

OVERVIEW OF SGWICUS (BD) LTD AND ELECTRICAL DISTRIBUTION

This Thesis submitted to the division of Electrical and Electronics Engineering, "Daffodil International University" for the satisfaction of the level of Bachelor of Science in Electrical and Electronic Engineering (EEE).

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DECLARATION:

We hereby declare that this thesis result found by ourselves. The materials of work found by other researchers are mentioned by reference. This thesis is submitting to Daffodil International University for partial fruition of the requirement of the degree regarding Bachelor of Science in Electrical and Electronics Engineering. This thesis neither in whole nor in part has been previously submitted for any degree. This Thesis is completed under the observation of **Dr. Md. ShahidUllah**, Professor & Head, Daffodil International University and the report truly approved.

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I would like to thank almighty Allah for giving me the opportunity to complete the internship and prepare the internship report.

Really I am thankful for the management **SGwicus (BD) Ltd.** For providing the chance to accomplish industrial training in Dhaka Export Processing Zone (DEPZ) and I would like to thank that person also who help to me in the workplace by giving guidance and suggestions during my visiting periods.

Here impossible to avoid my supervisor Name :

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Especially thanks to him For Helping me to do this internship report under his supervision and guideline through by respectable **Mr. Md. AshrafulHaque.**

I would like to mention the name **Mr.Md.AshrafulHaque.**

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Abstract:

This chapter is going to regarding an industrial power system and Installation. In here I will show the power generating system and also will be explained how to work in various components and devices with a good distribution system and also a single line diagram.

More important things are here, you can learn some idle principle form these informative books which are collected from various Electrical standard books like how to install and what is the requirement of the installation and how to make a single line diagram.

For clarification and your better understanding herewith dropped some reference books such as BNBC, NEC and you have to follow so more which book will help to make an Electrical Engineer.

The power sector is an important part of a developing country. For industrial and economic development the power sector should be given top priority. Our country is trying to develop the power sector and increase the generation capability day by day and the most important part here is a single line diagram.

In the present day, we can't think a day without control. Bit by bit the enthusiasm for control is extending yet the period of power isn't growing such an extraordinary sum in Bangladesh. Like the same way we know, Bangladesh is a lead country for the garments to the other country and the entire person has good know that the garments factory needs a power station and in this chapter, I will explain about this power station, installation with single line diagram.

I did my internship at a privet industrial company which is staying at Dhaka EPZ. For my better learning, I have visited mores industrial factory and I have seen different types of the power plant and so much installation with proper SLD. My training duration was of 45days.

Hence I have visited more than one power plant and achieved a clear idea about power generation, control and maintenance processes. This report consists of a brief description of these processes, visits to the different power plants and the knowledge of various type experiences regarding different types of power stations with SLD. All of these steps will be described in my report.

The single-line diagram is the blueprint for electrical systems and analysis. It is the beginning step in preparing a critical response plan, accepting you to become thoroughly familiar with the electrical distribution system layout and design in your facility system

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Abbreviations

DB	Distribution Board
SLD	Single Line Diagram
SDB	Sub-Distribution Board
HT	High Tension

LT	Low tension
ACB	Air Circuit breaker
VCB	Vacuum Circuit Breaker
RMS	Root Mean Square
NFPA	National Fire Protection Association
NEC	National Electric Code
UV	Ultraviolet
WD	Wave-guide Dispersion
SRV	Safety relief valve

List of Symbols in books

λ	Wavelength
λ_B	Bragg wavelength
n_{eff}	Effective index
z	Position along the grating
n	Mode index
f	Fundamental Frequency
ω	Angular frequency
M	Modulation Index
T	Fundamental Time Period

CHAPTER-1

INTRODUCTION

1.1 Company Introduction

SGwicus (BD) Ltd. is one of the high-quality garments manufacturing company under category “A” as per BEPZA classification and duly incorporated in the “Joint stock companies of Bangladesh.

Its located at old DEPZ under Plot#73,77-80 Ganakbari,Savar,Dhaka-1349,Bangladesh .

1.2 Overview of Company

Electrical Department :

At SGwicus (BD) Ltd. have a separate Electrical section so there was a big chance to learn about Electrical and also a good thing is here, This Company Management is Korean so they are doing their all electrical work by following Electrical Standard under NEC, NFPA and so many standard books.

Substation:

There has an **11KV** Substation by using this substation total electrical system is running such as so many machines, Boiler, Motor, Light, Fan, etc.

There are two AVR, Three Transformer, Three LT and three PFI in the Substation room.

Generator:

This company is using Three (3) Generators as backup power for the whole electrical system and Both are synchronized with substation.

Boiler:

There are two boilers in that factory and this SAM HO MODEL: SHS-300 Horizontal smoke tube furnace boiler.

Dual fuel boiler which we called combination type boiler accepts the fuel GAS/OIL. The size of each boiler is 5.6 TON.

1.3 Objectives

The objectives of this internship are bellow

Some of the responsible people investigated me and keep me under observation in the internship periods such as the head of the human resource department and the head of compliance

Everywhere the responsible person gives me the introductions like how to apply for a new installation. How should make a design and drawing.

1.4 Scopes

Already I have mentioned in the overview of the company. From that passage, it's easy to understand there was a lot of chance to learn and explore. Cause there have a substation, Generator, Compressor, Boiler and so other.

CHAPTER-2

Single Line Diagram

2.1 Introduction of SLD :

A single line diagram (SLD) is the depiction of a ground-breaking system using the essential picture for each fragment of electrical. The single line diagram (SLD) of a power structure is the framework that will show the guideline affiliations and strategy of the system portions close by their data, (for instance, yield rating, voltage, current, restriction and reactance, and others.

It doesn't need to show all of the pieces of the structure on a single line diagram of the electrical wiring system. Circuit breakers need not have showed up in the pile stream study yet are they ought to for an affirmation study. In the single line diagram (SLD), the structure portion has regularly pulled in the sort of its pictures. Generator, Motor and transformer affiliations, star, delta and fair-minded earthing are appeared by pictures drawn by the side of the depiction of these parts.

2.2 Single line diagram figure

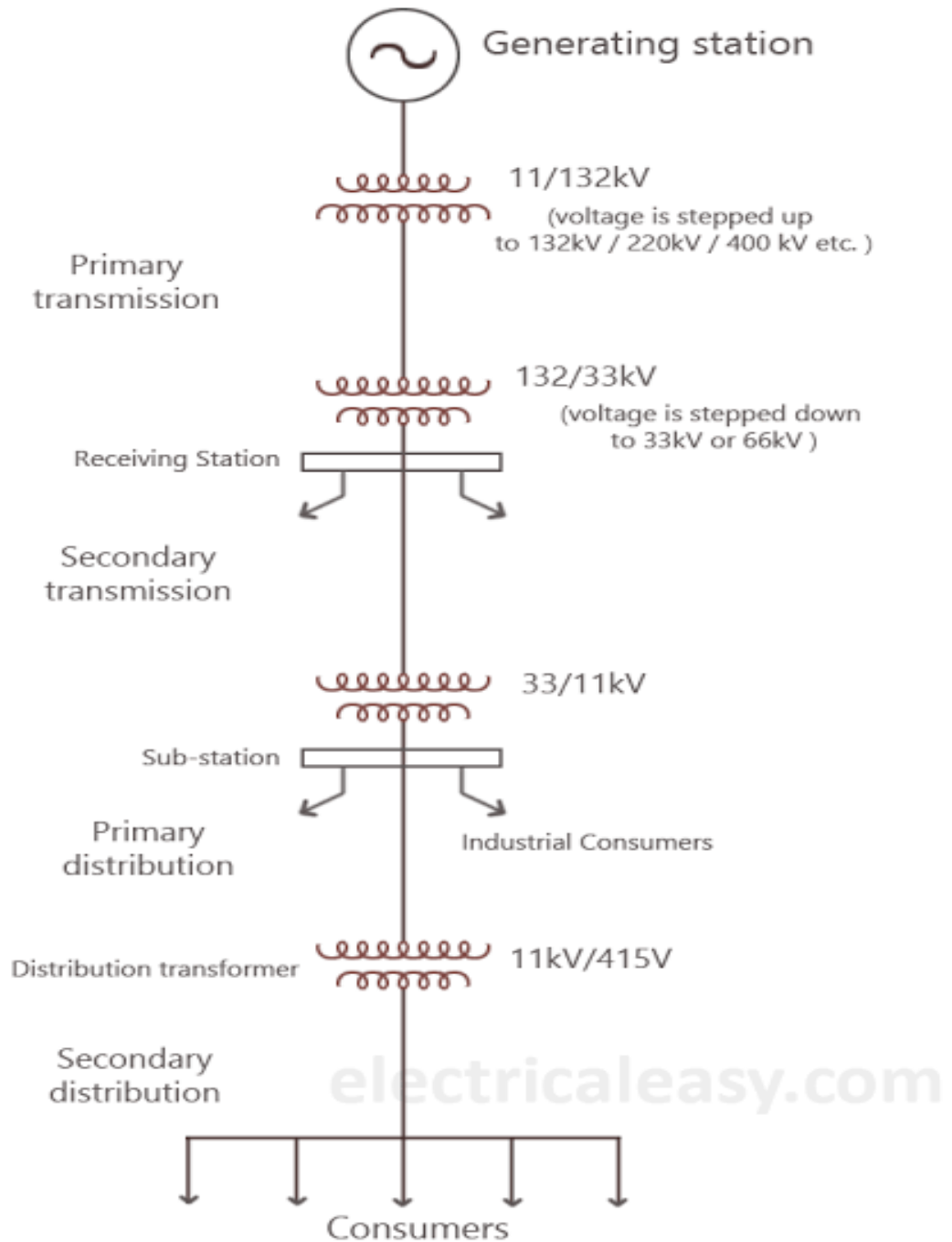


Fig. 2.1 Single line diagram for 11 kv substation

2.3 Explanation of SLD.

A single line diagram is the depiction of a ground-breaking system using a clear picture for each fragment. The single line layout of a power structure is the framework that shows the key affiliations and game-plan of the system fragments close by their data, (for instance, yield rating, voltage, obstacle, and reactance, etc.).

It isn't critical to show all of the fragments of the system on a single line graph, e.g., an electrical switch need not have shown up in the load stream study yet are the most for a protection study. In the single line plot, the system part has regularly pulled in the kind of its pictures. Generator and transformer affiliations, star, delta and fair-minded earthing are appeared by pictures drawn by the side of the depiction of these parts.

2.3.1 Why SLD is required?

Despite whether you have another or existing office, the single-line diagram is the basic guide for all future testing and dispatching, organization and upkeep activities of the Electrical structure. For instance, the single-line chart takes after an advantage report for your office and gives a review of your office at a moment in time of the system. It needs to change as your office changes to ensure that your system is sufficient guaranteed. To make all of the movements file in a run of the mill archive, make the electrical structure better reasonable for the particular individual inside/outside of the creation line or others. A ground breaking single-line diagram is urgent for a combination of organization practices including:

- Short circuit checks

- Coordination considers

- Load stream contemplates

- Safety appraisal thinks about

- All other planning assessments

2.3.2 What should be in a single line diagram (SLD)?

- Electrical prosperity procedures
- Efficient upkeep

What ought to be in a solitary line chart (SLD)?

A commonplace bundle of single line outline will include:

- Incoming lines demonstrating voltage and size
- Incoming principle wires, patterns, switches, and fundamental/sudden death rounds
- Power transformers (rating, winding association, and establishing implies)
- Feeder breakers and combined switches rating and type.
- Relays (capacity, use, and type)
- Current as well as potential transformers with size, type, and proportion
- Control transformers rating.
- All primary link and wire runs with their related separating switches
- All substations, including basic transfers and principle boards or board with an all out heap of every feeder and every substation.
- Critical gear/engine voltage and size (UPS, battery, generator, control circulation, move switch, PC room cooling).
- An outline load plan for the LT switchgear board of the substation.

- A stacked calendar for every dissemination boards and switchboard of the board.
- Rating and measurement of each transport bar.
- All cordial links with link size and type with rating and kind of their related disconnecting switches (for example electrical switch).
- Length and voltage drop of every single active link from the board.
- Rating of PFI(Power Factor Improvement), changeover, ATS, generators with related security and separating switch
- All earthling link rating (size, type, and so on.) and earthlings Source.
- All associated burden with their devote load limit.
- All extra switches (active circuit breakers) will be referenced in the SLD.
- Earthling framework will be incorporated with the element of earthling pit, exhausting, earth terminal size, earth lead, and ECC link size and type.

2.3.3 Calculation of Single Line Diagram:

This article explains how to **calculate and draw a single line diagram** of the three-phase, 50-Hz power system.

If you want to make a Single Line Diagram of Electrical wiring than you have to some Calculations. In short, I will show you how some point what calculation you have to do to draw a single line Diagram.

Follow the mention points:

- *Proper Calculation of load
- *Wire/Cable size
- *Breaker size
- *Earthing Position

*Feed to & feed from point

*Grounding

*Grounding Value

2.4 Summary

This chapter is about the Single line diagram of an electrical supply. Proper SLD will help you most in the distribution line and in the panel.

Sometimes the Single line diagram will help you to define the cable, Easy to understand the load and so many facilities.

In this chapter we knew how to make SLD and about the benefit of the Single line diagram.

CHAPTER-3

Power plant

3.1 Introduction of power plant

A power station additionally alluded to as a power plant or powerhouse and in some cases producing station or creating plant is a modern office for the age of electric power. Most power stations contain at least one generators, a pivoting machine that changes over mechanical power into electric power. The relative movement between an attractive field and a transmitter makes an electrical flow. The vitality source saddled to turn the generator differs broadly. Most power stations on the planet consume petroleum derivatives, for example, coal, oil, and flammable gas to create power. Others utilize atomic power, however there is expanding utilization of cleaner sources, for example, sunlight based, wind, wave and hydroelectric.

3.2 Power plant normally two types:

There are a few distinct kinds of intensity plants utilized over the present reality. Power plants are arranged into various gatherings dependent on the criteria utilized for the characterization. The criteria utilized in this article is the thing that wellspring of vitality is used to deliver the power. Utilizing the criteria of the wellspring of vitality for power creation, we can comprehensively group control plants to-

1. Conventional Power Plants
2. Non-Conventional Power Plants

3.2.1 Conventional Power Plants:

They include the generation of electricity from conventional sources of energy. These resources are finite and exhaustible. Once consumed, these sources cannot be replaced by others. Examples include coal, timber, petroleum, lignite, natural gas, fossil fuels, nuclear fuels, etc.

The conventional power plants include the following power plants,

- 1.Steam Engines Power Plants
- 2.Steam Turbine Power Plants
- 3.Diesel Power Plants
- 4.Gas Turbine Power Plants
- 5.Hydro-Electric Power Plants
- 6.Nuclear Power Plants

3.2.1.1 Conventional Power Plants In Bangladesh:



Figure: Nuclear power plant of Bangladesh

3.2.2 Nuclear power plant construction table

	Model	Cross MWe	Construction start	Commercial operation
ooppur 1	VVER-1200/V-523	1200 MWe	November 2017	2023 or 2024
Rooppur 2	VVER-1200/V-523	1200 MWe	July 2018	2024 or 2025

Table of Nuclear power plant Construction in Bangladesh

3.2.1.2 Explanations Nuclear power plant of Bangladesh

Bangladesh created 64 TWh gross of power in 2016. Around 53 TWh (82%) was from gaseous petrol and 10 TWh from oil. Power request is rising quickly (7% every year) and limit was 18.8 GWe starting at 2018. About 10% of the populace stays without power either from the lattice or neighborhood sun based establishments, and those depending on the network experience visit control cuts. Some 5% of government consumption is being distributed to 'power and vitality'. The administration plans for the entire nation to be available to the lattice by 2021, and the Rural Electrification Board has attracted up yearning intends to interface 2.7 million additional family units by at that point. A long haul plan was

made in the Power System Master Plan (PSMP) 20162, a refreshed form of the PSMP 2010. The arrangement focuses on an age limit of 23 GWe in 2020, 40 GWe in 2030, and 60 GWe in 2041. The principal commitment from atomic is normal in 2023, and the arrangement shows roughly 7 GWe atomic limit by 2041.

3.2.2 Non-Conventional Power Plants:

The non-traditional wellsprings of vitality are by and large constantly delivered in nature and are not expendable. Models incorporate wood, geothermal vitality, wind vitality, tidal vitality, atomic combination, biomass, sunlight based vitality and so on

The following are the power plants from non-conventional sources of energy.

1. Thermoelectric Generator
2. Thermionic generator
3. Fuel-cells Power Plants
4. Photovoltaic solar cells Power System
5. MHD Power Plants
6. Fussion Reactor NPP Power System
7. Biogas, Biomass Energy Power system
8. Geothermal Energy
9. Wind Energy Power System
10. Ocean Thermal energy conversion (OTEC)
11. Wave and Tidal Wave

3.3 Types of Major Power Plants:

A power plant might be characterized as a machine or gathering of hardware that creates and conveys a progression of mechanical or electrical vitality. The fundamental gear for the age of electric power is the generator. When coupling it to a prime mover runs the generator, the power is created. The sort of prime move decides, the kind of intensity plants. The significant power plants are,

- Steam power plant
- Diesel power plant
- Gas turbine power plant
- Nuclear power plant
-

3.3.1 Steam power plant:

As the name recommends, these power plants convert heat vitality into electrical vitality. The working liquid of these plants is for the most part steam and they take a shot at the Rankin cycle. A steam control plant comprises of an evaporator that is utilized to create the steam from water, a prime mover like a steam turbine to change over the enthalpy of the steam into the rotating movement of the turbine which is connected to the alternator to deliver power. The steam is again consolidated in the condenser and encouraged to the evaporator once more.

3.3.1.1 Advantage of steam power plant

- a) The fuel is very modest
 - b) Less introductory expense when contrasted with other producing stations
 - d) It required less space when contrasted with the hydro-electric power station.
 - e) The cost of age is lesser than that of the diesel control station.
1. Coal and debris taking care of course of action

3.3.1.2 Disadvantages of steam power plant

2. Steam creating plant
3. Steam turbine
4. Alternator
5. Feed water
6. Cooling course of action

3.3.2 Diesel Power Plant

For producing electrical power, it is basic to pivot the rotor of an alternator by methods for a prime mover. The prime mover can be driven by various strategies. Utilizing the diesel motor as the prime mover is one of the famous strategies for creating power. At the point when prime mover of the alternators is diesel motor, the power station is called diesel control plant. The mechanical power required for driving alternators originates from the ignition of diesel. As the diesel costs high, this kind of intensity station isn't reasonable for delivering power in huge scale in our nation.

3.4 Standard of Power plant structure:

Standards of intensity plant are portrayed underneath:

1. Low capital expense.
2. Dependability of providing power.
3. Low upkeep cost.
4. High productivity.
5. Minimal effort of vitality created.
6. Save ability to satisfy future power need.

3.5 Working principle of gas turbine power plant:



Figure :Gas Turbine

At Baghabari control plant an engine is utilized which is combined with the blower to expel the idleness of everything being equal. The gas turbine utilizes air and gaseous petrol to work. From the start air and gas are blended at a specific proportion. The measure of fuel and air is constrained by the fuel GCV (Gas control valve) and air IGV (Inlet manage valve). IGV opening point is 340, 570 and 840. From that point onward, the air and gas are packed by a blower. Intercooler builds the weight of compacted low-pressure air. This procedure continues rehashing until the ideal air–gas proportion is acquired. At last, this compacted blend is sent to the interior ignition motor where the blend is scorched in a bound space. This space is known as an ignition chamber. Its temperature is about 1200° C. After burning, the pole of the motor

begins to pivot. This pole is combined with the alternator. Along these lines, control is delivered at the alternator. The fumes gas goes out through a stack at a temperature of around 575 °C. The support of the motor is done at regular intervals

3.6 Segments of Gas turbine:

3.5.1 Compressor:

The blower is a significant piece of a gas motor. The air or gas that is gone through the blower is diminished in volume and it gets pressurized. It likewise expands the consume rate and the speed of the blend. Furthermore, air conveys various sorts of residue. The blower additionally expels that residue from the air.

3.6.1. Combustion Chamber:

In this area, the tourist must be permitted to stream into the burning chamber. The petroleum gas is embedded into the burning chamber. The high temperature and high-pressure results of ignition go through the turbine and pivot it. There are all out 14 burning chambers in a unit and all ignition chamber are associated with one another

3.5..2 Turnover up engine of Gas Turbine control plant:

Turn over up engine is one of the most significant pieces of a gas turbine. By this turn over up-engine, the turbine evacuates the idleness. At the point when the turbine speed is 750 rpm and rotor speed is 1600 rpm, engine runs independently. Be that as it may, when the turbine speed goes to 2300 rpm, excitation is begun. Toward the end, turbine speed raises up to 3000 rpm at no-heap condition.

3.5.3 Cooling framework:

In control plant, we have utilized two sorts of cooling frameworks. One is Lube oil and another is water cooling framework. For the interior cooling of the turbine bearing, they have utilized a lube oil cooling framework.

3.5.4 Safety relief valves (SRV) :

Wellbeing alleviation valves secure the gas beneficiaries and other gear from the overpressure of gases of pipelines.

3.6 Summary

Power plant designing or power station building is a division of intensity designing, and is characterized as "the building and innovation required for the creation of focal station electric power. The field is centered around the age of intensity for ventures and networks, not for family control generation. The field is an interdisciplinary field, utilizing the hypothetical base of both mechanical and electrical building. The designing part of intensity plant the executives has developed with innovation and has gotten dynamically increasingly muddled. The presentation of atomic innovation and the movement of other existing advances have enabled the capacity to be made in a bigger number of ways and on a bigger scale than was already conceivable. The task of various sorts of specialists to the structure, development, and activity of another power plant is reliant on the kind of framework being constructed, for example, regardless of whether it is an atomic power plant, hydroelectric plant, or sun powered plant.

CHAPTER-4

SUBSTATION

4.1 Introduction of substation:

This chapter will be explaining about the A Substation that implies an electrical framework with the high-voltage limit and can be utilized to control the mechanical assembly control, generators, electrical circuits, and so on. The Substations are primarily used to change over from AC (substituting current) to DC (direct current). A few kinds of substations are little in size with an inbuilt transformer just as related switches or controls. Different sorts of substations are enormous with different kinds of transformers, gear, circuit breakers, and switches.

4.2 List of the Equipment of Substation:

- Incoming and outgoing Voltage
- Power transformer
- Instrument transformer
- Bus bar
- Circuit Breaker (CB)
- Isolator
- Lighting Arrester
- Transformer

4.2.1 Bus bar:

Bus bar essentially is utilized to associate all the hardware in a substation. So when a few lines work at a similar voltage and both associated electrically, at that point it is known as transport bar. In a substation, approaching and active lines are associated with the transport bar.

4.2.2 Single line bus bar:

Single line bus bar all the feeders and transformer are connected to a single line bus bar.

4.2.3 Double line bus bar:

In twofold line transport bar frameworks, two transport bar is seen so that one active or approaching feeder can be invigorated from any of the two transports. In this substation, every feeder is associated with both of the transports through individual isolators. The course of action furnishes to associate one feeder with a transport bar and that specific feeder can be moved starting with one transport bar then onto the next. This course of action is utilized for 132 V frameworks.

4.2.4 Circuit Breaker:

Another significant piece of a substation is the electrical switch. An electrical switch is a self-worked electrical change intended to shield an electrical framework from harm brought about by over-burden or short out. At the point when a shortcoming is identified electrical switch promptly breaks the electrical framework. In a substation, SF₆, ACB thus many electrical switch is utilizing

4.2.5 Isolator:

Isolator is a mechanical part used to seclude a segment from any conductors. It is a physically or naturally worked mechanical gadget which isolates a piece of the electrical power framework ordinarily at off burden condition. At the point when an issue happens, isolator is utilized. By opening the isolator, it tends to be seen that the flawed segment is disengaged from the empowered segment of the matrix. By watching this, it is conceivable to be certain that there is no present going through the disengaged area.

4.2.5.1 The picture of isolator:



Figure:Picture of Isolator

4.2.6 Lightning Arrester:

Lightning is the consequence of the lightning flood. A lightning arrester is a module utilized on electrical power frameworks to ensure the protection and the other gear from harm because of lightning. A lightning arrester is otherwise called a flood arrester.

Lightning arrester secures the significant hardware of the substation. When lightning strikes on the transmission line, lightning arrester sidesteps the high voltage to the ground with the goal that the close-by the transformer isn't influenced .

4.2.7 Switchgear:

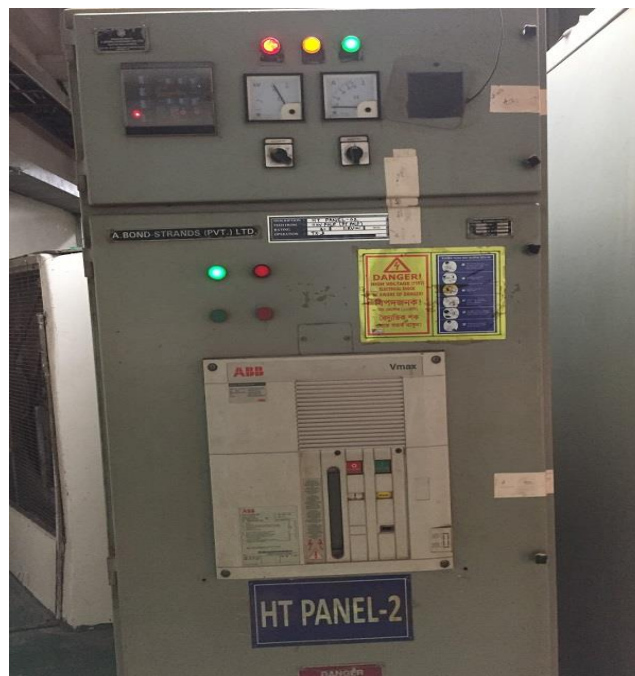
Switchgear is a nonexclusive term that incorporates all the exchanging gadgets related to control framework security. It likewise incorporates all gadgets related to control, metering and controlling of electrical power frameworks. Get together of such gadgets in a sensible way shapes switchgear. At the end of the day, frameworks utilized for exchanging, controlling and ensuring the electrical power circuits and various sorts of electrical gear are known as switchgear. This is an extremely fundamental meaning of switchgear.

4.2.7.1 Application of switchgear:

- *High Tension (HT) Panel
- *Low tension (LT) Panel
- *Power Factor Improvement (PFI)
- *Main distribution board (MDB)
- *Sub-distribution board (SDB)

4.2.7.1.1 High tension (HT) panel:

HT Panels like HT Switching Panel with Load Break Switch (LBS), Vacuum Circuit Breaker (VCB), Minimum Oil Circuit Breaker (MOCB), SF6, Metering Panel, Cubicle, etc. We maintain and follow all of the International standard and testing methods to ensure standard quality, safety, and life of service.



Physical Figure of HT panel

4.2.7.1.2 Low Tension (LT) Panel:

Low voltage switchgear (LT Panel) which is applied for power control and distribution systems of AC 50Hz, rated working voltage up to 500V. It's mainly used in indoor/outdoor substation, power station, industrial, Commercial, Residential Buildings for power distribution and can be used to control, protect the circuit.

LT switchgear consists of Main Incoming Circuit Breaker (MCCB/ACB) as per the capacity of the Transformer, Rated Bus-bars, Outgoing Circuit Breakers (ACB/MCCB/MCB) to control/switch the power required in different machines/sections/purpose. Necessary indications and measuring equipment for current, Voltage, Power (If applicable) are built-in so that the panel operator can easily monitor the usages. All the bus-bars/live parts are well insulated to avoid any kind of accident and fault.

4.2.7.2.1 Picture of LT:



Figure:LT panel of substation

4.2.8 Power Factor:

The power factor of the framework is corrupted because of the inductive heap of various ventures and huge condos. Power-Sonic produces PFI (Power Factor Improvement) Plant for improving the corrupted Power Factor of the framework. We have microchip based PFC (Power Factor Correction) hand-off up to 24 phases. The Capacitors we use are of various evaluations (2.5, 5, 10, 20, 25, 50 KVAR... . and so forth.) and comparing Magnetic Contactor for appropriate venturing of the Capacitor bank. Here and there we additionally use detuned Reactor with the Capacitors for symphonious filtration of the framework.

We should adhere to the worldwide standard and testing Strategy to guarantee quality, administration, and life wellbeing of the gear .

4.2.8.1 Figure of Power Factor:



Figure:PFI

4.2.9 Main distribution board (MDB) :

The power conveyance framework, comprising of the Main Distribution Board (MDB), Sub Main Distribution Boards (SMDBs) and Final Distribution Boards, by which the electrical vitality is feed to by means of branches to arrive at the precise end client .

4.2.10 Sub Distribution Board (SDB):

MDB feeds to SDBs, which is introduced for the most part at where a huge dissemination link ends and a few littler sub-circuits beginning stage. These are the dissemination board that albeit comparable development, is greater than a last dispersion board circuit. The sheets have introduced the center of burden through the power circulation framework, at the point in an enormous dispersion link closes, and a few littler beginning sub/colleague circuits.

We are altogether acquainted with low voltage switches and re-wearable wires in our home. The switch is utilized to physically open and close the electrical circuit in our home and the electrical wire is utilized to shield our family unit electrical circuit from overflow and short out flaws.

4.2.11 Switchgear Protection:

We are altogether acquainted with low voltage switches and re-wearable wires in our home. The switch is utilized to physically open and close the electrical circuit in our home and the electrical wire is utilized to shield our family unit electrical circuit from overflow and short out flaws.

Similarly, every electrical circuit including a high voltage electrical power framework needs exchanging and defensive gadgets. Be that as it may, in high voltage and extra-high voltage framework, this exchanging and defensive plan turn into a muddled one for high issue current break in a sheltered and secure manner. Notwithstanding that from a business perspective, each electrical power framework needs estimating, controlling and directing the course of action. On the whole, the entire framework is called switchgear and insurance of intensity framework. The electrical switchgear has been creating in different structures. Switchgear security assumes an indispensable job in the cutting edge control framework organizes, directly from age through the transmission to appropriation end. The present interference gadgets are known as an electrical switch. The circuit breakers can be worked physically as when required and it can likewise be worked consequently during over present and shortcircuits or some other blames in the framework by detecting the anomaly of framework parameters. These power framework parameters can be current, voltage, recurrence, stage edge, and so forth. The electrical switch detects the defective state of the framework through insurance transfers and these transfers are again incited by flawed sign typically originates from a flow transformer or voltage transformer.

The switchgear needs to play out the capacity of conveying, making and breaking the typical burden current like a switch and it needs to play out the capacity of clearing the issue in the power framework. Notwithstanding that, it additionally has the arrangement of metering and controlling the different parameters of electrical power frameworks. Hence the switchgear incorporates circuit breakers, flow transformers, voltage transformers, assurance transfers, estimating instruments, electrical switches, electrical wires, smaller than normal circuit breakers, lightning arresters or flood arresters, electrical isolators and other related bits of gear.

Electric switchgear is essential at each exchanging point in the electrical power framework. There are different voltage levels and henceforth different issue levels between the creating stations and burden focus. In this way different sorts of switchgear get together are required relying on various voltage levels of the framework. Other than the power framework systems, electrical switchgear is additionally required in modern works, mechanical activities, residential and business structures.

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4.2.12 Transformer

transformer is a electrical passive device who transfer electricity one circuit to another circuit. In Sgwicus (BD) ltd. there have Three transformer and the transformer specification mentioned as bellow:

4.2.12.1 Specification of transformer :

Transformer-1	Transformer-2	Transformer-
Capacity-100 kva	Capacity-630 kva	Capacity-800 kva
Input-1100 V	Input-1100 v	Input-1100 v
Output-220 (Secondary)	Output-220 (Secondary)	Output-440 (Secondary)
Frquency-50	Frquency-50	Frquency-50
Phase-3	Phase-3	Phase-3

4.2.12.2 Picture of Transformer:



Physical picture of transformer:

4.2.12.2.1 Transformer protection:

Transformer insurance/protection is the most significant piece of the assurance framework. A transformer supplies low to high voltage or high to low voltage. To secure the transformer, over current and earth shortcoming insurance, Buokholz hand-off, Silica gel, Radiator, PRD, Oil temperature meter are utilized in a different power plants.

I observed another protection system for a transformer which is silica gel. There is a little amount of oil under the silica gel this absorbs the moisture of the air and sends this air to silica gel. Which absorbs the rest of the moisture of the air? It protects the transformer oil from the dust and water particle of air.

4.3 CHOICE OF SITE FOR POWER STATIONS:

4.3.1 Supply of fuel:

The steam power station should be located near the coal mines so that transportation cost is minimum. However, if such a plant is to be installed taken that adequate facilities exists for the transportation of coal.

4.3.2 Transportation facilities:

An advanced steam control station regularly requires the transportation of material and hardware. Thusly, satisfactory transportation offices must exist. The plant ought to be all around associated with different pieces of the nation by the railroad and so forth.

4.4 Summary

This Chapter we have known that about a proper substation and distribution and also about many kinds of protection.

Distribution Line and select place for the substation. Transformer ,HT Panel, LT Panel.

The power factor is also the most important things which we can learn from this chapter.

CHAPTER-5

PROTECTION SYSTEM

5.1 Introduction

Understudies who complete this course will have increased a hypothetical and applied comprehension of intensity framework assurance. The presentation of instrument transformers, transducers, defensive transfers, and circuit breakers is first tended to. These gadgets are then incorporated into facilitated defensive frameworks for generators, transformers, transmission lines, reactors, capacitor banks, framework transports, and so forth. Exchange offs between dependability, selectivity, speed, straightforwardness, and economy are accentuated.

5.2 Protection types

Control framework insurance/protection is one of the significant pieces of electrical designing, which manages the assurance/protection of electrical from shortcomings through the protection of blamed parts from the remainder of the electrical system. The fundamental motivation behind insurance is to keep the power framework stable by protecting just the segments that are under issue. Thus, insurance plans must apply for solid shortcoming. During crisis conditions, if any shortcoming happens in the substation or Power Plant, the administrators screen the flaw and outing the plant from the control room.

5.2.1 Generator Protection:

In sgwicus (BD) Ltd. There have Three genarators.Bellow mentioned their specification:

SL	Model	Standby	Cont	Volts	Amp	Pf	Poles	HZ	Phase
1	EG-603E	690/552 KVA/KW	629/503 KVA/KW	220/127	1650	.8	4	50	3
2	EG-603E	690/552 KVA/KW	629/503 KVA/KW	220/127	1650	.8	4	50	3
3	EG-603E	690/552 KVA/KW	629/503 KVA/KW	220/127	1650	.8	4	50	3

Table: Generator Specifications

5.2.1.1 The picture of SGwicus Generator.



5.2.1.2 Explanations of generator protection:

The generator is a significant segment of a power plant. The prime mover is utilized to change over mechanical vitality into electrical vitality. A few deficiencies require prompt consideration and shutdown of the framework. For generator security, various sorts of game plan are taken.

5.3 Over current with under voltage protection:

If more than one generator supply the load and due to some reason one or two generator suddenly trips, then another generator tries to supply the load. Each of these generators will experience a sudden increase in current and thus decrease the terminal voltage. The automatic voltage regulator connected with the system tries to restore the voltage. Over current is protected by using circuit breakers and relays that are connected to the star connected side of the generator.

Over current means excessive current passing through the equipment than the rated current. It may happen due to overload, short circuit fault. To remove this fault over current relay is used. These relays consist of a combination of two relays: over-current relay and instantaneous relay.

5.4 Over voltage protection:

Overvoltage happens because of abrupt misfortune in the heap of the generator due to the speed up prime mover. The overvoltage is required for generator assurance. This security is given by momentary hand-off and IDMT (Inverse Definite Minimum Time Relay). IDMT set the pickup individually at 130% to 140% and 110% of evaluated generator voltage.

The generator produces 11KV. In the event that the voltage is more noteworthy than the appraised voltage, transfer detects the strange practices of voltage and gives a caution to the control framework.

Over current and earth fault protection:

Over-current and earth assurance are utilized to ensure the transformer against the deficiency current and over-burden current. Over-current transfer is utilized to secure the transformer which detects the impedance during short out conditions. At the point when the short out happens there might be earth flaw during this condition.

5.3 Summary

Final summary of this chapter goes to totally about protection of electrical power distribution. May be this chapter will helpful for keep secure and safe for all electrical equipment in a industrial installation system.

CHAPTER-6

BOILER

6.1 Introduction of boiler:

A heater/boiler or steam generator is a gadget used to make steam by applying heat vitality to water. A heater or steam generator is utilized any place a wellspring of steam is required. The heater is a segment which is commonly used to get steam by applying warm vitality. In my capacity plant, there is two boilers for two units. The primary reason for the heater is to make the steam which is utilized to drive the turbines.

6.2 Types of boiler:

Generally there are two types of boiler,

- Water tube boiler
- Fire tube boiler.

6.2.1 In SGwicus (BD) ltd. They are using two boilers. Both specifications are mentioned bellow:

BOILER-1	BOILER-2
Brand : SAMHO (SHS-300)	Brand : SAMHO (SHS-300)
TYPE-Smoke tube boiler	TYPE-Smoke tube boiler
Capacity-2000 kg/hr	Capacity-2000 kg/hr
Heat area- 58 meter square	Heat area- 58 meter square
Electricity Consumption-11.25 Kw	Electricity Consumption-11.25 Kw
Weight- 5.7 Ton	Weight- 5.7 Ton
Maximum pressure-10 kg/cms	Maximum pressure-10 kg/cms
Fuel-oil/Gas	Fuel-oil/Gas

Boiler specification Table

6.2.2 Physical picture of boiler of SGwicus



Picture of boiler

6.2.3 Water tube type boiler:

In the Barapukuria control plant, water tube boilers are utilized for all units. In the kettle area there likewise numerous cylinders which contain water. In this segment hot gases are created by the consuming of fuel. An assortment of water (tubes with water) is connected with a steam-water drum through two arrangements of headers. The hot pipe gases from the heater load are set up to stream around the water tubes with a sufficient number of times. The gases in this way surrender their warmth to a considerable degree, get cooled and released to the stack. The steam is isolated from water in the drum and is collected in the steam space.

6.2.4 Boiler Equipment:

*Furnace

*Circulating water pumps

*Feed Water Pump

*Super heater

*Economizer

*Steam turbine

6.2.4.1 Furnace:

The heater is a piece of the kettle which is appended inside the evaporator where characteristic coal is ignited with the nearness of air for delivering heat.

6.2.4.2 Feed water pumps:

Coursing water siphons circle water inside the heater to upgrade evaporator activity. In control station utilizes both close and untamed water stream framework. They take the water from the profound siphon.

6.2.4.3 Feed Water Pump:

The principle motivation behind the feedwater siphon is to raise the weight of the feed water to sufficiently high for it to enter the kettle. It is expected to improve by and large productivity. For kettle security purposes, the disintegrated molecule is expelled from the water to make it de-mineralized.

6.2.4.4 Super heater/Heater:

The super heater is utilized in control plants in light of the fact that the superheater changes over the soaked steam into superheated steam. The temperature of the super-warmed steam inside the superheater is 5380 C.

6.2.4.5 Economizer:

An economizer is a mechanical gadget that is utilized as a warmth exchanger by preheating a liquid to diminish vitality utilization. The kettle is given an economizer and air pre-warmers to recuperate heat from vent gases. The warmth is utilized for feed water warming

6.2.4.6 Steam turbine:

The steam turbine is the gadget that changes over warm vitality into mechanical vitality. In a power plant, the steam turbine is connected to a generator to create electrical power. The turbine fills in as the major mechanical side of the framework by giving the rotating movement to the generator.

6.3 Boiler Safety:

While water is changed over to steam it grows in volume multiple times and goes down steam pipes at more than 25 m/s. Hence, steam is a decent method for moving vitality and warmth around a site from a focal kettle house to where it is required, yet without the correct heater feedwater treatment, a steam-raising plant will be experienced scale development and consumption. Best case scenario, this builds vitality costs and can drive to low quality steam, diminished proficiency, shorter vegetation and an activity which is untrustworthy. At the very least, it can drive to cataclysmic disappointment and death toll. While varieties in norms may exist in various nations, stringent legitimate, testing, preparing and accreditation is applied to attempt to limit or counteract such events. Disappointment modes include:

- Over pressurization of a boiler.
- For low water in the boiler causing overheating and vessel failure.
- Pressure vessel failure of the boiler due to inadequate construction or maintenance or doesn't meet the Electrical standard.

6.4 Summary:

This chapter is about boiler and also the explanation all about boiler equipment.

That chapter will help you learn about boiler applications .Here also discussed about the safety of boiler and the classifications.

So, this chapter is so much effective for these kinds of people which are like to know about boiler and boiler application.

CHAPTER-7

CONCLUSIONS

6.1 Conclusions:

The electrical energy has a vital rule in the development of civilization. There has been a universal basic drive towards better living through expanded utilization of energy. The advancement of a country is measured in terms of capital consumption of electrical energy. The study of generation and operation systems of great importance. Bangladesh power development board (BPDB) evolved on May 1, 1972 as an integrated utility with the responsibility of power generation, transmission, and distribution.

In this paper, we have studied Single line Diagram(SLD), Rules and Regulations of installation the electrical power a generation, Fault protection, and operation system of Bangladesh. For the proper thesis work, we have been studied the different types of electric power generation systems and operating systems. The major part of the power generation in Bangladesh is generated by mainly two types of generation plants these are steam power plants and gas turbine power plants. Most of these power plants are open-loop type, so the efficiency of these plants is low. If these two types of plants are used as a closed-loop type the efficiency will increase up to 52.6%. So the Bangladesh government should take proper steps (if possible) to combine these plants as the close-loop type to increase the generating capacity by using the same resources.

6.2 Restriction of the Internship.

Here I will mention some Limitation and changes which I have faced in my internship period. There was some problem regarding the power factor but I corrected this power factor and also did regarding so much maintenance.

The positive thing is there was no bonded or limited area so that was helping me for my internship.

6.3 Future work scopes

There has some work scope for the future and the company does come changes in their factory.

Such as power factor correction, SLD correction, and some maintenance related work.

There has a chance to interfacing with the generator each with other and cooling systems establishes.

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Appendix A

I have learned some effective and innovational type work from Sgwicus (BD) .I knew some calculation as like how to set a breaker, Cable size and how to define the load of a equipment. I am like to thanks once again to Sgwicus (BD) ltd. Company for their good and smooth behavior with proper guideline.