b. *Settlement*, To solve this problem, an innovation called "Temperature Sensor in Coal Feeder to Detect Fires" was made by modifying the thermal switch and providing a new "thermocouple" sensor on the innercoal feeder.

CHAPTER IV

CLOSING

A. Conclusion

From the discussion above, the following conclusions can be drawn:

1. Maintenance is the activity of maintaining factory facilities and equipment and making necessary repairs or adjustments in order to achieve a state of production operation that is satisfactory and in accordance with planned.
2. PLTU Teluk Sirih is a PLTU unit designed with the apIndustrial Internshipcation of Circulating Fluidized Bed (CFB) technology in its boiler. The coal used by PLN in the Sirih Bay Sector is low rank coal. Low rank coal is a sub-bituminous coal with a calorific value <5000 kCal / kg (adb).
3. Coal feeder is equipment that functions to supply coal from the banker to the furnace and regulates the amount of coal flow. The Teluk Sirih PLTU itself uses a gravimetric coal feeder type.
4. Preventive maintenance carried out on the coal feeder includes cleaning (cleaning dust or dirt contained in the coal feeder), periodic checking, replacing lubrication, and so on.
5. The problems that exist in the Coal Feeder PLTU Teluk Sirih that require corrective maintenance include:
 - a) Broken Belt
 - b) Damage to the drive pully gearbox
 - c) Damage to coal feeder roller bearings
 - d) Slip on the coal feeder belt.

B. Recommendasion

1. In every job, always prioritizes occupational health and safety so that work accidents can be avoided.

2. In carrying out preventive and corrective maintenance, it is expected to be carried out carefully, carefully, and in accordance with work instructions.
3. Always present innovations and constructive ideas for a better PLTU Teluk Sirih in the future.
4. In implementing Industrial Internship, always show a persistent attitude, never give up in seeking knowledge so that the Industrial Internship that is carried out is useful for the future.
5. In implementing Industrial Internship, give a good and positive impression to all leaders and employees of Industrial Internship places so that good relationships are established and make the campus name proud.

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Format Nilai Akhir PLI

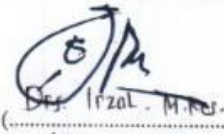
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MES	SI	GI	7101	

DAFTAR NILAI MAHASISWA MATA KULIAH PENGALAMAN LAPANGAN INDUSTRI SEMESTER.....

Nama Dosen Pembimbing..... Drs. Irzal. M.Kes.
Jurusan..... TEKNIK MESIN

No	Nama Mahasiswa	NIM/TM	Nilai Supervisor	Nilai Dosen Pembimbing	Total (Nilai Akhir dan Huruf)
	AGUNG AGATHA DAMANIK	140670031 2014	80,8	83	81,9/A-

Padang..... 8-8-2020
Dosen Pembimbing,


(.....)
NIP. 19610014 19903 1004

- Nilai Supervisor dan Nilai Dosen Pembimbing di ambil dari format yang khusus untuk itu.
- Nilai Akhir adalah Nilai rata-rata dari jumlah Nilai Supervisor dan Dosen Pembimbing (dalam bentuk angka dan huruf)

**LEMBARAN PENILAIAN DOSEN PEMBIMBING
TERHADAP MAHASISWA PLI**

Nama Mahasiswa (Praktekan) : AGUNG AGATHA DAMANIKI NIM. 14067003
 Jurusan : TEKNIK MESIN
 Judul Laporan : PEMELIHARAAN COAL FEEDER PADA PLTU CFB (CIRCULATING FLUIDIZED BED) DI P. PLN TELUK SIKIH
 Jadwal Kegiatan : 06 Sept 2018 s.d. 19 Oktober 2018
 Nama Dosen Pembimbing : Drs. Izzal M. Kes.

Ketentuan :

1. Sasaran penilaian adalah kemampuan mahasiswa menghasilkan laporan PLI yang sesuai dengan persyaratan yang ditetapkan pada bagian penulisan laporan.
2. Kualitas fisik buku laporan dan faktor lain yang tidak menggambarkan kemampuan mahasiswa menulis laporan tidak termasuk komponen yang dinilai. Tetapi dituntut sebagai persyaratan pengeluaran nilai PLI.
3. Penilaian dilakukan secara menyeluruh dalam arti harus dipisah menurut isi laporan.
Pelaksanaan: skor atau biji nilai diperoleh dari pengisian kolom *range penilaian* berikut:

ASPEK YANG DINILAI	RANGE PENILAIAN					
	Mengu lang <65	Cukup Baik (65-69)	Baik (70-74)	Baik Sekali (75-79)	Sangat Baik Sekali (80-84)	Dengan Pujian (85-100)
1. Penggunaan Kaidah penulisan karya ilmiah di dalam Bahasa Indonesia					80	
2. Kemampuan menyerap dan menginterpretasikan informasi ide petunjuk yang diberikan oleh dosen pembimbing						85
3. Kemampuan mengemukakan dan mempertahankan ide secara sistematis selama melakukan konsultasi laporan PLI dengan dosen pembimbing						85
4. Kemampuan menentukan sendiri kejanggalan yang terdapat pada tulisan (isi laporan)					80	
5. Inisiatif mengemukakan dan melengkapi data/informasi yang diperlukan						85
Jumlah Skor	=	=	=	=	=	=
Total Skor (jumlahkan semua Jumlah Skor) =						

BIJI NILAI Dosen Pembimbing = $\frac{\text{Total Skor } 415}{5} = 83$

Padang, 2020
 Dosen pembimbing

- Catatan:
1. Isilah kolom penilaian dalam bentuk angka sesuai Dengan *range penilaian*
 2. Lembaran penilaian ini harus diserahkan ke kantor Unit hubungan Industri (UHI) bersama laporan Akhir PLI (sesudah diisi oleh dosen pembimbing)

(Izzal M. Kes.)
 NIP. 0610814 199103 1 004

CATATAN KONSULTASI LAPORAN DENGAN DOSEN PEMBIMBING

Nama Mahasiswa..... AGUNG AGATHA DAMANIK
 Jurusan/NIM/TM..... TEKNIK MESIN / 19067005 / 2014
 Tempat PLI/PKN..... DT. PLN Teluk Sirih

Tanggal	Topik/Masalah yang dibahas	Saran Perbaikan	Paraf Dosen Pembimbing
20 17 20	Kata Pengantar	revisi	
25 17 20	Hal. & Penomoran	Perbaiki	
28 17 20	Hal. Pengantar	Perbaiki	
	Paftar Pustaka	Perbaiki	
4 18 20	Buwing		

Diketahui oleh:
Dosen Pembimbing

(.....Dr. Izzal. M. Kes......)
 NIP. 19610814 1003 1004

LEMBARAN PENILAIAN SUPERVISOR INDUSTRI

Nama Mahasiswa : AGUNG AGATHA DAMANT NIM. 1406203
 Nama Perusahaan/Industri : PT. PLN (PERSERO) SEKTOR PEMBANGKIT TELUK SUEH
 Jadwal Kegiatan : 06 SEP sampai 19 OKT 2019
 Nama Supervisor : RIZKY PUTRA
 Jabatan Supervisor di Perusahaan : SUPERVISOR Es. TIKOR

ASPEK YANG DINILAI	RANGE PENILAIAN					
	Mengu- jung (65)	Cukup Baik (65-69)	Baik (70- 74)	Baik Sekali (75-79)	Sangat Baik Sekali (80-84)	Dengan Pujian (85-100)
1. Penguasaan ilmu bidang studi (teori) penunjang praktek.				78		
2. Keterampilan membaca gambar kerja/petunjuk dan sejenisnya.				77		
3. Keterampilan menggunakan alat atau instrumen yang dipakai dalam praktek.					80	
4. Kapasitas hasil praktek dalam jangka waktu yang disediakan.					80	
5. Kualitas hasil praktek dibandingkan dengan standar (tolok ukur) yang ditetapkan.					80	
6. Kemampuan berpraktek secara mandiri.					80	
7. Inisiatif untuk meningkatkan hasil praktek.					80	
8. Inisiatif untuk menyelesaikan atau mengatasi masalah yang ditemui.				78		
9. Kerja sama dengan orang lain selama melaksanakan praktek.					80	
10. Disiplin dan kehadiran di tempat praktek.					80	
11. Sikap terhadap petunjuk, kritik, atau anjuran dari pembimbing praktek.					80	
12. Pelaksanaan program keselamatan kerja bagi diri sendiri dan orang lain.						85
13. Pemeliharaan keselamatan alat, bahan dan lingkungan tempat praktek.						85
14. Kewajaran penampilan dan berpakaian ditempat praktek.						85
15. Adaptasi dengan situasi dan kondisi di tempat praktek.						85
Jumlah Skor	=	=	=	=	=	=
Total skor (jumlahkan semua Jumlah Skor) = 1213						

NILAI Akhir = $\frac{\text{Total Skor}}{15} = \frac{1213}{15} = 80,8$

- Rekomendasi: Untuk bisa berhasil atau lebih berhasil dalam praktek, mahasiswa ini memperhatikan (cantumkan tanda ✓)
- () bimbingan yang lebih intensif
 - (✓) penempatan dan penunjang (teori)
 - () pemberian waktu praktik yang lebih lama
 - () pembinaan sikap dan disiplin yang lebih positif

Catatan:
Isilah kolom penilaian dalam bentuk angka sesuai dengan range penilaian.

