50 MW PEAKING POWER PLANT BANGLADESH POWER DEVELOPMENT BOARD

A Thesis Submitted In Partial Fulfillment of Requirements for the Award

Degree of

Bachelors of Science in Electrical and Electronics engineering

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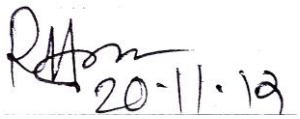
CERTIFICATION

This is to guarantee that this undertaking and proposal entitled "**OUTLINE OF 50 MW SANTAHAR PEAKING POWER PLANT"** is finished by the accompanying understudy under my immediate supervision and this work has been completed by him in the research centers of the Department of Electrical and Electronic Engineering under the Faculty of Engineering of Daffodil International University in fractional satisfaction of the prerequisites for the level of Bachelor of Science in Electrical and Electronic Engineering. The introduction of the work was hung on August 2019.

Countersignature



Professor Dr. M. Shamsul Alam

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DEDICATED TO

OUR BELOVED PARENTS

ABSTRACT

Bangladesh Power Development Board (BPDB) is a statutory body created in May 1, 1972 by Presidential Order No. 59 after bifurcation of erstwhile Bangladesh Water and Power Development Authority. BPDB had started its operation with generation capacity of only 500 MW. In its 56 years' service, the installed capacity of the country increased to 15,953 MW at the end of the FY 2017-2018. During our internship within the Bangladesh power development board, we tend to worked on the generation and distribution of power within the sensible field. Here we tend to worked as a team and was concerned within the generator section, electrical device section, turbine, station and room. All told of those sections, we tend to were incontestable however these systems work and what protecting measures area unit taken for them. The on-duty engineer showed United States however every of the units works (as a whole) with correct synchronization of the gas booster, combustion chamber, and rotary engine. Then the generated power is transmitted through station to grid by varied change of magnitude and change of magnitude transformers. We tend to ought to learn the importance of protection and switchgear system for the plant and the way do they work. In the end, the full office was a correct combination of our theoretical and sensible information which is able to facilitate and guide United States to manage real-life issues within the power sector.

ACKNOWLEDGEMENT

Firstly, we express appreciation to omnipotent Allah from the base of our souls. We might want to offer our true thanks to our good manager, Mr. K. B. M. Rakib Hasan**,** Department of Electrical and Electronic Engineering, DIU who enlivened us in each minute. We are appreciative to him for his persistent consolation, kind co-activity, and academic direction up and down the task work. He has consistently been incredibly liberal with his time, information and thoughts and permitted us the extraordinary opportunity in this exploration. We likewise need to pass on our gratefulness to Prof. Dr. Md Shamsul Alam Dean, Department of Electrical and Electronic Engineering for his assistance, backing and consistent consolation. We offer our unassuming thanks to all educators of the Department of Electrical and Electronic Engineering for their help from numerous points of view all through this task work. We are additionally thankful to the writers whose important research papers and books we have considered as the reference in this venture paper. Aside from that, we might want to thank our whole companions for sharing learning; data and helping us in making this venture a triumph. Additionally much obliged for loaning us a few devices and gear. At long last, we might want to thank our folks who have given us colossal motivations and supports. Without their psychological and money related to backings, we would not ready to finish our undertaking.

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INDEX

LIST OF ABBREVIATION

EHV -Extra High Voltage

SLD -Single line Diagram

PT -Potential Transformer

CT -Current Transformer

HVCT -High Voltage CT

LVCT -Low Voltage CT

CVT -Capacitor Voltage Transformer

LA -Lightening Arrestors

ES -Earth Switching

CB -circuit Breaker

HV side -High Voltage Side

LV side -Low Voltage Side

PLCC -Power Line Carrier Communication

OLTC -On Load Tap Changer

HG Fuse -Horn Gap Ruse

OTT -Oil Temperature Indicator

WTI -Winding Temperature Indicator

IDMT Characteristics - Inverse Definite Minimum Time Characteristics

LIST OF SYMBOLS

X0 – Zero sequence reactance

X1- Positive sequence reactance

R0- Zero sequence resistance

Ip – Primary current

Np – Primary Winding Turns

Is – Secondary Current

Ns – Secondary Winding Turns

Vp – Primary voltage

Vs – Secondary voltage

Zs – Impedance attached at the secondary side coil

CHAPTER 1

INTRODUCTION

1.1 Introduction

As a part of completion of our under graduation degree we have to choose one between one project thesis and intern. We choose intern and we had the opportunity to do in Bangladesh power development board (BPDB). We worked in BPDB as our intern after completion of our theoretical course. The details work of what exactly we did is clearly described in our report'

Figure 1.1: power plant

1.2: Company Profile

Company name: Bangladesh power development board

Head office: Dhaka

Date of start:

Power plant type: Oil fuel

Total capacity: 50 MW

Address: Santahar, Rajshahi Division

1.3: Objective of the Internship

The first objective is to complete the EEE500 course that is a vital a part of finishing a Bachelor in EEE at DIU. Before doing this place we tend to had solely theoretical data on these topics but on completion of associate place in Santahar we've attained sensible data too. The following list summarizes our place goals.

* Standing Understanding official management
* Getting sensible data concerning the ability Distribution System.
* Getting sensible data concerning varied protection.
* Getting data concerning safety

1.4: Scope

This report relies on the office program wherever we tend to reviewed the fundamental method of power plant and its whole process. In BDB, as an intern, we had the opportunity to visit and gather practical knowledge on a Gas turbine, Gas booster compressor, Instrument air compressor, Water treatment plant, and Switchgear, Power plant and Control room of the plant. This was a great scope for all of us to relate all our theoretical knowledge with practical knowledge and to realize how a power plant runs by all these important sections.

1.5 Methodology

We have designed our report chiefly in 5 major components. They're Generation, Protection and Switchgear, Testing & Maintenance, Substation, management & Backup System. And thenceforth, these sections are divided into subsections as of these sections would like multiple things to be delineated so as to urge an entire plan regarding the operation and maintenance of the plant

1.6 Vision and Mission

Vision

To delivered uninterrupted power quality to all

Mission

To secure continuous growth of electricity for sustainable development and ensure customer satisfaction

CHAPTER 2

OVERVIEW OF BPDB

2.1 Background

The continuous dynamic method of the ability sector Bangladesh power development board was started in 1972 once this sector was the responsibility of the Bangladesh Power Development Board (BPDB). Later once many changes and subdivisions of such a exigent and huge sector into rural and concrete areas, the distribution of electricity in Dacca town was given upon Dacca electrical provide Authority (DESA) in 1991. Progressing to the event of one vendee market model ever since the mid-1990s, the govt allowed a great deal of necessary changes that has evolved many freelance power-producing entities within the market. Therefore ranging from power generation to transmission and distribution, the total operational responsibility antecedently unwearied upon BPDB has been decentralized among all fresh fashioned power generating business units like Electricity Generation Company People's Republic of Bangladesh (BPDB) Ltd.

2.2 Load factor and Load Management

Demand of electricity within the system varies throughout the day and night. The most demand is occurred throughout five pm to eleven pm that is termed as ‘peak hour’ and different a part of the time is termed as off-season hour. The extent of this variation is measured in terms of ratio, that is that the quantitative relation of average and most demand. For economic reasons, it's fascinating to own a better ratio, as this could allow higher utilization of plant capability. Moreover, the price of energy provide throughout peak hour is higher, as a result of some comparatively costlier power plants are needed to place operative throughout the height hour. For these reasons, load management is crucial throughout the year for higher capability utilization of power plants and minimum generation price.

2.3 Generation

Total put in capability was fifteen, 953 MW which incorporates four, 552 MW IPP/SIPP, 1755 MW Rental station & 251 MW in REB (for PBS) and 660MW Power Import from Bharat. The utmost peak generation was ten, 958 MW that was fifteen.60% higher than that

within the previous year. The explanations for the lower peak generation with reference to generation capability were:

(i) Some plants square measure out of operation for maintenance, rehabilitation & overhauling

(ii) Capability of some plants dated due to aging and

(iii) Gas shortage.

The Generation capability combine is shown below:

By type of plant		By type of fuel	
Hydro	230 MW (1%)	Gas	9,413 MW (61%)
Steam Turbine	2,404 MW (15%)	Furnace Oil	3,443 MW (22%)
Gas Turbine	1,322 MW (8%)	Diesel	1380 MW (6.49%)
Combined Cycle	5,730 MW (36%)	Power Import	660 MW (4%)
Power Import	660 MW (4%)	Hydro	230 MW (1%)
Reciprocating Engine	5,604 MW (35%)	Coal	524 MW (3%)
Solar PV	3 MW (0%)	Solar PV	3 MW (0%)
Total	**15,953 MW (100%)**	**Total**	**15,953 MW (100%)**

Figure 2.1 install capacity of plant and fuel type

2.4 install capacity by fuel type with comparison

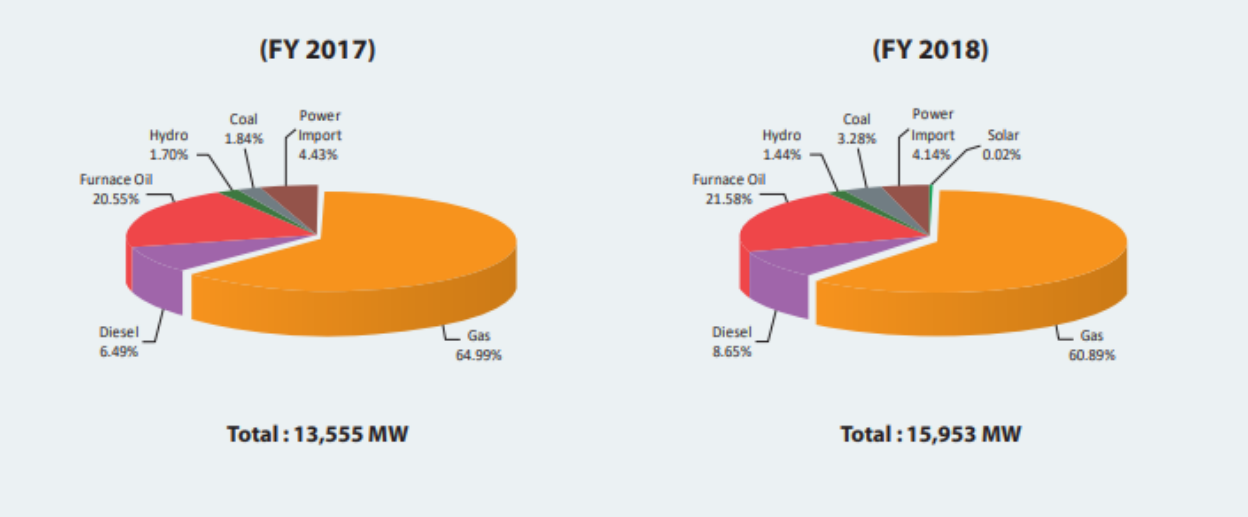

Figure 2.2 fuel type with comparison

2.5 Future plan of santahar power plant

To ensure uninterrupted power generation by recruiting mean and toughened men and increasing potency of the machine is that the final set up of BPDB. a really distinctive future set up of BPDB is to implement a company culture within the organization. If that may happen, BPDB are a middle of attraction for several professionals. BPDB additionally wish to strengthen their money position by earning most profit by giving the most effective services to their valued client.

2.6 Overview of generation of santahar 50MW power plant performance indicator (June 2019)

INFORMATION ON GENERATION FOR DETERMINING PERFORMANCE INDICATORS

Organization : Bangladesh Power Development Board | Power Station :Santahar 50 MW Peaking Power Station | Month : June/2019

Unit	Present Generation Capacity	Maximum Generation			Gross Generation	Net Generation	Gen. Cost/KWH	O&M Cost	Total Fuel Consumption	Cost per Unit (Fuel)	Total Fuel Cost (Including all cost)
	KW	KW	Date	Time	KWH	KWH	Tk.	Tk.	Liter	Tk./Ltr	Tk.
1	2	3	4	5	6	7	8	9	10	11	12
#01	8730	7800	03.06.19	20:00	544027	533867	10.73	0.00	Furnace Oil 1918185 Liter	Furnace Oil 42.70 Taka/Ltr	88106285.73
#02	8730	7700	03.06.19	21:00	1799840	1766228					
#03	8730	8000	03.06.19	21:00	1030088	1010851					
#04	8730	7700	24.06.19	10:00	1777960	1744757			Diesel 73000 Liter	Diesel 63.15 Taka/Ltr	
#05	8730	7300	03.06.19	19:00	1540440	1511673					
#06	8730	7000	03.06.19	21:00	1521930	1493508					

Heat Value	Forced Outage	Maintenance Outage	Reserve Outage	Remarks
Kcal/Kg	HRS	HRS	HRS	
13	14	15	16	17
9729	0.00	135.00	506	
	0.00	0.00	454	
	0.00	55.00	500	Average Efficiency Throughout the Month is 38.79%
	0.00	0.00	461	
	0.00	0.00	491	
	0.00	0.00	474	

Figure 2.3 performance indictor in generation of santahar 50mw power plant

2.7. Power station operation status (June 2019)

Name of Power Station: Santahar 50 MW Peaking Power Station **June/2019**

Unit	Capacity	Scheduled Outage	Forced Outage		Reserve Time	Operating Time	Forced Outage Rate (FOR)	Availability	
	MW	**Hrs**	**No.**	**Hrs**	**Hrs**	**Hrs**	**%**	**%**	720
#01.	8.73	135.00	0	0.0	506.00	79.00	0.00	81.25	720
#02.	8.73	0.00	0	0.0	454.00	266.00	0.00	100.00	720
#03.	8.73	55.00	0	0.0	500.00	165.00	0.00	92.36	720
#04.	8.73	0.00	0	0.0	461.00	259.00	0.00	100.00	720
#05.	8.73	0.00	0	0.0	491.00	229.00	0.00	100.00	720
#06.	8.73	0.00	0	0.0	474.00	246.00	0.00	100.00	720

$$\text{Forced Outage Rate (FOR) \%} = \frac{(\text{Forced Outage Hrs}) \times 100}{(\text{Operating Hrs} + \text{Forced Outage Hrs})}$$

$$\text{Availability \%} = \frac{(\text{Unit Hrs} - \text{Scheduled Outage}) \times (1\text{-FOR}) \times 100}{\text{Unit Hrs}}$$

Unit Hrs = Hours of the Month. = **720**

Figure 2.5 power station operation summarized of June

2.8 Santahar 50 MW peaking power station monthly maintenance of June

Monthly Maintenance Report(Engine wise)

Name of Reporting Month : June/2019

Name of the Power Plant	Unit No	Commissioning Date	Fuel Type	Installed Capacity (MW)	De rated/ Present Capacity (MW)	Last Major Overhaul Date	Last Maintenance Date	Next Maintenance Date	Shut Down		Generated Energy in Reporting Month(kWh)	Plant Factor in Reporting Month	Remarks
									Duration	Reason			
Santahar 50MW Peaking Power Plant, BPDB, Bogra.	01	30/11/2012	Furnace Oil(FO)	8.73	8.73		09.12.15				544027	8.66%	
	02	30/11/2012	Furnace Oil(FO)	8.73	8.73		16.12.15				1799840	28.63%	
	03	30/11/2012	Furnace Oil(FO)	8.73	8.73		21.12.15				1030088	16.39%	
	04	30/11/2012	Furnace Oil(FO)	8.73	8.73		28.12.15				1777960	28.29%	
	05	30/11/2012	Furnace Oil(FO)	8.73	8.73		07.01.16				1540440	24.51%	
	06	30/11/2012	Furnace Oil(FO)	8.73	8.73		02.01.16				1521930	24.21%	

Figure 2.5 monthly maintenance report of June

CHAPTER 3

FUEL POWER PLANT

3.1 Introduction

Station may be a thermal station that burns a fuel, like coal or gas, to supply electricity. Fuel power stations have the machinery to convert energy into combustion into energy that then operates as associate degree electrical generator. The premium mobile is also a turbine, a turbine or, in little plants, a mutual internal-combustion engine. All plants use the energy extracted from increasing gas, either steam or combustion gases. Though completely different energy conversion ways exist, all thermal station conversion ways have restricted potency by the Carnot potency and thus manufacture waste heat. Fossil fuel power stations give most of the power utilized in the globe. Some fossil-fired power stations square measure designed for continuous operation as base load power plants, whereas others square measure used as peaker plants. However, from the beginning of the 2010s, several countries square measure operational the base load for plants designed to work as a dispatch able generation to balance generation by variable renewable energy.

3.1.1 Main system of Santahar Fuel power plant

Figure 3.1 Main system of santahar fuel power plant

3.2 Types of fuel power plant

- Steam
- Gas turbine and combined
- Reciprocating engine

3.3 Types of fuel

- Coal
- Natural gas
- Oil

3.3.1 Coal

Coal is that the most plethoric fuel on the earth, and wide used because the supply of energy in thermal power stations and may be a comparatively low cost fuel. Coal is AN impure fuel and produces a lot of gas and pollution than the same quantity of crude or gas. for example, the operation of a 1000-MWe coal-fired powerhouse leads to a nuclear radiation dose of 590 person-rem/year, compared to 136 person-rem/year, for the same nuclear energy plant together with U mining, reactor operation and waste disposal

3.3.2 Natural gas

Gas could be a quite common fuel and has principally replaced coal in countries wherever gas was found within the late twentieth century or early twenty first century, like the U.S.A. and United Kingdom. Typically coal-fired steam plants square measure refitted to use gas to scale back internet CO2 emissions. Oil-fuelled plants could also be reborn to gas to lower budget items.

3.3.3 Oil fuel

Heavy oil was once a big supply of energy for wattage generation. When oil value will increase of the Nineteen Seventies, oil was displaced by coal and later fossil fuel. Liquid oil remains vital because the fuel supply for diesel motor power plants used particularly in isolated communities not interconnected to a grid. Liquid fuels can also be employed by turbine power plants, particularly for peaking or emergency service. Of the 3 fuel sources, oil has the benefits of easier transportation and handling than solid coal, and easier on-site storage than fossil fuel.

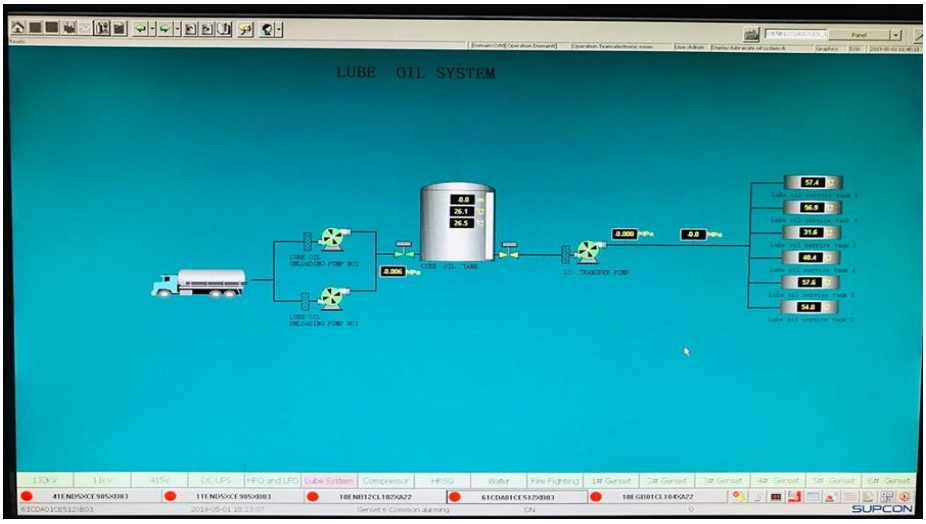

Figure 3.2 lube oil system of santahar power plant

3.4 Difference between Nuclear and fuel power plant

Nuclear and fossil fuel-burning power plants disagree principally in wherever their energy comes from; a setup produces heat from hot metals, and a fossil-fuel plant burns coal, oil or gas. Additionally to the technical variations between the 2 approaches, they have an effect on the atmosphere differently: Fossil-fuel plants area unit ill-famed for greenhouse emission emissions, whereas nuclear reactors area unit legendary for radioactive material, which may stay venturous for thousands of years.

3.5 How does power plant work with its major component?

Fuel: The energy that finds its means into your TV, computer, or toaster starts off as fuel loaded into an influence plant. Some power plants run on coal, whereas others use oil, gas, or methane series gas from moldering rubbish.

Figure 3.3 used fuel in power plant

Furnace: the fuel is burned in a giant furnace to release heat energy

Boiler: A boiler is a closed vessel in which water is converted into steam by utilizing the heat of coal combustion. Heat from the furnace flows around pipes full of cold water. The heat boils the water and turns it into steam

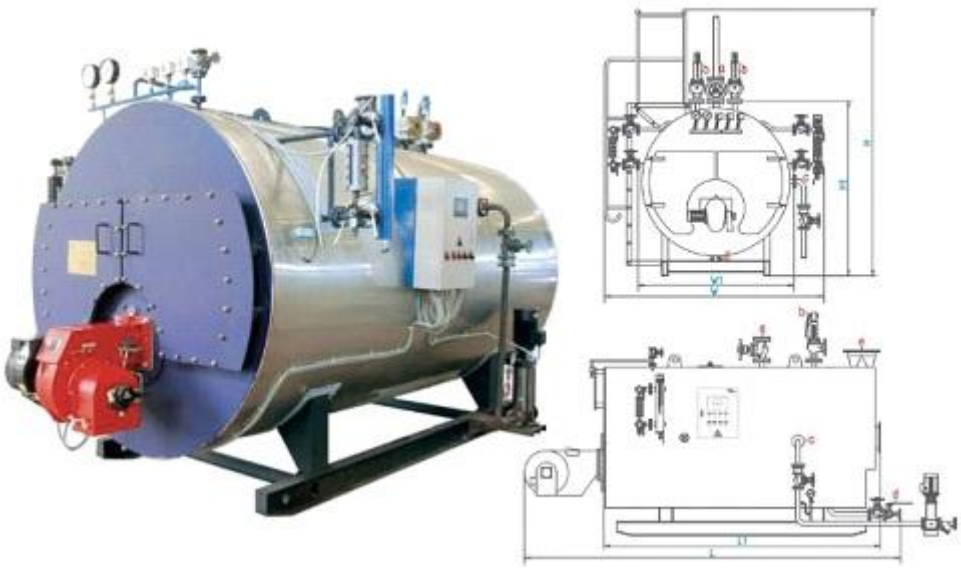

Figure 3.4 steam boiler model of power plant

Turbine: the flow of steam at higher-force around a wheel that's bit likely a wind power mil made of tightly packed metal blades of metal. When the blades start rotating as the steam flows past known as a steam turbine .this is made to convert the steam energy to kinetic energy. Turbine work efficiently when heat entered into it at the higher pressure and temperature and out at lower temperature and pressure as the turbine designed.

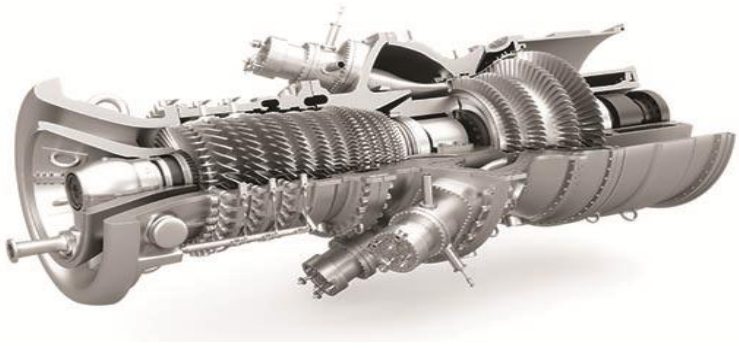

Figure 3.5 model of gas and steam turbine used in power plant

Cooling tower: the enormous, jug-shaped cooling towers you see at recent power plants create the rotary engine additional economical. Boiling quandary from the turbine is cooled during a device known as a condenser. Then it's sprayed into the enormous cooling towers

and tense back for apply. Most of the water condenses on the walls of the towers and drips back off once more. Solely a tiny low quantity of the water used escapes as steam from the towers themselves, however large amounts of warmth and energy square measure lost.

Generator: The rotary engine is coupled by associate shaft to a generator, therefore the generator spins around with the rotary engine blades. Because it spins, the generator uses the K.E. from the rotary engine to create electricity.

Figure 3.6 high power diesel generator model

Electricity cables: The electricity travels out of the generator to a electrical device close.

Step-up transformer: Electricity loses a number of its energy because it travels down wire cables, however high-voltage electricity loses less energy than low-tension electricity. Therefore the electricity generated within the plant is stepped-up (boosted) to a awfully high voltage because it leaves the facility plant.

Figure 3.7 transformer used in power plant

Pylons: Hugh metal towers carry electricity at extraordinarily high voltages, on overhead cables, to where it's required.

Step-down transformer: Once the electricity reaches its destination, another electrical device converts the electricity back to a lower voltage safe for homes to use.

Homes: Electricity flows into homes through underground cables.

Appliances: Electricity flows all spherical your home to retailers on the wall. After you enter a tv or alternative appliance, it may be creating a awfully indirect affiliation to a bit of coal many miles away!

3.6 Some working pictures of santahar power plant control room

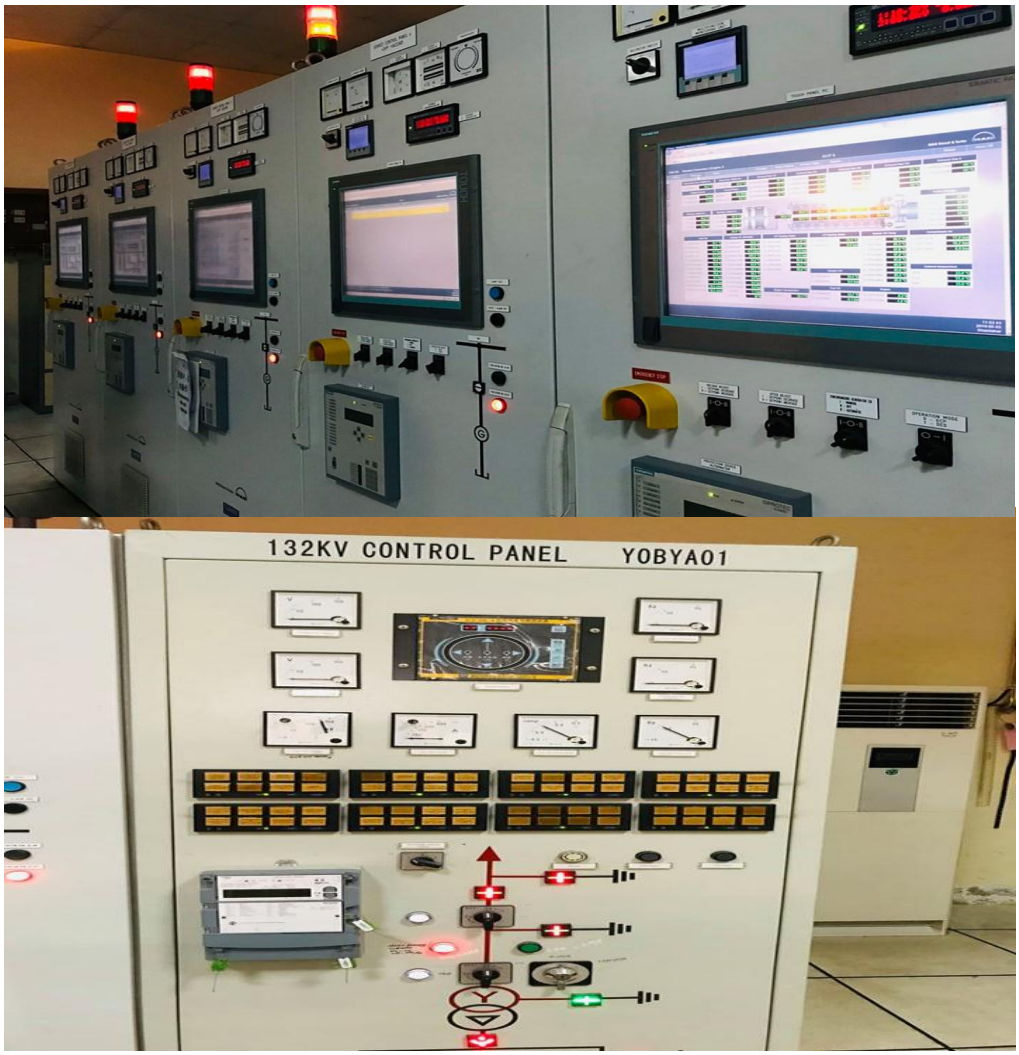

Figure 3.7.1: 132kv control panel

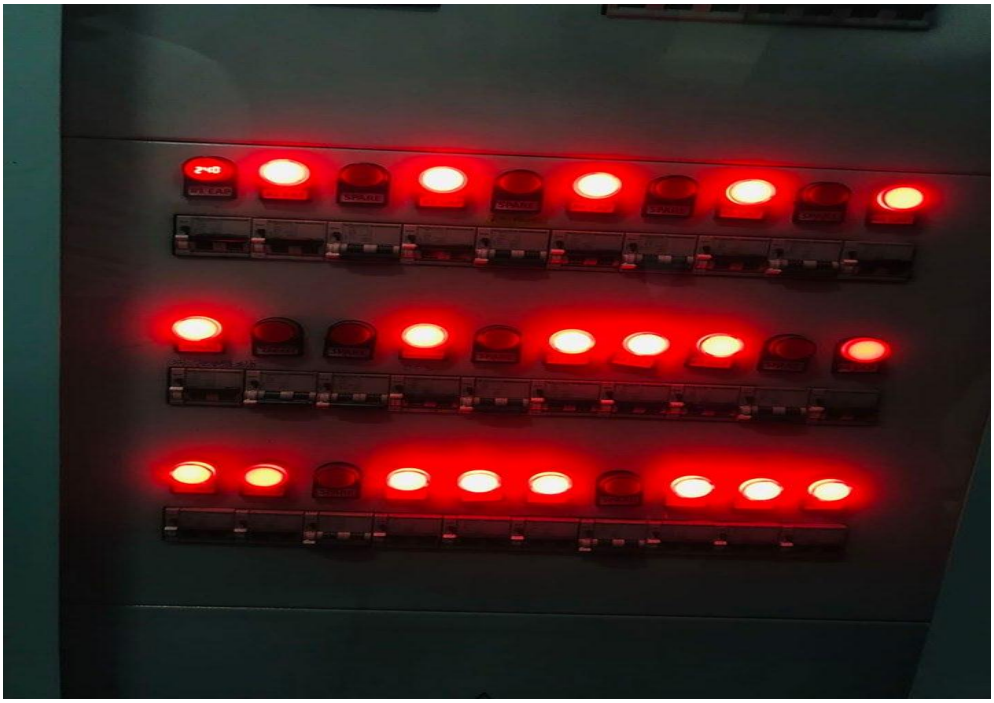

Figure 3.8 Intern time working picture

CHAPTER 4

DISTRIBUTION SYSTEM

4.1 Distribution Transformer

A distribution transformer or service transformer could be an electrical transformer that gives a definitive voltage change inside the power dissemination framework, venturing down the voltage used in the conveyance lines to the degree used by the customer.

Figure 4.1: Distribution Transformer

4.2 Uses of Distribution Transformer

Distribution transformer is AN electrical device that's accustomed hold electric power from an essential dissemination circuit to an optional dispersion circuit. Voltage is acknowledged through dissemination transformers to minor high voltage level on circulation position all the way down to endues levels. This will even be accustomed transfer current among a secondary distribution circuit or to the service circuit.

4.3 Fitting of Distribution System

Electric power appropriation transformer is utilized in the last stage in the conveyance of electric power, its conveys power from the transmission framework to singular buyers

Figure 4.2: Fitting Of Distribution System

4.4 MAIN ELEMENTS OF OVERHEAD LINES

An overhead line is additionally wont to transmit or appropriate electrical power. Though building partner overhead line, it should be guaranteed that mechanical quality of the street is such along these lines on give against the premier likely climatic condition. When all is said in done, the most components of partner overhead line are given beneath:

- Conductors
- Supports
- Insulators
- Cross arms
- Miscellaneous things

4.4.1 Conductor

An electrical channel might be a substance during which electrical charge transporters, once in a while electrons, move effectively from iota to particle with the applying of voltage. Copper, steel, gold, aluminum, and metal are likewise reasonable transmitters.

4.4.2 Pole

The supporting structures for overhead line conductors are various sorts of shafts and towers called line bolsters. By and large, the street bolsters should have the consequent properties:

- High mechanical quality
- Lightweight in weight while not the loss of mechanical quality.
- price in expense
- Economical to keep up.
- Longer life.
- Straightforward availability of conductors for upkeep.

Figure 4.3: Pole of the System

4.4.3 Types of pole

The line supports utilized for transmission and dissemination of the electric power are of different sorts these are

- Wooden posts
- Steel posts
- SPC posts
- Lattice steel towers
- The decision of supporting structure for a specific case relies on the line range x-sectional territory, line voltage, and cost and nearby conditions.

4.5 Insulator

The overhead line conducts should be supported on the poles or tower in such way that current from conducts do not flow to earth through supports such as line conducts must be properly insulated from supports. In general, the insulator should have the follows desirable properties

* High mechanical strength
* High electric resistance of insulator material
* High relative permeability of insulator material
* The insulator should be non-porous, free from impurities and cracks otherwise the permeability will be lowered
* High ratio of puncture strength to flashover

4.5.1 Types of Insulator

The most commonly used insulators are given below

* Pin type insulators
* Suspension type insulators
* Strain insulators
* Shackle insulator

4.5.1.1 Pin Sort Insulator

The pin sort insulator is secured to the cross arm on the pole. There's a grove on the higher finish of the nonconductor for housing conductor. Pin sort insulators area unit used for the transmission and distribution of electrical power at voltages up to 33KV.

Figure 4.4 pin type insulator

4.5.1.2 Suspension Sort Insulator

The cost of the pin sort nonconductor will increase chop-chop because the operating voltage is magnified. Therefore, this type of insulators isn't economical on the far side 33KV. for prime voltage (>33KV), it's a usual practice to use suspension sort dielectric.

Figure 4.5 suspension type insulator

4.5.1.3 Strain Insulator

When there is a dead end of the line or there is a correct or shape curve, the line is subjected to Greater tension. For the low voltage (<11KV) shackle insulator is used as strain insulator.

Figure 4.6: Strain Insulator

4.5.1.5 Shackle Insulator

In the period of time, the shackle insulators were used as strain insulators. However these days they're oftentimes used for low voltage distributions lines. Such stuff are often used either during a horizontal position or during a vertical position.

Figure 4.7 Shackle type insulator

4.6 Instrument Transformer

For activity high voltage, low vary meter is employed with a high resistance connected serial with them. However it's not convenient to use these ways with AC and voltage instruments. For these functions, specially made correct magnitude relation instrument transformers are employed in conjunction with commonplace low vary A.C instruments.

4.6.1 Styles of Instrument Transformer

* Potential electrical device
* Current electrical device

4.7 Repaid

In each plant, there ar innumerable components that require to be tested on a routine basis. Moreover, electrical components have to be compelled to be repaired properly so as to create lasted for an extended time. So, there are bound testing and maintenance procedures that we have a tendency to were told regarding.

A brief discussion of them is in below

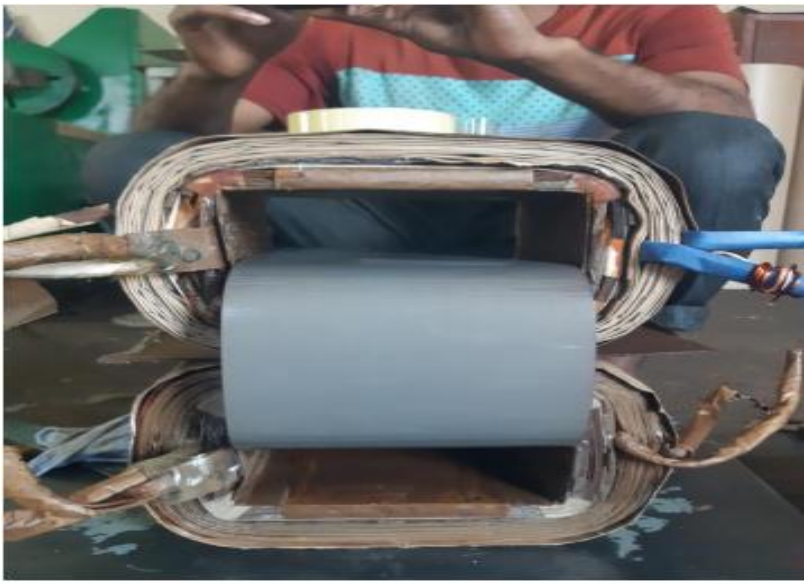

Figure 4.8: Transformer repairing in workshop

4.8 Heating Chamber of Transformer

The transformer warming and drying framework comprise of 2 drying/oil filling vacuum chambers. These chambers can be worked either physically through touch screens provided by the maker, or remotely from the PC. Each chamber comprises of 3 stations for transformers. An I2R framework is added to these chambers so as to diminish process duration by utilizing electric capacity to warm transformers to target vacuum and oil filling temperatures. The I2R comprises of three autonomous sub-frameworks that can be associated with either chamber. The I2R frameworks named System1, System2, System3 is appraised for units up to 5MVA and thusly will sustain station 1/2/3 of either chambers.

Figure 4.9: Heating Chamber of Transformer

4.9 Feeder

In power building, a feeder line is a piece of an electric circulation arrange, normally a spiral circuit of middle of the road voltage. The idea of feeder lines is additionally significant in open transportation

Figure 4.10: Feeding system of transformer in sub-station

CHAPTER 5

PROTECTION SYSTEM AND SWITCHGEAR

5.1 Introduction

Power plant protection is a branch of electrical power producing industries that deal with the electrical power system from different fault in electrical network. Power plant and Substations regularly have exchanging, assurance and control instrumentation and one or plenty of transformers. In a monster station, circuit breakers are won't interfere with any short-circuits or over-burden flows which will happen on the system. Littler circulation stations may utilize reclose circuit breakers or wires for the insurance of dispersion circuits. Substations don't once in a while have generators, however, an impact plant may have a station close. Various gadgets like power issue revision capacitors and voltage controllers can likewise be settled at a station.

5.2 Types of protection

- High voltage transmission network
- Generator sets
- Overload and backup for distance (overcurrent)
- Earth fault/ground fault
- Distance impedance relay
- Back-up
- Low-voltage networks
- Cyber security and so on.
- Fire safety measures
- Reverse power protection

5.3 High voltage transmission network protection

Protection on transmission line and distribution system serves two functions. Protection and power plant or substation protection of the public. At a basic level protection disconnects equipment which experiences and overload or a short to earth some items of substation such as might require additional protection based their functional requirement

5.4 Generator sets

In a power plant, the protective relays are intended to prevent damage to alternators or the transformers in case of abnormal conditions of operation, due to internal failures as well as insulating failures or regulation malfunctions. Such failures are unusual, so the protective relays have to operate very rarely. If a protective relay fails to detect a fault, the resulting damage to the alternator or the transformer might requires costly equipment's repairs or replacements.

5.6 Overload and back-up system (overcurrent)

In the power section overload protection is major concern requires a current transformer which simply measures the current in a circuit there are two types of overload protection instantaneous overcurrent and time overcurrent. Instantaneous overcurrent requires that the current exceeds a predetermined level for the circuit breaker to operate. Time overcurrent protection operates base on a current on current vs time curve. If the measured current exceeds the preset amount of time the circuit breaker or fuse will operate

5.7 Distance (impedance relay)

Distance protection detects by both current and voltage. A fault on a circuit will generally create a sag in the voltage level if the ratio of current to voltage calculate at the terminal of relays. Which equal to an impedance, land within a predetermined level of circuit breaker will operate. This is useful for reasonably long lines .longer lines then 10 miles. Because base on their line character they are operates .if the relay setting is determined to be below the apparent impedance it is determined that the fault is within the zone of protection. When the line of transmission is too short or less than 10 miles.

5.8 Reverse power protection

Our intern authority introduced us to a brand new sort of protection for the generator referred to as Reverse Power Protection. This is often really a protection for the cause of the generator instead of for the complete generator. It describes a condition wherever the cause of a generator isn't provisioned spare force to stay the generator rotor spinning at constant frequency because the grid to that the generator is connected. In different words, the generator can really become a motor and can draw current from the grid and can be provision force to the cause that is meant to be provision force to the generator. Thence a protection relay is about up by EGCB inside the generator cause

5.9 Fire safety measure

During our operating amount in santahar, we have a tendency to earn a full day coaching session concerning fireplace. In BPDB, there's area district regional locality vicinity a part wherever giant cylinders containing Carbon-Di-Oxide gas area unit set that are created interconnected by pipes with all internal sections as within the Combustion chamber, Gas booster etc. The capability of greenhouse gas in these cylinders at BPDB is 6000 kilo per tank. They're programmed specified wherever ever any burning or combustion happens internally within the system; greenhouse gas directly reaches there and handles true mechanically. For that, there are a unit sensors used everyplace within the system, of course, to seek out out any combustion. Aside from that, routine workshop is control for the staff and stuffs to stay them aware and cautious concerning dealing fireplace. Figure 4.1 shows the compartment wherever the big greenhouse gas cylinders area unit created connected. This compartment branches out and expands to numerous sections of the plant wherever there's a necessity for fireplace safety. It's to say that these cylinders area unit modified on a routine basis as they have to be refilled

5.10 Circuit Breaker

A breaker is a mechanically operated control designed to safeguard AN electrical circuit from harm caused by overload or contact. Its basic operate is to detect a fault condition and to right away discontinue electrical flow. Not like a fuse, which operates once then has got to get replaced, a fuse is reset to resume traditional operation. The circuit breakers that are ordinarily employed in totally different sections of the plant are as follows,

- SF6 fuse
- Air Blast fuse (ABCB)
- Vacuum circuit breaker
- Miniature fuse (MCB)
- molded Case fuse (MCCB)

5.11 SF6 CIRCUIT BREAKER

The electrical switch is one of the most significant units in the electrical power framework. The insurance, solidness and coherence of the framework rely upon the circuit breakers capacity to switch line, load and energizing flows and to intrude on flaw flows. The SF6 gas

electrical switch guarantees the elevated level of execution required for the dependable activity of the electrical framework by utilizing the incredibly great electrical protecting trademark and amazing circular segment extinguishing properties of sulfur hexafluoride (SF6) gas. The unwavering quality of the framework is additionally expanded by the utilization of a SF6 gas protecting framework and a solitary weight double stream SF6 gas puffer interrupter which diminishes the quantity of moving chamber and assistant frameworks in the circuit breakers. The pressure required to blast the SF6gas against the arc and the interrupt the current is generated by the compression of the gas between the moving cylinder and the stationary position of the interrupter during the opening operation

5.12 VACUUM CIRCUIT BREAKER

In such breakers, vacuum is utilized as the circular segment extinguishing medium. Since vacuum offers the most elevated protecting quality, it has far unrivaled curve extinguishing properties than some other medium. For instance, when the contacts of the breaker are opened in vacuum, the interference happens from the outset zero flow with dielectric quality between the contacts working up at the rate a large number of times higher than that got with other circuit breakers.

5.13 Air break circuit breaker

In BPDB we tend to saw each Air Break electrical fuse and Air Blast electrical fuse that has been utilized in bus bar and motor feeders and its rated voltage is four hundred V AC and 230 V AC severally. It’s been principally used here for its quick operation truly. These circuit breakers have panels that square measure put in in switchgear panel space of BPDB. Thus once these circuit breakers square measure tripped, light-weight glints in those panels that indicate that the breaker is tripped. Figure 4.2 is that the apparent look of the breaker. It can't be created work outwardly except simply pull up the lever as we are able to see within the figure to trigger down the breaker manually just in case of any emergency want.

5.14 Different relays system protection

Even though several protection relays for generators and transformers have already been discussed previously but there were certain completely new relays that were shown to us in BPDB. Actually these are very familiar to power plant engineers but for us as an intern, these are totally new.

5.15 Lightning arrester

We have seen several lightning arresters be used close to power electrical device section in BPDB wherever they're wont to bypass current to the bottom once the high voltage or thunder strike happens.

In this chapter, the protection system in BPDB has been mentioned which incorporates protection against abnormalities in Generator, electrical device, cable, and rotary engine. These are the key elements that require to be protected all the time. All of those protections are mechanically programmed to trigger as per state of affairs and that them are controlled and monitored from the room. The fireplace Fighting and Safety procedure conjointly is additionally} mentioned that's a significant issue not just for the protection of plant however also for several lives. the various circuit breakers that are an imperative a part of the ability plant and relays of various sorts that are significantly utilized in BPDB has been mentioned and mentioned shortly yet. Therefore the protection system chapter ends here.

CHAPTER 6

CONCLUSION

6.1 Problems

In our internship program, we faced some problems. Those are as follows:

- During our internship one generator unit was turned off for low gas pressure. This is why we could not observe full load of the power station.
- The time of the internship was too short for which we could not learn all the sections thoroughly.
- Before the internship we did not have any academic knowledge about the mechanical section of the power plant, for which we faced some problems in our internship.

6.2 Recommendation

The length of the internship length ought to be enlarged. We expect the length ought to be spare for a minimum of 3 months.

- Students ought to complete powerhouse connected courses like powerhouse and switchgear before post.
- University authority ought to supply a minimum of one course associated with technology to grasp the mechanical elements of the facility station.
- Power station could be a high voltage space. therefore everybody ought to bear in mind of the precautions of powerhouse

6.3 Conclusion

Power sector could be a vital and sensitive issue for any country for its industrial therefore economic process. But, from the start Asian nation is facing varied issues in power sector. Among them the most downside is its inadequate generation of electricity. Day by day the demand is increasing however the generation of power isn't enlarged within the same manner. As a result, limitation is going on overtimes.

Through this place we tend to get the chance to figure as a member of an expert team that was concerned within the I&C (Instrumentation and Control) section, electrical section, mechanical section and therefore the maintenance section. The generation of electricity is one in every of the foremost advanced processes among of these sections. Electricity is generated when heaps of advanced steps then provided to the grid. We've got gathered some sensible expertise in generation of electricity. We tend to even have gained sensible information in dominant an outsized station from the room with the assistance of our superintendent engineers. With the expertise of this place we will relate the sensible understanding with the theoretical information of power generation. During this place we tend to even have encountered some real world issues in electricity generation. We tend to believe that, the sensible expertise that we've got gathered in Santahar can facilitate US in our business life

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