INTERNSHIP REPORT

ON

POWER GENERATION, TRANSMISSION AND PROTECTION SYSTEM EQUIPMENTS OF ASHUGANJ POWER STATION COMPANY LIMITED

SUBMITTED BY

MD. IQBAL HOSSAIN

SID: 2008 – 3 – 80 – 014

SUBMITTED TO

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

FACULTY OF SCIENCE AND ENGINEERING

EAST WEST UNIVERSITY

In partial fulfillment of the requirements for the degree of

Bachelor of Science in Electrical and Electronic Engineering

(B.Sc. in EEE)

[SUMMER – 2012]

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APPROVED BY

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ACADEMIC ADVISOR

ANWARUL AZIM

_____

CHAIRPERSON OF THE DEPARTMENT
DR. MOHAMMAD MOJAMMEL AL HAKIM

Approval Letter

ASHUGANJ POWER STATION COMPANY LTD.
(APSCL)
(An Enterprise of Bangladesh Power Development Board)

CIRIFICATION FOR INDUSTRIAL ATTACHMENT TRAINING PROGRAMME

Certified that Md. Iqbal Hossain, Student.ID No- 2008-3-80-014 of Electrical & Electronic Engineering of East- West University, Dhaka, has participated the Industrial Attachment Training Program from 26-12-2011 to 11-01-2012 and successfully completed the course.

11-01-2012

COURSE CO-ORDINATOR
&
Manager (HRD)
Ashuganj Power Station Company Ltd.
Ashuganj, B-Baria.

Acknowledgement

To begin with, I wish to convey my heartfelt gratitude to Almighty Allah for his help to complete the Internship successfully. I also thank to the management of Ashuganj Power Station Company Ltd (APSCL) for providing me such opportunity to accomplish my industrial training. I would specially thank to Engr. MD. Nurul Alam, Managing director of APSCL who gave me the permission to do internship work at APSCL.

I would like to thank Anwarul Azim, my advisor for his constant support and many suggestions, but also for his patience and gentleness in those times, where I had to slug through problems.

I want to thank all those people who helped to complete my internship report successfully. In this process my special thanks goes to Engr. Lutfurrahman (Principal of Trainnig Center, APSCL) who coordinated my internship program and helped me to get acquainted with other engineers. I am very grateful to Engr. Bikash Ranjan Roy, manager (I & C), Engr. Md. Azizur Rahman, senior engineer (combine cycle power plant), Engr. Noor Mohammad, manager (Sub-station), Engr. Md. Kamruzzaman, senior engineer (Generator and switchgear protection), Engr. Md. Anwar Hossain, manager (Operation) for their supportive guidance. They helped me to learn the scheduled topic which was present in my internship training schedule. I also want to thank each and every employee of APSCL for their continual support.

I would also like to mention the name of Dr. Anisul Haque, ex Chairperson and Professor of the Department of Electrical & Electronic Engineering and Dr. Khairul Alam, Chairperson and Professor, Department of Electrical & Electronic Engineering, for being so kind during the period of my internship. I am also grateful to all of my teachers and friends for their cooperation and encouragement throughout my whole academic life in East West University.

Executive Summary

I did my internship at Ashuganj Power Station Company Ltd (APSCL) located on the left bank of the river Meghna from 26th of Dcember to 11th of January and this internship report is the result of those 15 days attachment with the APSCL.

Ashuganj Power Station Company Ltd. (APSCL) owns the second largest power station in Bangladesh. Ashuganj Power Station fulfills about 15% of power requirements of the country. The installed capacity by its 9 units is 777 MW.

My duration of stay was divided to work in five sections as generator, sub-station, CCPP, I & C and operation. During my internship I gathered practical knowledge about production of electricity, operation, CCPP, major equipments e.g. Generator, Transformer and Switchgear equipments required for distribution and protection of the system.

Protection and controlling of the equipments of the power station is a very important and complicated task. With the help of the plant engineers I observed the control room and protective equipments such as: relays (digital and electrical), circuit breakers etc very closely and understood the functions and controlling system of those equipments.

Substation is an important part of a power station to distribute power and protection purpose. I acquired knowledge about various types of transformers, bus-bars, circuit breakers (SF6 and Oil), lightning arresters, CT, PT and other equipments of the substation which were clearly taught and shown by the senior engineers of the substation of APSCL.

Training Schedule

The following table contains my training schedule in Ashuganj Power Station Company Limited (APSCL). My internship started on 26 December, 2011 and ended on 11 January, 2012.

Date	Division	Time	Instructor
26-12-11	Power Plant Training Center	8am to 5pm	Eng. Achinta Kumer Sarker DGM(MM)
27-12-11 to 28-12-11	Operation	8am to 5pm	Eng. Md Anwer Hossain Manager (Operation)
29-12-11 to 01-01-12	Instrumentation and Control (I&C)	8am to 5pm	Eng .Bikash Ranjan Roy Manager (I&C)
02-01-12 to 04-01-12	Combined Cycle Power Plant (CCPP)	8am to 5pm	Eng .Mizanur Rahman Manager(CCPP)
05-01-12 to 08-01-12	Substation	8am to 5pm	Eng.Nur Mohammad Manager(Substation)
09-01-12 to 11-01-12	Generator and Protection	8am to 5pm	Eng .Md.Kamruzzaman Senior Engineer

List of abbreviations

APSCL = Ashuganj Power Station Company Limited

CCPP = Combined Cycle Power Plant

CT = Current Transformer

PT = Potential Transformer

CB = Circuit Breaker

MW = Mega Watt

LPT = Low pressure turbine

IPT = Intermediate pressure turbine

HPT = High pressure turbine

ONAN = Oil Natural Air Natural, without pumps and fans

ONAF = Oil Natural Air Forced, without pumps for oil, with fans for air

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CHAPTER - 1 Company Profile

I did my internship at Ashuganj Power Station Company Ltd (APSCL) from 26th of December 2011 to 11th of January 2012 and this internship report is the result of those 15 days attachment with the APSCL.

1.1 Introduction

Ashuganj Power Station Company Ltd. (APSCL) owns the second largest power station in Bangladesh. The installed capacity by its 9 units is 777 MW and present de-rated capacity is 642 MW. Electricity generated in this power station is supplied to the national grid and distributed to the consumers throughout the whole country. This power station plays a significant role in the national economic development by generating more than 15% of the total demand of electricity in the country.

Power Sector Development and reform Program of the Government of Bangladesh, Ashuganj Power Station Company ltd, has been incorporated under the companies Act 1994 on 28 June 2000. All the activities of the company started formally on 01 June 2003. From that day the overall activities of the company along with the operation, maintenance and development are vested upon a Management Team consisting of the Managing Director, the Director (technical) and the Director (Finance).

In this power station Natural Gas from Titas Gas Transmission and Distribution Company Ltd. is used as fuel. Water from Meghna is used through in-take channels for steam generation and cooling of generated steam. Used water (for cooling) is again thrown into the Meghna through discharge channels. Huge water from the discharge channels is used for irrigation in the dry season. Approximately 36,000 acres of land of Ashuganj are irrigated by this water. [3], [4]

1.2 Background of Ashuganj Power Station

In 1966 the then government decided to setup a power station in Ashuganj. Ashuganj is situated near Titas Gas Field and at the bank of the river Meghna. So it was the most favorable place for power station because of availability of natural resources for power generation. For this purpose about 311 acre lands at the 1 kilometer north-east away from the Meghna Railway Bridge was acquired. APSCL played an important role in generation of power from 1970. [3]

1.3 Company Objective

i. To carry out the business of electric power generation

ii. To supply and sell electricity to Bangladesh Power Development Board through National Grid.

iii. To undertake projects to increase the power generation of APSCL to meet the growing demand of electric power in the country.

iv. To increase the net worth of the company.

1.4 Generation Details

Table 1-1: Generation details of APSCL

Particulars of Operation	Unit 01	Unit 02	Unit 03	Unit 04	Unit 05	GT 01	GT 02	ST (cc)	Gas Engine
Make & Capacity of Turbo-Alternator	Brown Boveri 80 Mva, 11Kv, 0.5 pf	Brown Boveri 80 Mva, 11Kv, 0.5 pf	Brown Boveri 190 Mva, 15.75Kv, 0.5 pf	Brown Boveri 190 Mva, 15.75Kv, 0.5 pf	Brown Boveri 190 Mva, 15.75Kv, 0.5 pf	GEC, 69.6 Mva, 13.8 Kv	GEC, 69.6 Mva, 13.8 Kv	GEC, 43 Mva, 13.8 Kv	Genbacher
Date of Commissioning	17-08-70	08-07-70	17-12-86	04-05-87	21-03-88	15-11-82	23-03-86	28-03-84	30-04-11
Year of Last Overhauling	1989	1994	2003	2011	2008	2004	2000	n/a	n/a
Generated energy since installation(Gwh)	10575.44	9807.24	22455.89	21306.43	29952.39	5985.33	6662.45	1745.36	5983.88
Load factor (in 2011) %	68.96	68.96	69.24	71.35	84.80	99.42	92.29	98.03	95.00
Station heat rate Kcal/Kwh	11979	11696	12076	11017	10356	18175	18175	0	9366
Stationary Thermal Efficiency in 2011	29.97	30.87	29.89	31.75	34.86	19.86	19.86	0	38.54
Cost of fuel per unit generation in Tk	0.93	0.87	0.90	0.90	0.79	1.30	1.30	0.00	0.69

1.5 Financial Performance

Despite adversities APSCL maintained a substantial progress during the year 2010-11, increase revenue by 5.8% over the last year resulted increase the net profit ,before interest and tax to TK 1408 million as against TK 749 million of 2009-10 a 87%increase .The profit growth was at a phenomenal rate of 146.49%. A comparative detail of financial result of 2009-10 is given below:

Table 1-2: Financial performance of APSCL

Description of item	2010-11	2009-10	In taka increase and increase/(decrease)%
Sales	6621,164,145	6,258,110,680	5.80
Fuel cost	3,197,188611	4,013,874,956	(20.35)
Operating profit	1,163985,710	686,691,441	69.5
Non-Operating profit	244,175,566	61,863,776	294.7
Net profit	962,250,119	391,5490,49	145.75
Provision for taxation	345,908,849	141,500,000	144.46
Net profit after tex	616,341,270	250,049,049	146.49

1.6 Objective of the Internship

The main goal of this internship is to gather practical knowledge and experience about power station. In this internship report, we focused on generation process, protection strategy and maintenance of individual section and control unit of Ashuganj Power Station Company Ltd. We tried to give a complete overview of Ashuganj Power Station Company Limited in this report.

1.7 Future Project of APSCL

APSCL is a power generation company and its position is second in the country. It is APSCL challenges to replace outlived inefficient plants. To cope up the growth of the demand and its business APSCL have under taken the following some important high efficient projects given below: [3]

i. **Ashuganj 225 MW Combine Cycle Power Plant Project:** The Company has taken a project to install 225 MW combine cycle power plant using ECA fund. The construction of the project will start soon. The salient feature of the project is given below:

Table 1-3: Salient feature of the 225MW future project

Capacity	225 MW
EPC Contract Price	USD61,970,240 +EURO60,362,742+BDT2,530,772,664
ECA Backed Project Financer	Expecting ECA support
Mandated lead arranger	Standard Chartered Bank
Contract Agreement signing Date	05 October, 2011
Expected date of completion	April, 2014
Project duration	25 months
Fuel	Natural Gas

ii. **Ashuganj 450 MW Combine Cycle Power Plant Project**: The company has also initiated the process to install another 450 MW combined cycle power plant using ECA funding. The evaluation of the Bid is under process. Key information of the project is placed bellow:

Table 1-4: Salient feature of the 450MW future project

Capacity	450 MW
Estimated Cost of Project	BDT 3,333 Crore
Expected project financing	ECA backed project finance
Project completion time	27 months
Expected contract agreement	June, 2012
Expected date of completion	September, 2014
Current status	Selection of EPC contractor in progress
Fuel	Natural Gas

iii. **Ashuganj 450 MW Combine Cycle Power Plant (North) Project**: The Company is also taken up program to install another 450MW Combine Cycle Power Plant, jointly financed by Asian Development Bank (ADB) and Islamic Development Bank (IDB). A brief particulars of the project is furnished below:

Table 1-5: Salient feature of the 450MW (North) future project

Capacity	450 MW
Estimated project Cost	BDT 3,400.02 Crore
Project finance	ADB & IDB
Expected Completion	October, 2015
Current status	Engagement of Consultant is in process
Fuel	Natural Gas

CHAPTER - 2 Steam turbine power plant

In this part of my internship training Mr. Bikash Ranjon Roy (Manager of I & C) was my instructor where I worked 3 days. I visited steam turbine unit, gas distribution, water pump, water purification process and turbine

2.1 Introduction to steam turbine

Ashuganj Power Station Company Ltd. (APSCL) uses gas as fuel to generate the heat. This heat is used to heat water and create steam. Then the steam passes through turbine which transfers the thermal energy of the steam to the mechanical energy. A generator rotor is attached with this turbine and generator transfer mechanical energy to the electrical energy. There are five steam turbine power plants in APSCL. Installed capacity of steam turbine power plant in APSCL is 578MW.

2.2 Air collection

To burn gas in the boiler house, oxygen is needed. This oxygen is collected from air.

2.2.1 Forced draft fan

Force Draft (FD) fan is used to collect air from nature. In every steam power plant there are two FD fan. There are FD fan inlet vane actuators which control air collection. When load is increased then it also increases air collection from nature.

Figure 2-1: Forced draft fan

2.2.2 Air pre-heater

In the air pre heater chamber air is heated to remove moisture from air. There is a drive in the chamber which uniformly distributes heat all over the chamber. If the motor's rpm is less than 2 then it gives a signal to the control room. If this low speed persists for a 3 minutes it trips boiler. A tachometer is connected with the driver to measure the speed.

2.2.3 Flow transmitter

Flow transmitter measures the flow of air to the boiler. It works by measuring pressure difference **of** two points. Formula is used $F \propto \sqrt{(\Delta P)}$, here F= air flow and P= pressure.

2.3 Fuel gas

In APSCL natural gas is used as a fuel for ignition in combarsion in the boiler and produce heat. Natural gas supplied by Titas gas transmission and distribution co.ltd, Bangladesh. This gas and air collected by FD fan from atmosphere are fired in the boiler to produce heat

2.3.1 Line gas control valve

Control gas line valve control the gas flow into the boiler by changing position of valve in pipe. It can be controlled manually or automatic.

2.3.2 Gas flow meter

Flow counter count flow meter counts the flow of gas into the pipe per hour.

Figure 2-2: Gas flow meter

2.3.3 Gas heater

Gas heater is used to dry gas. Gas pipe is taken through the steam chamber so gas is heated by steam. This heat removes moisture and different particle from gas.

2.4 Water collection

In the steam turbine power plant water is one of the important things. Boiler requires clean and soft water for longer life and efficiency. The source of boiler water is generally river or lake. APSCL collects water from Meghna river and treats this water to make demineralized water which used in boiler to produce steam.

2.4.1 Pump

In APSCL there are three circulating water pumps for collecting water from river. In every place there are two pumps one is working and another is standby. There is a discharge valve behind the pump which is driven by oil. This valve works as either 0% close or 100% open. If it takes time from 0% close to 100% open more than 90 sec then the pump will trip. This water which collects from river goes to condenser to condensate steam. Rest of the water goes to purify then goes to river again.

2.4.2 Water purifying basin

Water comes from river in the water purifying basin directly. This water is purified in two stages in the basin. Different particle and waste are fallen under the basin. Next this purified water goes to the water filter house.

2.4.3 Water filter house

Figure 2-3: Water filter house

In the water filter house there are different type tanks and filters which purify the water. There are four polyelectrolyte tanks where two is used for checking ph. There are two gravel filters. It works very effectively by pulling water down through the gravel, where the solid debris is trapped close to the surface, and the soluble waste is broken down by bacteria that grow on the gravel surface further down. The clean water is then taken back to the surface. The lower level of impurities not only reduces corrosion rates in the boiler but also reduces the erosion of the turbine blades

2.4.4 De-hydronization process

De-hydronization process is about decreasing pressure and increasing temperature. In general process temperature will increase with decreasing carbon number to maintain conversion at pressure. When this de hydrate water is fully fit to get the heat then this water is sent to the water tube.

2.5 Boiler

The basic purpose of a boiler is to turn water into steam, in this case super-heated steam. This operation sounds relatively simple but is actually more complicated. The boilers utilized on campus are of the stack drum type, which means there are drums within the boilers and flue gas through the stack to atmosphere. The upper drum is called a boiler drum and is where saturated steam leaves the boiler. While the lower drum is called the mud drum and is where liquid feed water enters. Tubes called rises and down comers are used to connect the two drums. All the energy required within the boiler is produced by the combustion of a fuel.

2.5.1 Water tube boiler

The tubes contain water and the hot gases produced by combustion of fuel flow outside. A bank of water tubes is connected with steam-water drum through two sets of headers. The hot flue gases from the furnace are made to flow around the water tubes a sufficient number of times. The gases thus give up their heat to an appreciable extent, get cooled and are discharged to the stack. The steam formed separates from water in the drum and gets accumulated in the steam space. In APSCL water tube boiler is used. In every steam power plant there are three stage water tube boilers.

2.5.2 Ignition

The ignition coil is the component that connects directly with electricity line and includes two transformer windings. The primary winding feeds into the distributor, while the secondary winding connects to the spark plugs. When enough energy has been created, the spinning cam opens a breaker, which causes a high-voltage jump in the ignition coil. This voltage surge is transported to the spark plugs, resulting in the necessary electric spark to begin ignition. At the beginning of the firing of the burner small amount of natural gas and air is needed. This small amount of gas is known as ignition gas which is supplied into the burner by ignition pipe or line. After the burner is on the ignition line is turned off and main line for fuel and air supply is turned on.

2.5.3 Burner

Figure 2-4: Burner room with water tube boiler

Burner is the chamber in the boiler where natural gas or coal is burned with the presence of air for producing heated gas or flue gas. In Ashuganj Power Station Company Ltd (APSCL) natural gas is burned with the presence of air for generating heat for making steam. In steam turbine power plant of APSCL each furnace chamber has nine furnaces. The temperature inside the furnace chamber is 1200-1500°C. The treated water from the feed water tank through economizer enters into the boiler through tubes and the flue gas produced inside the furnace passes through the tubes.

2.5.4 Boiler drum

It is the place where the water is reserved which comes through the economizer. Inside the drum upper and lower level of amount of water is measured by the level transmitters. If the level crosses the upper limit or goes below the lower limit then the plant will trip. So it is very important to control the level of the water. This is done by an automatic system. From the boiler drum the saturated steam is transferred into super heater.

2.5.5 Safety valve

The function of the safety valve is to permit the steam in the boiler to escape to atmosphere when the pressure in the steam space exceeds a certain specified limit. Thus the safety valve prevents the building up of excessive pressure in the boiler. The safety valve is located above the steam space in the boiler. The safety valves operate on the principle that a valve is pressed against its seat through some agency such as strut, screw or spring by external weights or force. When the steam force due to boiler pressure acting under the valve exceeds the external force, the valve gets lifted off its seat and some of the steam rushes out until normal pressure is restored again.

2.5.6 Pressure gauge

Each boiler has to be provided with a pressure transmitter which measures the pressure at which the steam is being generated in the boiler. The transmitter is usually mounted at the front top of the boiler shell or drum. The gauge has to be clearly visible to the attendant so that he can easily record the pressure reading. These gauges are used to measure gas and air pressures.

2.5.7 Boiler efficiency

Boiler efficiency is defined as the ratio of heat energy utilized by feed water in converting it into steam in the boiler to the heat energy realized by complete combustion of fuel during the same time. [1]

$$Boiler\ efficiency = \frac{energy\ absorbed\ by\ feed\ water}{energy\ absorbed\ by\ fuel}$$

2.5.8 Stack

Stack or chimney is a passage through which flue gas escape from a fire or furnace. From the furnace flue gas is produced. This flue gas is used to create the steam for rotating the turbine. The flue gas passes through several equipments and finally goes into the nature through stack.

2.6 Turbine

Figure 2-5: Steam turbine

A steam turbine is a mechanical device that extracts thermal energy from pressurized and converts it into rotary motion. The turbine mainly consists of nozzle and rotary and fixed blade wheel. The steam is expanded from a high pressure to a low pressure either in nozzles or in the blade where it is transformed into the mechanical work. The steam power plant of APSCL has a casing around the blades that contains and controls the working fluid.

2.6.1 Sections of steam turbine

The steam turbines used in Ashuganj Power Station Company Ltd (APSCL) are kept in three different sections or chambers. The size and characteristics of the blades of the turbines in these sections are different from each other.

i. **High Pressure Turbine (HP):** From the super heater the high speed steam first enters to the high pressure turbine. The blades in the high pressure turbine are the smallest of all turbine blades; this is because the incoming steam has very high energy and occupies a low volume. The blades are fixed to a shaft and as the steam hits the blades it causes the shaft to rotate.

ii. **Intermediate Pressure Turbine (IP):** From the boiler re-heater the steam enter into the intermediate pressure turbine. The steam has expanded and has less energy when it enters this section, so here the turbine blades are bigger than those in the high pressure turbine. The blades are fixed to a shaft and as the steam hits the blades it causes the shaft to rotate. From here the steam goes straight to the next section of turbine set.

iii. **Low Pressure Turbine (LP):** From the intermediate pressure turbine steam enters into the low pressure turbine and continues its expansion. The blades of the turbine of this section are larger than the previous two sections but the energy of steam is lesser than the previous two sections.

2.6.2 Operation and maintenance

When warming up a steam turbine for use, the main stream stop valves have a bypass line to allow superheated steam to slowly bypass the valve and proceed to heat up the lines in the system along with the steam turbine. Any imbalance of the rotor can lead to vibration, which in extreme cases can lead to a blade breaking away from the rotor at high velocity and being ejected directly through the casing. To minimize risk it is essential that the turbine be very well balanced and turned with dry steam - that is, superheated steam with minimal liquid water content. If water gets into the steam and is blasted onto the blades, rapid impingement and erosion of the blades can occur to leading imbalance and catastrophic failure. Also, water entering the blades will result in the destruction of the thrust bearing for the turbine shaft. To prevent this, along with controls and baffles in the boilers to ensure high quality steam, condensate drains are installed in the steam piping leading to the turbine.

CHAPTER - 3 Combine Cycle Power Plant

In this part of my internship training Md Mizanur Rahman (Manager of CCPP) was my instructor where I worked 3 days. I visited combine cycle power plant (CCPP), gas turbine generation, steam turbine generation in CCPP.

3.1 Introduction of CCPP

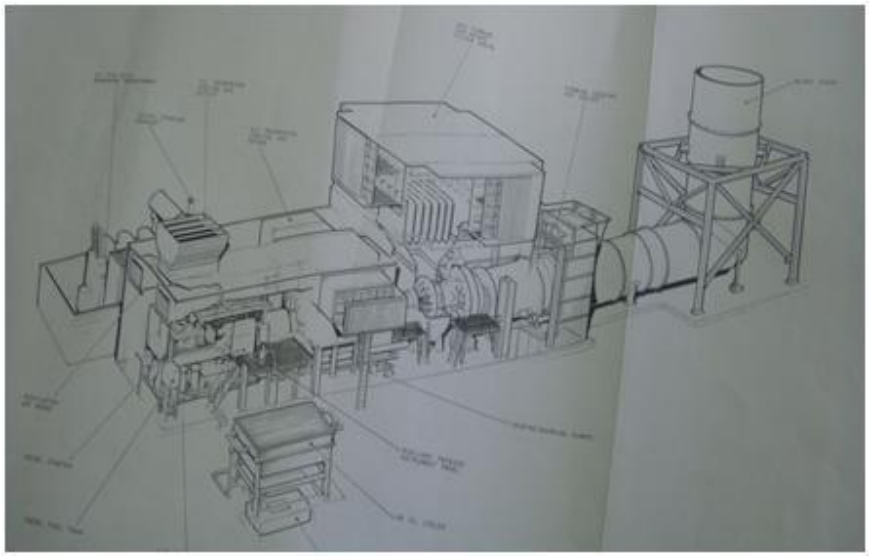

Figure 3-1: Design diagram of CCPP in APSCL

Ashuganj Power Station Company Ltd. (APSCL) uses gas as fuel to generate the heat. This heat is used to heat water and create steam. Then the steam passes through turbine which transfers the thermal energy of the steam to the mechanical energy. A generator rotor is attached with this turbine and generator transfer mechanical energy to the electrical energy. There are five steam turbine power plants in APSCL. Installed capacity of steam turbine power plant in APSCL is 578MW.

3.2 Gas turbine engine

The fuel and air are burn in a combustion chamber in the gas turbine engine. The resulting high-pressure gases are directed through nozzles toward the turbine blades and produce work by turning the turbine shaft. This is a continuous process in the continuous-combustion or constant pressure gas turbine. A portion of the compressed air is mixed with fuel and ignited in a combustion chamber. The balance of the compressed air passes around the chamber to absorb

heat, and then it is merged with the burned products of combustion. The pressurized mixture, usually at 1010°F or higher, flows into a reaction turbine. The turbine drives the compressor and also produces work by driving the generator. A portion of the exhaust gas may be re-circulated and it is possible to recover heat energy from the waste exhaust.

3.2.1 Compressor

The compressor is driven by the turbine through a common shaft. Air enters the compressor via an inlet duct. The compressor increases the air pressure and reduces the air volume as it pumps air to the combustor and through the engine. At the begging of the generation compressor is routed by diesel engine in APSCL.

3.2.2 Combustion Chamber

In combustion chamber combustion causes an increase in gas temperature proportionate to the amount of fuel being injected, a moderate increase in velocity, and a negligible decrease in pressure. Approximately 25 percent of the compressor's total air flow is used for combustion at an air/fuel ratio of about 15: l. The remaining 75 percent of compressor air output is fed to the combustor and to cool combustor liners for cooling combustion gases before they enter the turbine. Electrical igniters in the combustion chamber provide a spark to ignite the fuel/air mixture for engine start-up. The igniters are deactivated after start-up has been accomplished. Hot combustion gases are expelled through the turbine.

Figure 3-2: Combustion chamber in CCPP

3.2.3 Diesel Engine

The gas turbine is not a self-exciting machine. The turbine only can be rotated if fuel and air is burned inside the combustion chamber. But before the turbine starts the air cannot be sucked by the compressor automatically because the compressor is coupled with the turbine. So a diesel engine is coupled with the turbine to rotate the turbine at the beginning for helping to suck air by the compressor. At first the diesel engine starts. When the turbine starts to move by the diesel engine at 2008rpm speed then the diesel engine is turned off.

Figure 3-3: Diesel engine of CCPP

3.2.4 Governor or Speed Control

A diesel engine used in an auxiliary generator must have a governor to regulate and control engine speed. Since an automatic governor functions only with a change in speed, constant engine speed may not be totally possible and "hunting" can occur due to over-correction. The governor's sensitivity is determined by the minimum change in speed of the prime mover which will cause a change in governor setting; its speed regulation is the difference in generator speeds at full-load and no-load divided by the arithmetical mean of the two speeds.

3.3 Sub System of Combine Cycle

The sub system of combine cycle contains with several systems given below:

3.3.1 Fuel System

Figure 3-4: Fuel annex room in CCPP

The system provides the engine with the proper amount of fuel to sustain operation. System components include filters, a fuel manifold, fuel tubes, and nozzles. Off-engine components include the fuel control equipment and a supply system. Fuel (in APSCL it is natural gas) enters the tubular fuel manifold ring via the supply system. The fuel tubes direct the fuel from the manifold to the fuel nozzles which are mounted in the fuel. In APSCL gas comes from Titas.

3.3.2 Cooling System

Cooling is one of the most important elements in any power plant. Diesel engines are designed to be either air cooled or liquid cooled. Cooling is used to prevent the cylinder walls, the head, the exhaust manifold, and the lube oil from overheating. For turbine cooling approximately 25 percent of the air entering a combustor is mixed with fuel and burned. The remaining air is mixed with the products of combustion to reduce the temperature of gases entering the turbine to a safe operating level. Cooling is accomplished by engine airflow. In APSCL there are two cooling system in combine cycle power plant. One is air cooled and another is liquid cooled.

3.3.3 Air Intake System

In APSCL air and fuel ratio is 15:1. Intake air carries dust particles, water vapor and other foreign material. Since these materials can damage moving parts within the engine, filtration of the intake air is necessary. An air intake system must collect, filter, and distribute the required air to the engine cylinders. This must be accomplished with a minimum expenditure of energy (pressure drop). The objective of air filtration is the reduction of engine component wear. Several types of air filters or air cleaners are used. The pleated-paper type are strainers, porous enough to pass air but able to remove solid particles larger than 0.002 of an inch. [5]

3.3.4 Starting System

In APSCL normally generator starts by a diesel engine. At first diesel engine starts to rotate the shaft and when it rotates at 700rpm then it is fired. Usually after 2008rpm, diesel engine disconnects and gas engine began working independently.

3.4 Economizer

Economizers are mechanical devices intended to reduce energy consumption, or to perform another useful function such as preheating a fluid. It used for Boiler heating, ventilating, and air-conditioning purpose.

3.5 Damper

Dampers are often provided in CCPP so the gas turbine exhaust can bypass the heat recovery boiler allowing the gas turbine to operate if the steam unit is down for maintenance. Supplementary oil or gas firing is also included to permit steam unit operation with the gas turbine down.

3.6 Steam Turbine Section

In combined cycle power plant the exhaust gas which comes out from the gas turbine is used to produce steam and run a steam turbine. The exhaust gas has very high temperature (almost 5000C) which can be used to create steam by using several equipments. There is no furnace in steam turbine section in combine cycle power plant. In combined cycle power plant of APSCL there is one steam turbine section which runs by the exhaust gas of gas turbine-1 & 2. But now steam turbine runs only the exhaust gas of gas turbine 1.

3.6.1 Steam Generation Process

In combined cycle power plant of Ashuganj Power Station Company Ltd (APSCL) following equipment are used.

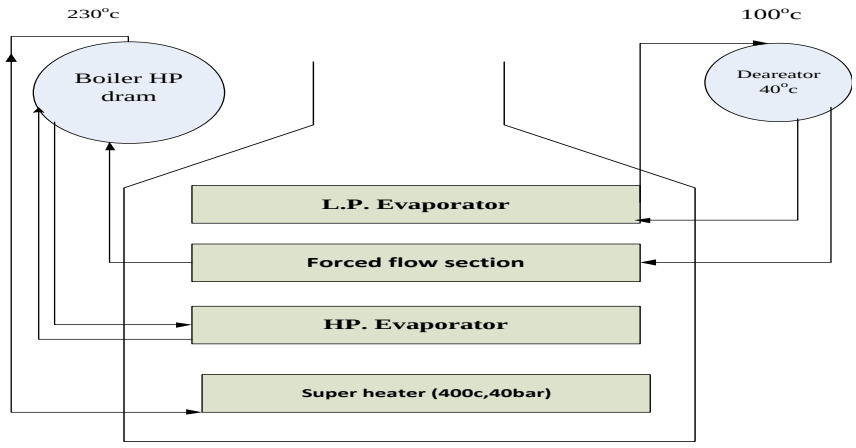

Figure 3-5: Design of Steam Generation process in CCPP

3.6.2 De-aerator

In combine cycle power plant it is used as the preserver of feed water which comes from the condenser by extraction pump. At this stage the temperature of feed water which enters the de-aerator is 40°C. From de-aerator the feed water is flowed into the low pressure evaporate again goes to de-aerator. When feed water through the LP Evaporate then it gains heat which is 100°C.

3.6.3 Forced Flow Section

At high pressure feed water goes through into the forced floe section and the temperature of feed water raises higher. Then the feed water is supplied to the high pressure boiler drum. Boiler feed pump is used to flow the water from LP boiler drum to HP boiler drum. When feed water passes through the forced flow section the temperature raises up to 220°C.

3.6.4 Super Heater

This part is at the bottom of the boiler where the temperature of the exhaust gas is highest. At this part the saturated steam becomes super-heated steam. Exhaust gas is flowed over the bundle of tubes which carry the steam. At the super heater the temperature of the exhaust gas that comes from the gas turbine is about 500°C. From the super heater the super-heated steam goes to the high pressure turbine at a temperature of 400°C and pressure of 40-bar.

CHAPTER - 4 Substation

In this part of my internship training Mr. Noor Mohammad (Manager of Substation) was my instructor where I worked 3 days. I visited sub-station yard, transmission field, sub-station control room.

4.1 Introduction of substation

The term substation may define as assembly of apparatus installed to change some characteristic of electric supply such as voltage, frequency, power factor etc. The purpose of substation is to take power at high voltages from the transmission or sub transmission level, reduce its voltage and supply it to a number of primary voltage feeders for distribution area. Besides that, it performs operational and emergency switching and protection duties at both the transmission and feeder lines. [2]

4.2 Equipment of Substation

Depend upon the type of sub-station in APSCL it required various type of equipment. Whatever, more commonly equipments are given below:

4.2.1 Bus Bars

A bus bar is used for a conductor carrying current to which many connections are made. These are generally used in sub-stations where the need number of incoming and outgoing lines at a same voltage. Normally bus bars used in the substations are of copper or aluminum and they are basically round and solid.

Figure 4-1: A typical bus bar of APSCL

4.2.2 C.T (Current Transformer)

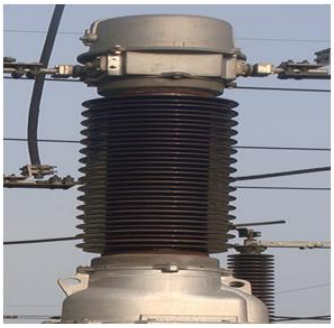

Figure 4-2: A typical CT

In electrical engineering, a current transformer (CT) is used for measurement of electric currents. When current in a circuit is too high to directly apply to measuring instruments, a current transformer produces a reduced current accurately proportional to the current in the circuit, which can be conveniently connected to measuring and recording instruments. A current transformer also isolates the measuring instruments from what may be very high voltage in the monitored circuit. Current transformers are commonly used in metering and protective relays in the electrical power industry. [1]

4.2.3 P.T (Potential transformer)

PT is used to measure or monitor the voltage on transmission lines and to isolate the metering equipment from the lines. It is also known as a voltage transformer (VT). PTs are designed to have a precise voltage ratio to accurately step down high voltages so that metering and protective relay equipment can be operated at a lower potential. Normally the secondary of a voltage transformer is rated for 69 V or 120 V at rated primary voltage. [2]

Figure 4-3: A typical PT

4.2.4 Transformer

Transformer is a static device used to transform power from one voltage level without changing the frequency. There are different parts of a transformer given below:

i. **Bushing:** This maintains the incoming and outgoing connection of a transformer.

Figure 4-4: Bushing of transformer

ii. **Radiator:** This is used to radiate the heat of a transformer when transformer is heated up at a certain level.

iii. **Oil temperature meter:** This meter indicates the temperature of transformer oil. If temperature crosses a certain level then it makes an alarm.

iv. **Temperature meter:** This meter indicates the temperature of transformer windings. If temperature crosses a certain level then it starts the winding fans.

v. **Oil level meter:** This meter indicates the oil level of transformer. If oil is low than a certain amount it makes an alarm that means that transformer have to feed oil.

vi. **Silica gel:** It works like breathing. There have a little amount oil under the silica gel which suck the moisture of air and further sends this air to silica gel which further sucks the rest of the moisture of the air.

Figure 4-5: Silica gel in a cylinder

vii. **Exchanger:** Regulate voltage through winding selection between primary & secondary side.

viii. **PRD (Pressure relief device):** release the oil pressure by releasing oil when oil pressure is high.

4.2.5 Insulator

Porcelain or ceramic insulator is used in substation to support the live conductors and bus bars.

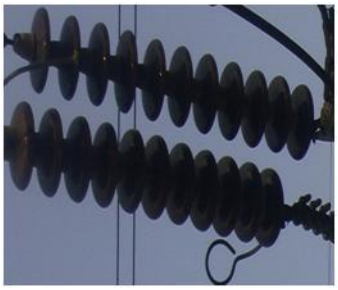

Figure 4-6: Insulator used in APSCL

4.2.6 Isolator

Islators are used for isolating the circuit when the current has already been interupted. They allow currents into the circuit until curcuit is repair again. Isolators re used for connecting and disconnecting parts of electrical installation after de-energizing.

Figure 4-7: Isolator used in APSCL

4.2.7 Lightning Arresters

All equipment those are feeding from power stations should be protected against direct lightning stroke. When stroke lightning stroke happens, a huge amount of surge voltage is created on the transmission line and this high voltage can damage any equipment within a short time. So this huge amount of lighting voltage are directly grounded through lightning arrester hence equipment are remains safe.

4.2.8 Sub-station Auxiliary Supply

In any substation, there are many equpinment and arrangements to supply power. Sometimes these equipments and arrangements are out of order due to different reasons and there have also several equipments (eg: circuit breakers, relay, isolator) to protect others. If the feeding line of protection provider equipment is failing then there should be an auxiliary power system. Generally this auxiliary power supply is DC supply.

4.3 Types of bus bar

Normally there are two types of bus bar in APSCL.

i. 230 KV bus bar : Generated units are stepped up to 230 KV bus bar.

ii. 132 KV bus bar : Generated units are stepped up to 132 KV bus bar.

4.3.1 Arrangement of bus bar

Bus bar is one of the most important elements in the electrical substation. Bus bar acts as nodal point in the substation which connects different incoming and outgoing circuits. Substations use different types of bus bar arrangements or switching schemes depends upon the application, reliability of the supply and cost of installation. In every substation bus bar plays a common role to connect different circuits. APSCL uses double bus-bar arrangement.

4.3.2 Double Main Bus-bar arrangement

Here each circuit is connected to both the buses. In some cases half of the circuits can be connected and operated on each bus when circuit breaker failure would cause loss to half of the circuits. In double main bus bar arrangement one or two breakers can be connected for each circuit. Double main bus bar and double breaker scheme provides high reliability for any type of fault in transmission line or circuit breaker. [5]

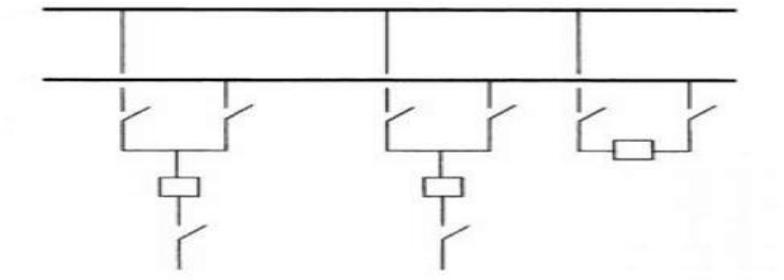

Figure 4-8: Double bus-bar arrangement

APSCL Uses double line bus bar arrangement scheme for their transmission purpose. They provide their generated power to Shajibazar, Ghorashal, Kishoregonj through double bus bar system.

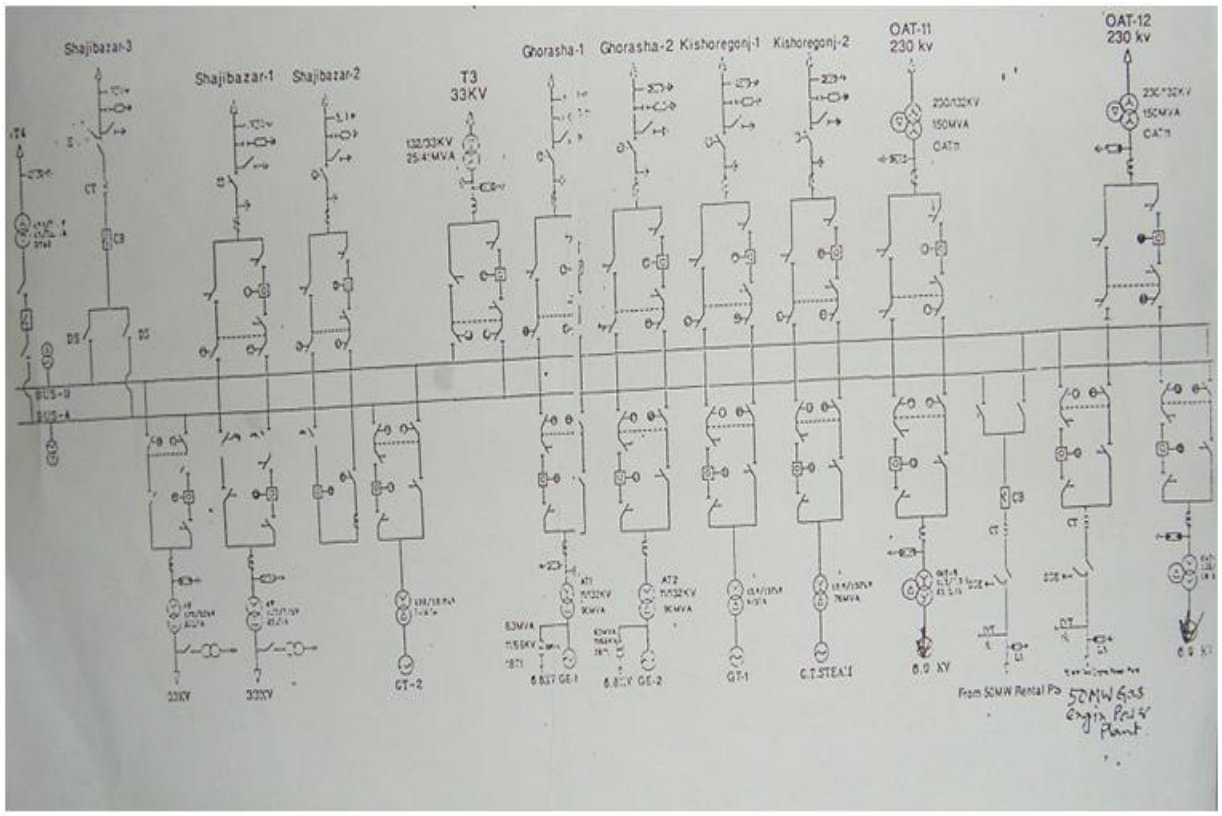

Figure 4-9: Double bus bar transmission arrangement of APSCL

4.4 Circuit Breaker

Circuit breakers are generally located so that each generator, transformer, bus, Transmission line, etc., can be completely disconnected from the rest of the system. These circuit breakers must have sufficient capacity so that they can carry momentarily the Maximum short-circuit current that can flow through them, and then interrupt this current; they must also withstand closing in on such a short circuit and then interrupting it according to certain prescribed standards. In the Ashuganj Power Station of Company Limited (APSCL) use MCB (Miniature Circuit Breaker), MCCB (Molded Case Circuit Breaker), ACB (Air Circuit Breaker), Vacuum Circuit Breaker, SF6 Circuit Breaker, Oil Circuit Breaker, Air Blast Circuit Breaker and Air Blast Circuit Breaker hear all of these circuit breaker working principle are descried. [6]

4.4.1 SF6 circuit breaker

SF6 is inert gas the property of this gas the higher pressure and temperature its dielectric strength will be SF6has two gas chamber when contract is close the pressure is two chamber have the same pressure but when the contract is open then one of the chamber get totally close and other remain open ,there is a narrow channel between two chamber and when contract open the SF6 flow a plane of high pressure region to the low pressure region there will be turbulence of SF6.At zero current the turbulence of SF6 absorb all the ions and since it is flowing from a narrow region hence it provide high dielectric strength but there is problem that the pressure of SF6 is not always remain fixed due to leakage in the cylinder of SF6 so there is pressure gauge as well as alarm attached with it. Whenever pressure decreases the alarm ringing and the gas is refilled to increase pressure.

Figure 4-10: SF6 circuit breaker

4.4.2 Oil Circuit Breaker

Bulk oil circuit breakers were designed as single-tank or three-tank mechanisms; generally, at higher voltages, three-tank designs were dominant. Oil circuit breakers were large and required significant foundations to support the weight and impact loads occurring during operation. The electrical arc generates hydrogen gas due to the decomposition of the insulating mineral oil. The interrupter is designed to use the gas as a cooling mechanism to cool the arc and to use the pressure to elongate the arc through a grid, allowing extinguishing of the arc when the current passes through zero.

Figure 4-11: Oil circuit breaker

4.5 Relay

A relay is a device used to control the operation of a magnetic contactor or other device .relay operate as a function of current ,voltage ,heat .and pressure and supply the “intelligence” that is necessary to provide automatic acceleration, protect against overload ,under voltage, excessive speed, excessive torque, etc. At APSCL two types of relay is used. One is electrical relay and another is electronics relay. [7]

4.5.1 Electrical Relay

Electrical relays Measuring and protection equipment These electrical relays trip to shut the system down until the problem can be addressed .An electrical relay is a switch which is under the control of another circuit., electrical relays were often made with electromagnets, They key difference between electromagnetic and solid state options is that electromagnetic relays have moving parts, and solid state relays do not. Electromagnets also conserve more energy than their solid state counterparts do.

4.5.2 Electronics Overload Relay

Electronic overload relays are the alternative to thermal overload relays. Electronic overloads relay offers reliable and fast protection for motors in the event of overload or phase failure. If a power phase is lost, motor windings can burn out very quickly. Electronic overload relays can detect a phase loss and disconnect the motor from the power source. Phase loss protection is not available on mechanical types of overload relays.

4.5.3 Buchholz relay

A Buchholz relay is a safety device sensing the accumulation of gas in large oil-filled Transformers, which will alarm on slow accumulation of gas or shut down the transformer if gas is produced rapidly in the transformer oil. These are used to break the circuit in case of any abnormalities in the transmission lines.

CHAPTER - 5 Generator

In this part of my internship training Md. Kamruzzaman (Senior Eng. of Generator) was my instructor where I worked 3 days. I visited Generation control room, generator, and steam turbine. Here I learned about Generator and different types of protection of generator.

5.1 Introduction to Generator

Generator is a electro mechanical device that converts mechanical energy into electrical energy. The operation of the electrical generators used depends upon the principle of electromagnetic conduction. When conductors move through a magnetic field or when a magnetic field in moved past conductors an induced current develops. The current that is induced into the conductors produces an induced electromotive force or voltage. To produce electricity there are 8 generators in APSCL.

Figure 5-1: Generator in APSCL

5.2 AC generator

Ac generator also called synchronous generators or alternators. Ac generators are the principal sources of electrical power throughout the world, and range in size from a fraction of a KVA to 1500 MVA. Alternating voltage may be generated by rotating a coil in the magnetic field or rotating by magnetic field within a stationary coil. The value of voltage generated depends on –

- **i.** The numbers of turn in the coil.
- **ii.** Strength of the field.
- **iii.** The speed at which the coil or magnetic fields rotate.

5.3 Generator Synchronization

The process of connecting an AC generator to other AC generators is known as synchronization and is crucial for the generation of AC electrical power. An AC machine must match both the amplitude and the timing of the network voltage, which requires both speed and excitation to be systematically and closely controlled for synchronization. [2]

5.4 Generator Protection

A modern generating unit is a complex system comprising the generator stator winding, associated transformer and unit transformer, the rotor with its field winding and excitation system, and the prime mover with its associated auxiliaries. Faults of many kinds can occur within this system for which diverse forms of electrical and mechanical protection are required. The amount of protection applied will be governed by economic consider rations, taking into account the value of the machine, and the value of its output to the APSCL OWNER. The following problems require consideration from the point of view of applying Generator Protection:

5.4.1 Over current protection

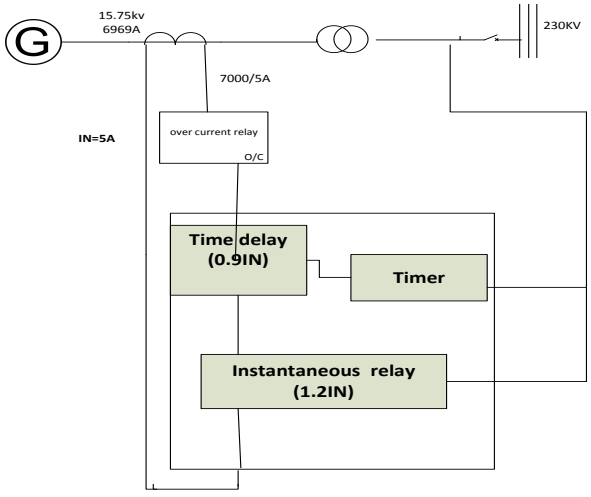

Figure 5-2: Over current protection

In APSCL generator unit 3, 4 and 5 uses rated terminal voltages 15.75kv and rated current 6995A. Hear over current relay connect through the CT with the terminal and use CT ratio 70000V/5A. Inversely we can say if 5A current flow the voltages flow 7000V,Over current relay consists of two types of relay, one is time delay relay which is connect with timer another is

instantaneous relay. In APSCL timer setting time is 0.5second. When time delay activated than start time counting and after 5second is breaks contract, on the other hand instantaneous relay operate instantaneously. Generally nominal current is 5A. If 0.9 times of nominal current flow through the line then time delay activated or if 1.2 times of nominal current flow through the line then instantaneous relay activated. In these case time delay activated but it start time counting where instantaneous relay operate instantaneously.

Suppose fault occurs in the terminal than high current (9000A) appear in the line time delay start time counting but instantaneous relay trip the breaker instantaneously. In the power r system time delay relay operate when load increase in the feeder line and instantaneous relay operate when fault in the line.

5.4.2 Stator Winding Protection

To respond quickly to a phase fault with damaging heavy current, sensitive, high-speed differential protection is normally applied to generators rated in excess of 1MVA. For large generating units, fast fault clearance will also maintain stability of the main power system. The zone of differential protection can be extended to include an associated step-up transformer. For smaller generators, IDMT/instantaneous over current protection is usually the only phase fault protection applied.

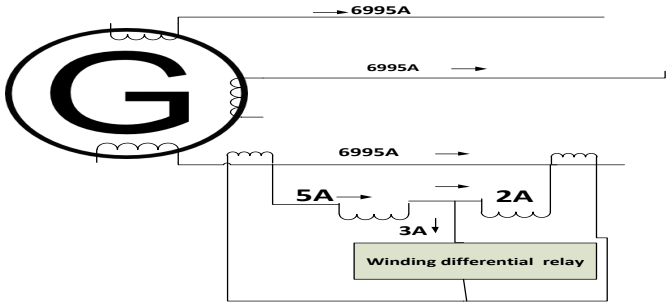

Figure 5-3: Stator Winding Protection.

5.4.3 Over current with under voltages

Over current with under voltages consist of under voltages section and under voltages section ,if only over current activated the relay do not operate .when over current and under voltage operate then the over current with under voltages relay operate .in the over current section if current flow 1.2in than it does not effect on the terminal voltages ,if current flow more the 1.2times of in in than the terminal voltages reduces ,for these reasons power system appear over current and

under voltages appear .when in the power system both condition appear then the under voltages with over current relay activated .if over current relay activated we understands that huge amount of fault in the system occurred ,if under voltage appear we can are confuse if it is fault or over load occurred or over voltages.

In the power system main causes of over voltages occur Sudden load rejection, Lightening, Line fault.

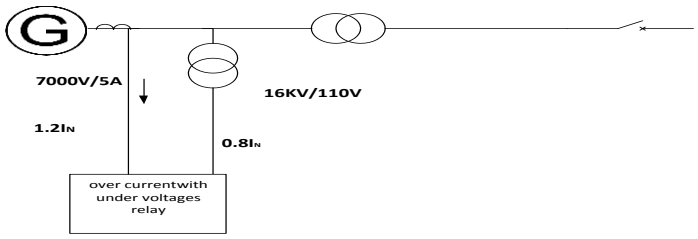

Figure 5-4: Over current protection

5.4.4 Over Speed Protection

The speed of a turbo-generator set rises when the steam input is in excess of that required to drive the load at nominal frequency. The speed governor can normally control the speed, and, in any case, a set running in parallel with others in an interconnected system cannot accelerate much independently even if synchronism is lost. However, if load is suddenly lost when the HV circuit breaker is tripped, the set will begin to accelerate

When a generator operating in parallel with others loses its power input, it remains in synchronism with the system and continues to run as a synchronous motor, drawing sufficient power to drive the prime mover. This condition may not appear to be dangerous and in some circumstances will not be so. However, there is a danger of further damage being caused.

5.4.5 Negative Sequence Protection

Power system can be divided into three sequences such as positive phase sequence, negative phase sequence and zero phase sequence.

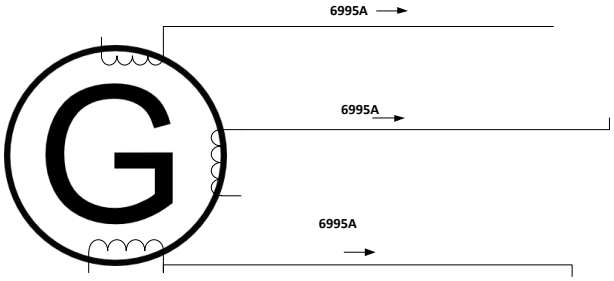

Figure 5-5: Negative sequence protection

5.4.6 Reverse Power Protection

Reverse power relay uses in APSCL for generator protection section .Its activated when real power and reactive power flows from grid to generator supply steam for rotor rotate 3000rpm and generate real power and supply field excitation to produces reactive power in the case if steam supply to the generator turn off the real power will be zero than grid supply real power to generator for rotation 3000rpm of rotor .in that case reverse power relay will trip the breaker .generator work as synchronous motor when real power is negative then grid supply real power. Synchronous motors use in APSCL to supply reactive power in the grid and over excited motor work as a condenser and power factor improvement .generator work as asynchronous motor when real power and reactive power is negative. When both real power and reactive power is positive than generator work as synchronous generator .when both real power and reactive power negative than generator work as asynchronous Generator. Asynchronous Generator has not existed in real life.

Lastly when real power is positive the generator work as synchronous generator and when real power is negative generator work as motor .when reactive power is positive generator work as asynchronous motor.

Figure 5-6: Reverse power Protection use in APSCL

5.4.7 Under Frequency Protection

An under frequency relay is one which operates when the frequency of the system falls below a certain value. Overloading of a generator, perhaps due to loss of system generation and insufficient load shedding, can lead to prolonged operation of the generator at reduced frequencies. This can cause particular problems for gas or steam turbine generators, which are susceptible to damage from operation outside of their normal frequency band. The turbine is usually considered to be more restrictive than the generator at reduced frequencies because of possible mechanical resonance in the many stages of the turbine blades. If the generator speed is close to the natural frequency of any of the blades, there will be an increase in vibration. Cumulative damage to the blades due to this vibration can lead to cracking of the blade structure .While load-shedding is the primary protection against generator overloading, under frequency relays should be used to provide additional protection. Alarm: 48 Hz.

5.4.8 Minimum impedance and Distance protection

Minimum impedance relay always deal with ratio of voltages and current .minimum impedance relay generally use in transmission line ,transformer, Grid, Generator .minimum impedance mean if voltages and current fluctuates then they always have ratio is call set point ,in APSCL use terminal voltages 110Vand current 5A then minimum impedance is

R= V/I = 110V/5 = 22.

So In APSCL use set point 22,if below set point then the plant will trip .if in the power system over load appear then current will increase in the terminal ,let current will increase 5Ato 18A then minimum impedance will be R=V/I=18

if in the power system short circuit occurred then current will increase in the terminal ,let voltages will decrease 5Ato 18A then minimum impedance will be R=V/I=80V/5A=16. In both case the plant will be trip

distance protection relay work same principle distance protection indicate the direction in which direction fault appear left or right side of generator .we ca set point in the case of distance protection .In APSCL use distance protection which sense 80%distance from the transformer winding and in the case of generator it sense 100%.the main difference between is distance relay is vector and minimum relay is scalar In the APSCL some synchronous generator has only minimum impedance relay And some generator use both minimum impedance and distance protection.

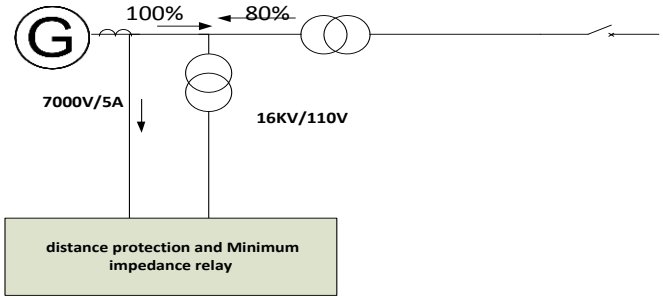

Figure 5-7: Minimum impedance and Distance protection

5.4.9 Stator ground fault protection

Stator ground faults are short circuits between any of the stator windings and ground, via the iron core of the stator. Typically, when a single machine is connected to the power system through a step-up transformer, it is grounded through high impedance. As a result, the amount of the short circuit current during stator ground faults is driven by the amount of capacitive coupling in the machine and its step-up transformer. Ground faults can be detected throughout most of the winding through the use of an overvoltage relay responding to the fundamental component of the voltage across the grounding impedance. This stator ground fault is sometimes known as 100% stator ground fault protection.

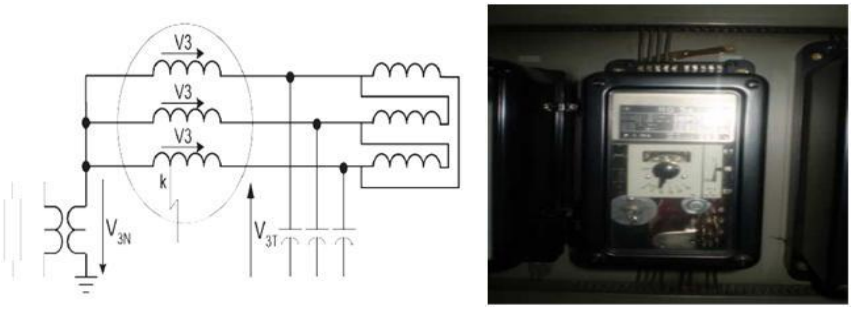

Figure 5-8: Stator ground fault protection

5.4.10 Back-up earth fault protection

This protection is provided as back-up earth-fault protection for the generator and downstream system. It must therefore have a setting that grades with the downstream protection. The protection is driven from the generator star-connected VT, while the downstream protection is current operated. It is therefore necessary to translate the current setting of the downstream setting of the current-operated earth-fault protection into the equivalent voltage for the NVD protection.

5.4.11 Rotor Earth Fault Protection

Two methods are available to detect this type of fault. The first method is suitable for generators that incorporate brushes in the main generator field winding. The second method requires at least a slip-ring connection to the field circuit.

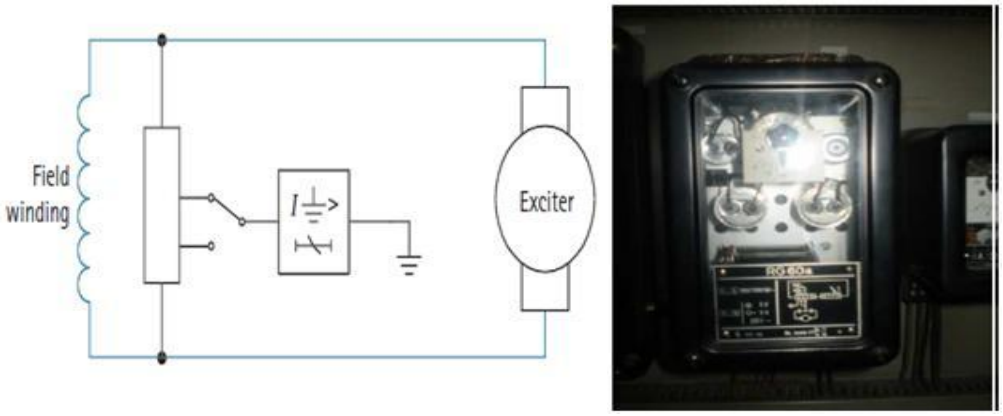

Figure 5-9: Earth fault protection of field circuit by potentiometer method & the relay used in APSCL

5.4.12 Unit Transformer Protection

Unit transformer are usually applied to balance the generator differential protection and prevent the unit Transformer through current being seen as differential current. The location of the third set of current transformers is normally on the primary side of the unit transformer. If located on secondary side of the unit transformer, they would have to be of an exceptionally high ratio. One advantage is that unit transformer faults would be within the zone of protection of the generator. However, the sensitivity of the generator protection to unit transformer phase faults would be considered inadequate, due to the relatively low rating of the transformer in relation to that of the generator. Thus, the unit transformer should have its own differential protection scheme.

CHAPTER - 6 Instrumentation and Control

In this part of my internship training Mr. Anwar Hossain (Meneger of Operation) was my instructor where I worked 2 days. I visited all control rooms where entire power plant can be controlled and supervised from the centered console and the large display panel in the main control room.

6.1 Control Units of APSCL

There are four different types of control room in Ashuganj Power Station and company limited (APSCL).

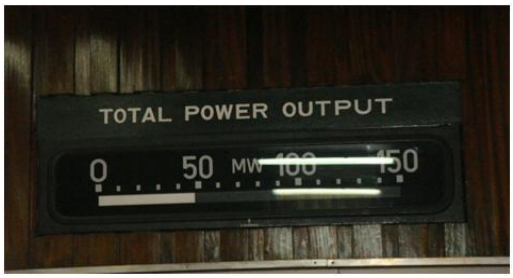

Figure 6-1: Total output unit measure meter

6.1.1 Control Room of Unit 1 & 2

Control system of unit 1 and 2 is analog in APSCL. Unit 1 and 2 of APSCL was developed in 1970. Power plant operators operate by pushing the button or changing the position of switch on control broad in these two control rooms. As the oldest power plant it is operated by senior engineer of APSCL.

Figure 6-2: Control unit 1 &2

6.1.2 Control Room of Unit 3 & 4

Control system of unit 3 and 4 is digital in APSCL. Unit 3 and 4 was developed from 1986 to 1988. All the metering and operation are done by using digital technology. Digital metering is more accurate than analog. So due to the advance technology and availability of devices less problems are faced to operate this unit.

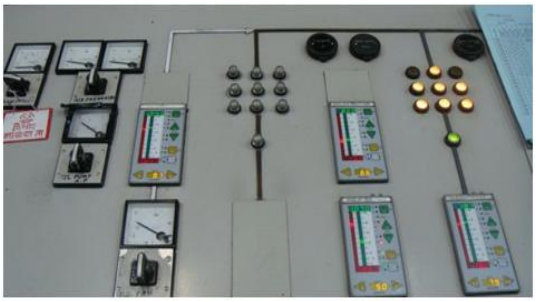

Figure 6-3: Control unit 3 & 4

6.1.3 Control Room of Unit 5

Control system of unit 5 is totally digitalized and controlled by pc. It needs little bit fewer operators than other power plant unit. This unit is controlled by PLA software.

6.1.4 Combine Cycle Control Unit

Gas turbine and steam turbine both combine consist of combine cycle .it was developed from 1982 to 1986 .in combine cycle use analog system .the efficiency of combine cycle day by day reduces because of backdated technology . in present situation the gas turbine unit 2 is totally unused .experts are require to repair and maintained combine cycle control unit .which has lack in APSCL.

Figure 6-4: Combine cycle control unit

6.2 Steam Generator Control

The object of steam generator control is to provide the steam flow required by the turbine at design pressure and temperature. The variables that are controlled are fuel firing rate, air flow, gas flow distribution, feed-water flow and turbine valve setting. The key measurements that describe the plant performance are steam flow rate, steam pressure, Steam temperature, primary and secondary airflow rates, fuel firing rate, feed-water flow rate and steam drum level, and electrical power output. The control system must act on the measurement of these plant parameters so as to maintain plant operation at the desired conditions.

6.3 Feed Water and Drum Level Control

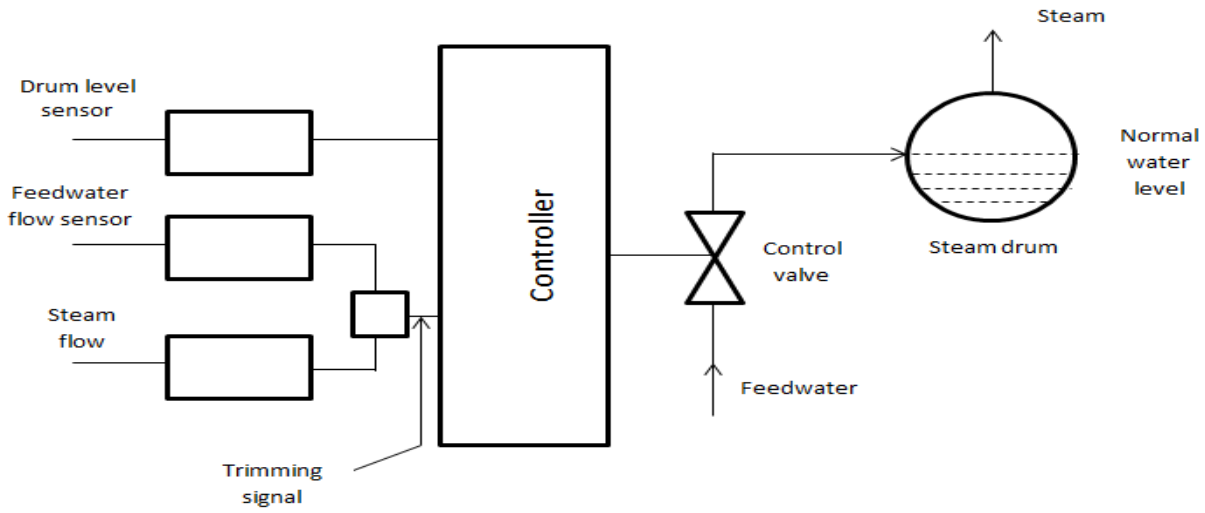

Figure 6-5: Feed water drum level control

Feed water and, therefore, steam flow is controlled to meet load demand by the turbine and at the same time maintain the level of water in the steam drum within relatively narrow limits. Normally, the water level in the drum is maintained half- full up to the diametric plane. High steam consumption by the turbine, combined with low feed-water supply would lower the water level in the drum. A three element automatic control system, of which the drum level is one element, is shown in fig: () The Drum level sensor respond to the error between actual drum level and its set point, such as in the case of high steam consumption and low feed-water supply, and acts of the controller to increase the feed-water valve opening to meet the steam flow demand. This action be too slow and is supplemented by sensor for feed-water and steam flow. The difference between the signals from these two sensors anticipates changes in drum level and sends a signal to the controller to actuate the valve in the desired direction.

6.4 Combustion Control

Combustion controls are used to adjust the amount o air and fuel supplied to the furnace to respond to the changes in boiler steam pressure. Three combustion controls are on-off, positioning, metering.

On-off controls, the simplest, are used on fire-tube and small water-tube boilers. The on-off control system supplies a pre- determined amount of fuel and air. On-off controls cannot supply a steady steam pressure because they work on a cyclic basis.

Positioning controls, used on many boilers, are more flexible and can provide better combustion efficiency than can on-off controls. These controls operate on a continuous basis, providing smoother changes in fuel and air feed allowing the boiler to maintain a more uniform steam pressure. The amount of air and fuel feed can be adjusted manually to change the air to fuel ratio.

Metering controls are a refinement of positioning controls. As with positioning controls, metering controls also have a master pressure controller that responds to a change in steam pressure. The metering control change the damper and fuel valve position to maintain the correct air to fuel ratio.

6.5 Safety Valve

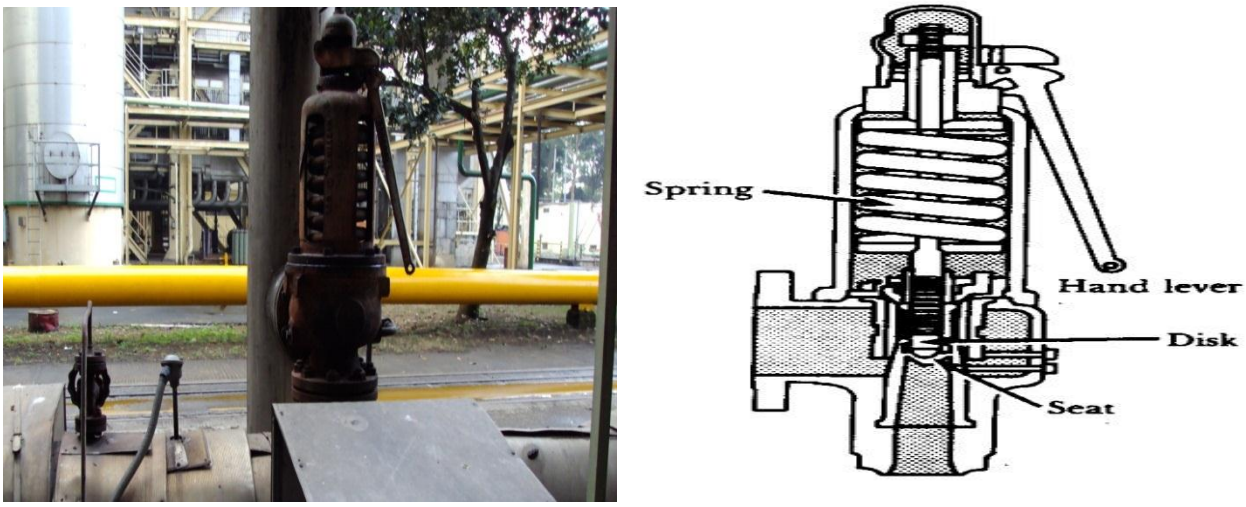

Figure 6-6: Safety valve used in APSCL

In the APSCL, boiler has several valve, they are set to pop at different pressure. Boilers are designed to operate at certain maximum pressures. IF the operating pressure is exceeded, the boiler may explode. Therefore, all boilers are equipped with at least one or more safety valves will open, releasing steam if the pressure in the drum becomes too high.

Safety valves can also be popped manually by using hand levers. For large boilers, each super-heater and re-heater will have one or more safety valves. The safety valves are located near the outlets of these tube sections.

6.6 Pressure gauge

In APSCL, pressure gauges are used to measure steam and water pressure in steam drums, feed-water heaters, steam headers, and other boiler equipment.

The Bourdon tube is the most common gauge used on a boiler. It consists of a curved tube that is sealed at one end. The sealed end is connected to a pointer by linkage. The open end of the gauge is the pressure connection. As pressure increases in the tube, the tube straightens out, moving the pointer. As the pressure decreases the tube returns to the normal curved position. Bourdon pressure gauges can measure pressures of steam, air, oil, water, or other fluids. These gauges require careful handling and proper maintenance to keep them operating accurately. They should be removed from their mountings, disassembled and cleaned with a suitable regularly.

Figure 6-7: Typical pressure gauge.

Steam gauges for a small boiler are usually mounted on top of the water column. The gauge will directly read the pressure of the boiler. In many boilers, so that they can easily be reads by the operator. At this level, the true steam pressure is the value read of the gauge minus the hydraulic

head. For each foot of vertical distance between the connection at the drum and the ground level, the gauge reading must be corrected by subtracting a value of 0.433 psi per foot of head. Gaugescan also be mounted above the point of pressure measurement. In this case the pressure due to the hydraulic head must be added to the gauge reading.

6.7 Flame detector

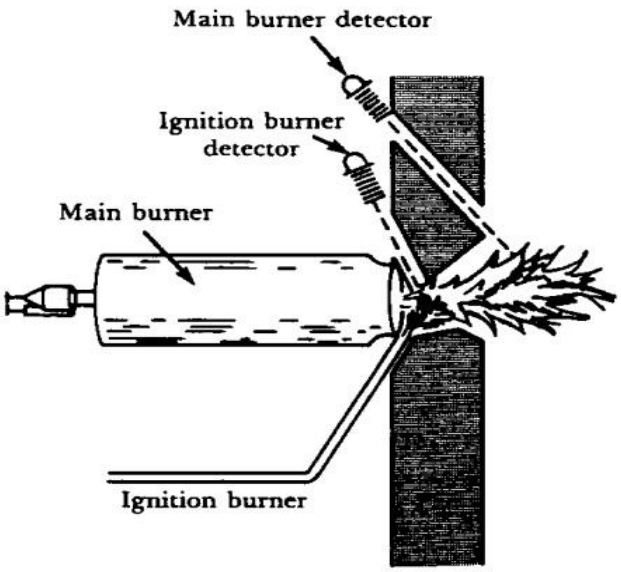

Figure 6-8: Flame detector.

Flame detectors, or scanners, monitor burner flames on all boilers and ignitors on coal or natural gas and oil- fired boilers. If the flame in a burner or ignitor goes out, a flame detector sends a signal to the fuel feed controls that automatically stop the flow of fuel into the boiler. Thus, the boiler is prevented from operation or igniting while explosive conditions in the furnace exist.

Three flame detectors used of boilers are photocell, ultraviolet, and infrared detectors. Photocells detect visible light, ultraviolet sensors detect ultraviolet light, and infrared sensors detect infrared light in the burner flame or ignitor. These devices are installed in the furnace wall as shown in figure.

6.8 Air flow transmitter

Air flow transmitter measures the flow of air to the boiler. It works by measuring pressure difference of two points. Formula is used $F \propto \sqrt{(\Delta P)}$, here F= air flow and P= pressure.

6.9 Junction box

Junction boxes are used where many wire connection are in a same node or same place. It removes the risk of wire shortage or leakage. Junction box also makes maintenance easier.

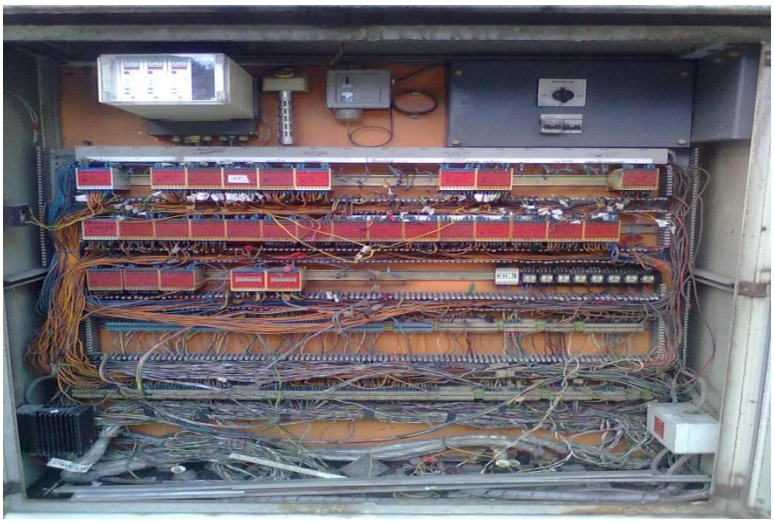

Figure 6-9: Junction box used in APSCL

6.10 Fire alarm

There are several fire alarms in APSCL for emergency purpose. If any accident happens then any one of operators should press the fire alarm button which blow the alarm that indicates that an accident occurred

Figure 6-10: Fire alarm used in APSCL

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6.11 Control of gas turbine

The purpose of gas turbine controls is to meet the specific control requirements of users and safe operation of the turbine. Which is given below:-

6.11.1 Turbine over temperature

Turbine temperature may be well sensed at the turbine inlet but the sensing device put at the turbine inlet goes wrong and therefore it is sensed at the turbine exhaust, which is also an indication of turbine inlet temperature. The temperature sensor may be a thermocouple, bimetal or mercury vapor. As soon as the turbine inlet/exhaust temperature increases a predetermined value, the relay system acts upon the shut-off valve and shut down the turbine by stopping the supply of fuel completely to the combustion chamber.

6.11.2 Turbine over speed

In this case, the reference speed is the maximum allowable speed instead of rated speed. The speed sensor could be a centrifugal governor, a tachometer generator or magnetic pick up. If the speed increases a certain fixed value, the speed acts upon the relay system to shut down the fuel valve.

6.11.3 Low lube oil pressure

It is essential to protect the turbine from low lube oil pressure to ensure proper lubrication and cooling of the turbine bearings. This is accomplished by the use of a pressure switch in the lube oil supply line. The switch operates an alarm signal or shut down fuel valve if the oil pressure drops a safe valve.

6.11.4 High lube oil temperature

High lube oil temperature in the lubrication system is a dangerous signal as it is an indication of low lube oil supply or failure in bearings, gears, etc. This protection is generally accomplished through the use of a temperature-sensing device immersed in the lube oil. The sensing device may be a thermal switch, which triggers an alarm or shut down the turbine.

6.11.5 Excessive vibration

A slight increase in vibration is a cause of warning. Protection against vibration is accomplished by stalling one or moves vibration pick-ups. The output signal is fed to a monitoring device, which may shut down the turbine if the vibration increases a certain value.

CHAPTER - 7 Conclusion

7.1 My achievements

Before internship I knew many theories and working principles of power system and related equipments but from internship I acquired practical knowledge about power system engineering and its equipment. Here, I always tried to relate my academic courses with practical participation of power generation process. Beside I also faced some practical problems which was not taught in my academic courses. My communication skill also improved through communication with different instructor. Therefore, I made good achievements with my industrial training which will help me in my future.

7.2 Problem faced

There are some problems which I faced during internship period. The problems are given below –

i. My instructor at APSCL showed me every equipment practically but did not relate with theory most of the times

ii. Practical participation in different works of APSCL would give more experience but practical participation was not allowed for internship student

iii. Company did not provide me enough data for security purpose.

7.3 Recommendations

Some recommendations are given below for the students to do their internship program in a better way –

i. The internship program should be scheduled in such a way so that it does not clash with the university classes.

ii. More theoretical knowledge about power generation, protection system, power equipments should be learnt before going for internship. Hence students must complete the related courses to their internship before joining the program. Taking the courses before the internship helps the students understand the topic much better.

7.4 Discussion

In case of power generation, APSCL is the combination of steam, gas and combined cycle plant. Last 26th December I went to Ashuganj Power Station Company ltd. for my internship program. I visited steam power plant, I observed how water is collected, purified and then boiled to produce steam. There are several switch gear and control rooms to control the overall system of producing steam and power generation. Various types of relays used for protective purposes that are also controlled in control room. I visited gas turbine of APSCL. There I have seen how fresh air and natural gas supplied by TITAS GAS are used as fuel to burn. After burning, produced hot gas used to rotate the turbine as well as power generation. For protective measures relays are also used and controlled in switch gear room. After gas turbine, I visited combined cycle power plant (CCPP). Here the exhausted hot gas is being used to boil water for producing steam. I visited the distribution section of APSCL. In sub-station, stepped up or down of voltages is being done using transformers and power is distributed. Different types of isolators are being used for maintenance purpose of transmission lines.

The authorities in APSCL were very concerned about all kinds of safety. The friendly environment in APSCL encouraged me to co-operate with each other. I learned a lot and obtained practical knowledge from my internship at APSCL, which will help me in my future life.

References:

[1] V.K. Mehta & Pohit Mehta, “Principles of Power system”, 4th Revised Edition, S.Chand & Company Ltd, 2009.

[2] M.V. Deshpande, “Elements of Electrical Power Station Design”, 3rd Edition, A.H.Wheeler & Company Private Ltd, 1986.

[3] http://www.apscl.com

[4] http://www.powerdivision.gov.bd

[5] http://www.scribd.com/doc/11911769/Network-Protection-and-Automation-Guide

[6] http://en.wikipedia.org/wiki/circuit_breaker

[7] http://en.wikipedia.org/wiki/relay

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Ashuganj Power Station Co. Ltd.
Name of the student:	Md. Iqbal Hossain
ID:	2008-3-80-014

Date:	26-12-2011
Start time/End time	08am to 04pm
Location:	Training Center & Whole Power Plant
Mentor:	Achinta Kumar Sarkar

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
c. The report should not be a compilation of lectures notes taken during the internship, rather it should depict what the intern has learned on a particular day.
d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

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East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

The objective of this day was
i. To know brief history of APSCL
ii. Know details about APSCL
iii. Visit whole power plant

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

This was an introductory day so first we met a DGM who provided his lecture about APSCL After that we visited the whole power plant with an officer. This day we didn't used any equipment rather we just introduced with the equipments.

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

This day we observed the machinary parts of the power plant only.

26.12.2011
Signature of the mentor with date
Name: ACHINTA KUMER SARKER
Designation: DGM(MM)
Contact Phone #: 01711-425460

10/7/12
Signature of academic supervisor with date
Name: ANWARUL AZIM
Designation:
LECTURER

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Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Ashuganj Power Station Co. Ltd.
Name of the student:	Md. Iqbal Hossain
ID:	2008-3-80-014

Date:	28-12-2011
Start time/End time	08am to 4pm
Location:	Steam turbine
Mentor:	Anwar Hossain

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
c. The report should not be a compilation of lectures notes taken during the internship, rather it should depict what the intern has learned on a particular day.
d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

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Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

The objective of this day was

1. Know details about steam turbine operation.
2. Know about the equipments operations
3. Know the configuration of different equipments

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

1. Boiler → Boiler Drum
   → Economizer
   → Superheater I, II, III
   → Reheater I, II
2. Force draft fan
3. Condenser
4. Feed water tank
5. Feed Pump
6. High pressure heater
7. Low Pressure heater
8. Air Pre heater
9. Combustion chamber
   i. Water tube
   ii. Gas control valve
   iii. Ignitor

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

In our academic course we learned about theory of different equipments but here we observed the different equipments physically & their operation practically.

07/1/12
Signature of the mentor with date
Name: Anwar Hossain
Designation: Manager (Operation)
Contact Phone #:

Anwarul Azim 10/07/12
Signature of academic supervisor with date
Name: Anwarul Azim
Designation: Lecturer

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Daily Activity Report

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Name of the company:	Ashuganj Power Station Co. Ltd.
Name of the student:	Md. Iqbal Hossain
ID:	2008-3-80-014

Date:	27-12-2011
Start time/End time	08am to 04 Pm
Location:	Steam turbine
Mentor:	Anwar Hossain

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
c. The report should not be a compilation of lectures notes taken during the internship, rather it should depict what the intern has learned on a particular day.
d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

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East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

The objective of this day was

1. Know the operational procass of the steam
2. Know the equipments of steam turbine.
3. know about type, efficiency of different parameters.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

This was the first day of our operational side so first we learned about theory part, details about steam turbine. Beside that we discussed the different equipments operation by several diagrams. We also compared theoretical parts with practical operation.

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

From our academic course we just knew the ~~Pure~~ theoritical parts only but here we observed the practical operations.

07/01/12
Signature of the mentor with date
Name: Anwar Hossain
Designation: Manager (Operation)
Contact Phone #:

Azim 10/07/12
Signature of academic supervisor with date
Name: Anwarul Azim
Designation: Lecturer

Department of Electrical and Electronic Engineering
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Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Ashuganj Power Station Co. Ltd.
Name of the student:	Md. Iqbal Hossain
ID:	2008-3-80-014

Date:	29-12-11
Start time/End time	08 am to 04 pm
Location:	Control room, Combustion chamber, Ground
Mentor:	Bikash Ranjan Roy

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
c. The report should not be a compilation of lectures notes taken during the internship, rather it should depict what the intern has learned on a particular day.
d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

EAST WEST UNIVERSITY

Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable, list multiple objectives)

The objective of this day was

1. Know about Instrumentation of the plant
2. Know about control system of the plant

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

1. Air ~~pump~~ fan
2. Air pre-heater
3. Tacho generator
4. Fire alarm
5. Safety valve
6. Air flow transmitter
7. Pressure transmitter
8. Oxygen meter
9. Solenoid valve
10. Analog control system in control room
11. Digital control system in control room
12. Thermocouple

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Here I gathered knowledge about Instrumentation & control system of power plant practically which I only knew theoritically.

02-01-2012
Signature of the mentor with date
Name: Bikash Ranjan Ray
Designation: Manager (I&C)
Contact Phone #: 01712887349

Anwarul Azim 10/07/12
Signature of academic supervisor with date
Name: Anwarul Azim
Designation: Lecturer

Department of Electrical and Electronic Engineering
East West University
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Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Ashuganj Power Station Co. Ltd.
Name of the student:	Md. Iqbal Hossain
ID:	2008-3-80-014

Date:	31-12-11
Start time/End time	08 am to 4Pm
Location:	Water Pump, Gas distribution field
Mentor:	Bikash Ranjan Roy

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
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Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

The objective of this day was
1. ~~Know~~ the control system & Instrumentation of water pump
2. know the control system & Instrumentation of gas distribution field.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

1. Water pump
2. Pump valve control panel
3. Discharge valve
4. Annunciator for water pump
5. Lub water filter
6. Water pressure meter
7. Emergency button for pump
8. Gas Control unit
9. Junction box in gas field
10. mechanical valve & Solenoid valve of gas
11. Gas flow meter
12. Gas pressure meter

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

I knew only the theoretical part that how to control & measures different system but here I gathered practical knowledge & Operation.

02-01-2012

Signature of the mentor with date
Name: Bikash Ranjan Roy
Designation: Manager (I&C)
Contact Phone #: 01712887349

10/7/12

Signature of academic supervisor with date
Name: Anwarul Azim
Designation: Lecturer

Department of Electrical and Electronic Engineering
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Daily Activity Report

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Name of the company:	Ashuganj Power Station CO. Ltd.
Name of the student:	Md. Iqbal Hossain
ID:	2008-3-80-014

Date:	01-01-12
Start time/End time	08 am to 04 Pm
Location:	Steam turbine, Control room
Mentor:	Bikash Ranjan Roy

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
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d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

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East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

The objective of this day was
1. Know about the different control systems in steam turbine and how to operate those equipments
2. Know about the control room operation and their working principles.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

1. Recirculation valve
2. Air regulation valve
3. Flow switch with indicator
4. Pneumatic control valve actuator
5. Make up water flow transmitter
6. Air removal pump,
7. Air compressor,
8. Condensate control valve
9. Differential pressure controller
10. Hot well level controller
11. Different control system in control room
12. Different types isolator switches.

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

In our academic course, we just knew the theory that, how a pressure meter, flow meter, level meter works but here we observed the equipments structures and functioning practically.

02-01-2012
Signature of the mentor with date
Name: Bikash Ranjan Roy
Designation: Manager (TEC)
Contact Phone #: 01712887349

Anwarul Azim 10/07/12
Signature of academic supervisor with date
Name: Anwarul Azim
Designation: Lecturer

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
Daily Activity Report

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Name of the company:	Ashuganj Power Station Co. Ltd.
Name of the student:	Md. Iqbal Hossain
ID:	2008-3-80-014

Date:	02-01-2012
Start time/End time	08am to 04 Pm
Location:	Gas turbine
Mentor:	Mizanur Rahman

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
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d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

The objective of this day was
1. know ~~about~~ the operation of a gas turbine.
2. know the equipments of gas turbine.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

First we discussed about theory part then we observed several equipments given follow:

1. Disel engine
2. Torque Converter
3. Exciter
4. Compressor
5. Gas turbine
6. Combustion chamber

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Here we observed the equipments of a gas turbine and their operations practically which we knew only theoretical part only from our academic course.

2-1-12
Signature of the mentor with date
Name: Mizanur Rahman
Designation: Manager (CCPP)
Contact Phone #:

Anwarul Azim 10/7/12
Signature of academic supervisor with date
Name: Anwarul Azim
Designation: Lecturer

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Ashuganj Power Station Co. Ltd.
Name of the student:	Md. Iqbal Hossain
ID:	2008-3-80-014

Date:	03-01-2012
Start time/End time	08 am to 04 pm
Location:	Gas turbine, Combine turbine
Mentor:	Mizanur Rahman

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
c. The report should not be a compilation of lectures notes taken during the internship, rather it should depict what the intern has learned on a particular day.
d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

The objective of this day was
1. know about the operation of a CCPP.
2. know about the equipments of a CCPP.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

First we discussed theoritical part of a CCPP then we observed several equiments mentioned follow:

1. Low pressure heater
2. High Pressure heater
3. Super heater
4. Dampers
5. Economisers
6. Boiler drump
7. Fuel pump

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

In our academic course we gatered theoritical operation of a power plant but here we observed the practical applications.

3-1-12

Signature of the mentor with date
Name: Mizanur Rahman
Designation: Manager (CCPP)
Contact Phone #:

10/07/12

Signature of academic supervisor with date
Name: Anwarul Azim
Designation: Lecturer

Department of Electrical and Electronic Engineering
East West University
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Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Ashuganj Power Station Co. Ltd.
Name of the student:	Md. Iqbal Hossain
ID:	2008-3-80-014

Date:	04-01-2012
Start time/End time	08am to 04 Pm
Location:	Gas engine power plant
Mentor:	Mizanur Rahman

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
c. The report should not be a compilation of lectures notes taken during the internship, rather it should depict what the intern has learned on a particular day.
d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

The objective of this day was
1. know the operation of a gas turbine & gas engine power plant
2. know about the different equipments

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

First we discussed about the theoritical part of a CCPP, Gas engine power plant, Gas turbine then we observed several equipments given follow:

1. Economizer
2. Lub oil tank
3. Lub oil Cooler

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Here we gathered practical knowlege which we knew theoritically only

4-1-12

Signature of the mentor with date
Name: Mizanur Rahman
Designation: Manager (CCPP)
Contact Phone #:

Anwarul Azim 10/07/12

Signature of academic supervisor with date
Name: Anwarul Azim
Designation: Lecturer

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
Daily Activity Report

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Name of the company:	Ashuganj Power Station Co. Ltd.
Name of the student:	Md. Iqbal Hossain
ID:	2008-3-80-014

Date:	05-01-2012
Start time/End time	08am to 04Pm
Location:	Sub-station (Switch yard)
Mentor:	Noor Mohammad

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
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East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

The objective of this day was
1. know about the operational procedure of sub-station
2. know the different equipments of a sub-station and their principles.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

This was the first day in sub-station section so we discussed about theory and beside that we observed several equipments; given below:

1. Transformer → Bushing
   → Gaskate
2. Transmission line
3. current Transformer (CT) & Potential transformer (PT)

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

We knew theoritical principles of different sub-stations but here we gathered practical knowledge about sub-station & different equipments of sub-station.

5/1/2012
Signature of the mentor with date
Name: Noor Mohammad
Designation: Manager (Sub-station)
Contact Phone #:

10/07/12
Signature of academic supervisor with date
Name: Anwarul Azim
Designation: Lecturer

ব্যবস্থাপক (উপ-কেন্দ্র)
এস্কাটন পাওয়ার ষ্টেশন কোং লিঃ
আশুগঞ্জ, ব্রাহ্মণবাড়িয়া

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Ashuganj Power Station Co. Ltd.
Name of the student:	Md. Iqbal Hossain
ID:	2008-3-80-014

Date:	07-01-2012
Start time/End time	08am to 04Pm
Location:	Sub-Station (Switch Yard)
Mentor:	Noor Mohammad

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
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d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

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East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

The objective of this day was

1. Know about sub-station operation
2. Know the construction & operation of a transformer
3. Know about different equipments that used in sub-station.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

The equipments that we observed given below:

1. Bus bar
2. CT (Current transformer)
3. PT (Potential transformer)
4. Transformer
   - i) Bushing
   - ii) radiator
   - iii) Cooling fan
   - iv) Oil temp. meter
   - v) Silica gel
   - vi) PRD
5. SF_6 circuit breaker
6. minimum oil circuit breaker
7. Insulator
8. Lighting arrester
9. Conductor

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Here we gathered different equipment operational knowledge practically which we knew only theoritically only.

7/11/2012
Signature of the mentor with date
Name: Noor Mohammad
Designation: Manager (Sub. station)
Contact Phone #:

10/07/12
Signature of academic supervisor with date
Name: Anwarul Azim
Designation: Lecturer

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Ashuganj Power Station Co. Ltd.
Name of the student:	Md. Iqbal Hossain
ID:	2008-3-80-014

Date:	08-01-2012
Start time/End time	08am to 04 Pm
Location:	Sub-station (Switch Yard) & Control room
Mentor:	Noor Mohammad

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
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Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

The objective of this day was

1. Know details about transmission line & its protecti
2. Know about sub-stational faults & its remedy
3. Know about sub-stational control room

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

1. Backup DC battery
2. Rectifier
3. Conductor
4. Distance relay
5. Impedance relay
6. Earth fault relay
7. Manual control switches of different equipments in control room.
8. Different parameter measurements meter in control room.

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Here we gathered practical knowledge about sub-station & its control system which we knew theoritically from our academic course.

8/11/2012
Signature of the mentor with date
Name: Noor Mohammad
Designation: Manager (Sub-station)
Contact Phone #:

ব্যবস্থাপক (উপ-কেন্দ্র)
বাংলাদেশ পাওয়ার ডেভেলপমেন্ট বোর্ড
আশুলিয়া

Anwarul Azim 10/7/12
Signature of academic supervisor with date
Name: Anwarul Azim
Designation: Lecturer

Department of Electrical and Electronic Engineering
East West University
EEE 499
Industrial Training
Daily Activity Report

Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Ashuganj Power Station Co. Ltd.
Name of the student:	Md. Iqbal Hossain
ID:	2008-3-80-014

Date:	09-01-2012
Start time/End time	08 am to 04 PM
Location:	Unit 3 & 4 (Steam turbine)
Mentor:	Mohammad Kamruzzaman

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
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d. In case of any confusion, interns are strongly recommended to consult their respective academic supervisors.

Department of Electrical and Electronic Engineering
East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

The objective of this day was
1. Know the construction of Generator
2. Know the classification of Generator
3. Know the working principles of Generator

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

We gathered theoritical knowledge by several activities given below:
1. Discussed different types of generators from different aspects
2. Discussed structure of Ac/Dc generators
3. Discussed about operational characteristics of Ac/D generators
4. Discussed about rotor & stator and their principles
5. Discussed about shaft voltage measurement, maintance work and cooling system of a generator.

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Here I gathered theoritical knowlege which is similar with my academic course.

09.01.12
Signature of the mentor with date
Name: Md. Kamruzzaman
Designation:
Contact Phone #:

Mohammad Kamruzzaman
Senior Engr. (Generator)
Ashuganj Power Station Co. Ltd.
Ashuganj, B-Baria-3402

Anwarul Azim 10/07/12
Signature of academic supervisor with date
Name: ~~Md. Kamruzz~~ Anwarul Azim
Designation: Lecturer

Department of Electrical and Electronic Engineering
East West University
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Separate Daily Activity Report should be completed by each intern for every day of work and should be signed by the mentor from the company and the academic advisor. Copy of all the reports should be attached to the final internship report.

Name of the company:	Ashuganj Power Station Co. Ltd.
Name of the student:	Md. Iqbal Hossain
ID:	2008-3-80-014

Date:	10-01-2012
Start time/End time	08am to 04Pm
Location:	Unit 3 & 4 (Steam turbine)
Mentor:	Mohammad Kamruzzaman

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
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Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

The objective of this day was

1. Know about maintanance of generator
2. Know the excitation & synchronization of generator.
3. Know the protections of a generator

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

We gathered theoritical knowledge given below:

1. Discussed about air filter cleaning, Dehumedifier checking, shaft voltage measurement etc
2. Discussed about Generator cooling system
3. Discussed about the protections of a generator such as over current protection, under frequency, loss of excitation, over voltage protection etc

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Here I gathered theoritical knowlege which is similar to my academic course.

09-01-12
Signature of the mentor with date
Name: Md. Kamruzzaman
Designation:
Contact Phone #:

Mohammad Kamruzzaman
Senior Engr. (Generator)
Ashuganj Power Station Co. Ltd.
Ashuganj, B-Baria-3402

10/07/12
Signature of academic supervisor with date
Name: Anwarul Azim
Designation: Lecturer

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Daily Activity Report

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Name of the company:	Ashuganj Power Station Co. Ltd.
Name of the student:	Md. Iqbal Hossain
ID:	2008-3-80-014

Date:	11-01-2012
Start time/End time	08am to 04pm
Location:	Unit 3 & 4 (Steam turbine)
Mentor:	Mohammad Kamruzzaman

General Instructions:

a. It is the intern's duty to make sure that all his/her daily activity reports are appropriately signed by both the mentor and the academic supervisor.
b. The daily report should be a brief narration of the activities during the internship period in the eyes of the intern and should be completed and submitted by every intern irrespective of the number of partners s/he might have for the presentation and final report writing purpose.
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East West University

Address the following points briefly (Use additional page if necessary)

1 What was the objective of the day's activities? (If applicable. list multiple objectives)

The objective of this day was
1. know about generator protection from differe
fault
2. know about different parts of a generator
3. know the control process of a generator from
a control room.

2. List the day's activities according to the order of objectives listed in 1. Mention the specifications of the equipments used/visited. Comment on how these activities fulfill your objectives.

We discussed theory about generator protection then we observed several equipments given below:

1. Impedance starting relay
2. Distance protection relay
3. Unit transformer differential relay
4. Distance protection time relay
5. Unit auxiliary transformer over current relay
6. Unit auxiliary transformer diff. relay

3. Relate your practical activity with the theoretical knowledge you gained in the respective academic course.

Here I observed several equipments & their operation practically which I knew theoretically only.

11-01-12
Signature of the mentor with date
Name: Md. Kamruzzaman
Designation:
Contact Phone #:

Mohammad Kamruzzaman
Senior Engr. (Generator)
Ashuganj Power Station Co. Ltd.
Ashuganj, B-Baria-3402

Anwarul Azim 10/07/12
Signature of academic supervisor with date
Name: Anwarul Azim
Designation: Lecturer