Internship Report

On

Power Generation, Transmission and Distribution

Of

Ashuganj Power Station Company Limited (APSCL)

By

Rezaul Islam (2007-2-80-001)

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Submitted To The

Department of Electrical and Electronic Engineering
Faculty of Sciences 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)

Spring, 2012

Approved By

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| Academic Advisor | Academic Advisor | Department Chairperson |
| Dr. Khairul Alam | Tahseen Kamal | Dr. Khairul Alam |

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

**CIRIFICATION FOR INDUSTRIAL ATTACHMENT TRAINING PROGRAMME**

***Certified that Rezaul Islam, Student. ID No- 2007-2-80-001 of Electrical & Electronic Engineering Département 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 Coordinator**
**&**
**Manager (HRD)**
**Ashuganj Power Station Company Ltd.**
**Ashuganj, B-Baria.**

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# Acknowledgment

The whole praise is to almighty Allah, creator of this universe. Who made us the super creature with great knowledge and who able us to accomplish this work. We also feel great pleasure in expressing our deepest appreciation and heartiest gratitude to the staff of Ashuganj Power Station Company Limited (APSCL) for their guidance and great help during the internship period. We would like to thank Engr. Md. Nurul Alam, Managing Director, APSCL and for allowing us to do the internship in Ashuganj Power Station Company Limited (APSCL). We would also like to thank Md. Luthfar Rahman, Manager (HRD) for his kind cooperation during internship period.

We would like to express our deepest affection for my parents and our friends who was always by us and encourage us during this internship period.

We would also like to thank our supervisors Dr. Khairul Alam (Associate Professor), Ms. Tahseen Kamal (Senior Lecturer) of Department of Electrical and Electronic Engineering, East West University, Bangladesh. With the guidance of our supervisors we have been able to complete our internship report properly. We would also like to thank Dr. Anisul Haque, Professor of the Department of Electrical & Electronic Engineering for his kind cooperation during internship period. We are also grateful to all of our teachers for their cooperation and encouragement throughout our whole academic life in East West University.

We also would like to thank of our mentors Engr. Achinta Kumar Sarker (DGM), Engr. Md. Anware Hossain, Manager (Operation), Engr. Noor Mohammed, Manager (Sub-Station), Engr. Md. Kamruzaman, Senior Engineer (Generator and Switchgear Protection.), Bikash Ranjan Roy, Manager (Instrumentation and Control), Md. Fazle Hasan Siddiqui, Assistant Engineer (Combined Cycle Power Plant), Khandaker Nazmul Amin, Assistant Engineer (Combined Cycle Power Plant), who had given us appointment from their precious time. We learned a lot from them in a very short period.

Under the supervision of Electrical & Electronic Engineering Department, We were lucky enough to undertake15 days internship that expanded our horizons and our way of thinking.

# Executive Summary

We got an opportunity to complete our internship in Ashuganj Power Station which is the second largest power station in Bangladesh at present. Internship was necessary for us to fulfill the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering. Our internship started on 26 December, 2011 and ended on 11 January, 2012. Our total working hours were 105 hours. Our internship at Ashuganj Power Station Company Limited (APSCL) was on the generation and distribution of the practical field of power sector. During this internship we got the opportunity to work as a member of a team which was involved in generator section, combined cycle power plant, thermal or steam power plant, sub-station section, operation section, instrumentation and control section. After completion of a complex procedure power is generated supplied to the grid.

We gathered practical experiences about generator, generator cooling system, turbines and generator protection system in the generator section of APSCL. We gathered practical experiences about steam generating equipments like boilers, condenser, water treatment plant, feed water tank, gas treatment plant and steam auxiliaries equipments from thermal power plant. We also gathered practical experiences about combined cycle power plant which consists of two plants like gas turbine power plants and steam turbine power plants. We gathered practical experiences about the components of combined cycle power plant are diesel engine, compressor, combustion chamber, diffuser and gas turbine. We gathered practical knowledge about instrumentation and control system like selection of instrumentation and how to control different type of valve, pump, pressure gauge, flame detector and protection system using directly operating system or digital control system. The substation of APSCL is outdoor type, step up, double bus bar type substation .We gathered practical experiences about different types of equipments in the substation of the APSCL i.e. power transformers, instrument transformers, SF6 circuit breaker, oil circuit breaker, air blast circuit breaker, relay, lightning arrester, bus-bar, transmission line. During our internship period we also learn about the bushing connection of power transformer and megger test of circuit breaker in the substation of APSCL. We observed that the electric power is first produced at power station and then delivered to the consumers through a large network of transmission and distribution system. We also visited the control room of APSCL where engineers and technicians control and monitor the electricity flowing in

and out of the substation and the functioning of all the electric equipments, through several panels in the control room.

# Training Schedule

The following table contains our training schedule in Ashuganj Power Station Company Limited (APSCL). Our internship started on 26 December, 2011 and ended on 11 January, 2012. Our total working hours was 105 hours. We visited combined cycle power plant (CCPP), substation, generating section, operating section, instrumentation and control section (I & C). During internship we gathered the practical knowledge about the design, generation and distribution of the power station.

| Day | Start/End Time | Break Time | Mentor | Location | Total Hours |
|---|---|---|---|---|---|
| Monday 26/12/11 | 8am-4pm | 1pm-2pm | Achinta Kumer (Dy. General Manager) | APSCL | 7 hours |
| Tuesday 27/12/11 | 8am-4pm | 1pm-2pm | Md. Fazle Hasan Siddiqui Assistant Engineer(CCPP) | CCPP | 7 hours |
| Wednesday 28/12/11 | 8am-4pm | 1pm-2pm | Khandaker Nazmul Amin Assistant Engineer(CCPP) | CCPP | 7 hours |
| Thursday 29/12/11 | 8am-4pm | 1pm-2pm | Noor Mohammad Manager(Substation) | Sub-station | 7 hours |
| Saturday 31/12/11 | 8am-4pm | 1pm-2pm | Noor Mohammad Manager(Sub-station) | Sub-station | 7 hours |
| Sunday 01/01/12 | 8am-4pm | 1pm-2pm | Noor Mohammad Manager(Sub-station) | Sub-station | 7 hours |
| Monday 02/01/12 | 8am-4pm | 1pm-2pm | Mohammad Kamruzzaman Senior Engineer (Generator & Switchgear protection) | Generating Section | 7 hours |
| Tuesday 03/01/12 | 8am-4pm | 1pm-2pm | Mohammad Kamruzzaman Senior Engineer (Generator & Switchgear protection) | Generating Section | 7 hours |
| Wednesday 04/0112 | 8am-4pm | 1pm-2pm | Mohammad Kamruzzaman Senior Engineer (Generator & Switchgear protection) | Generating Section | 7 hours |
| Thursday 05/01/12 | 8am-4pm | 1pm-2pm | Md. Anwar Hossain Manager(Operation) | Operating Section | 7 hours |

| Day | Start/End Time | Break Time | Mentor | Location | Total Hours |
|---|---|---|---|---|---|
| Saturday 07/01/12 | 8am-4pm | 1pm-2pm | Md. Anwar Hossain Manager(Operation) | Operating Section | 7 hours |
| Sunday 08/01/12 | 8am-4pm | 1pm-2pm | Md. Anwar Hossain Manager(Operation) | Operating Section | 7 hours |
| Monday 09/01/12 | 8am-4pm | 1pm-2pm | Bikash Ranjan Roy Manager(Instrumentation & Control) | I & C | 7 hours |
| Tuesday 10/01/12 | 8am-4pm | 1pm-2pm | Bikash Ranjan Roy Manager(I & C) | I & C | 7 hours |
| Wednesday 11/01/12 | 8am-4pm | 1pm-2pm | Bikash Ranjan Roy Manager(I & C) | I & C | 7 hours |

# Table of Contents

# List of Tables

# List of Figures

# Chapter 1

## 1. Introduction

APSCL was established in 1966. APSCL is the second largest power station in Bangladesh at present. Now there are total 9 units at APSCL. The installed capacity and present (de-rated) generation capacity of APSCL are 777MW and 686MW. APSCL fulfills about 15% loads of our country.

### 1.1 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. The company is taken many development programs to increase our power generation.

### 1.2 Company Profile

Name of the Company: Ashuganj Power Station Company Limited (APSCL)
Date of Incorporation: 28 June 2000
Registration No: C-40630 (2328)/2000 date: 28.06.2000.
Location: 90 km North-East of Dhaka on the left bank of the river Meghna.
Land: 311.22 Acres
Installed Capacity: 777 MW
Total number of plants: 4
Total Number of Units: 9
Plant 1: Thermal Power Plant (TPP)
Two Steam Units of 64MW- Unit # 1 & 2 each-commissioned in 1970.

Plant 2: Combined Cycle Power Plant (CCPP)

Gas Turbine Units-GT1 and GT2 of capacity 56MW each commissioned in 1982 and 1986 respectively. One Steam Turbine (ST) of capacity 34MW with waste heat recovery Boiler commissioned in 1984.

Plant 3: Thermal Power Plant (TPP)

Unit # 3 of 150MW capacity was commissioned in 1986.

Unit # 4 of 150MW capacity was commissioned in 1987.

Unit # 5 of 150MW capacity was commissioned in 1988.

Plant 4: Gas Engine Power Plant (GEPP)

Gas Engine Power Plant commissioned in 2011. According to APSCL, there are 16 generating units in the newly establish Gas Engine Power Plant. Each unit generates 3.332MW of electricity so that all units will generate 53.312 MW. Of them, 50 MW will regularly be supplied to the national grid while 3.312 MW will remain surplus, which will be used for internal purpose of the plant.

### 1.3 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.

### 1.4 Scope and Methodology

In this report mainly primary information is used. However, secondary sources are also used in some case where it is necessary.

- Primary Information: The primary source of information is hand on experience that we achieved in APSCL. Notes, lectures, sketches, diagrams, templates, photo are the primary source of information that we collected from APSCL.
- Secondary Information: The secondary source of information is based on Internet Searching, Reference Books etc.

# Chapter 2

## 2. Generator and Generator Protection of APSCL

### 2.1 Generator

**Mentor:** Mohammad Kamruzzaman, Senior Engineer (Generator & Switchgear protection).

Figure 2.1: Generator of APSCL

In the Ashuganj Power Station Company Limited (APSCL), generator section is the most important parts for generating electric energy from other forms of energy. During our internship we worked at APSCL generator section from 2nd January, 2012 to 4th January, 2012.In the generator section our mentor was Engr. Mohammad Kamruzzaman (Generator & Switchgear protection). He tried to give us practical knowledge about the about generator and Switchgear protection.

There are five units and five generators in the generating power plant in APSCL. The Characteristics of generators in whole APSCL are given below:

Table 2.1: Generator Characteristics

| Characteristics | Steam power plant | | CCPP | | |
|---|---|---|---|---|---|
| | Unit | | GT-1 | GT-2 | Steam turbine |
| | 1,2 | 3,4,5 | | | |
| Manufacturer | BBC,GERMANY | ABB, GERMANY | GEC, UK | GEC,UK | GEC,UK |
| Type | WT 572h, Self excited | WX21L-100LL, Self/Externally excited | Revolving Field, Cylindrical Rotor, Brush less | Revolving Field, Cylindrical Rotor, Brush less | Revolving Field, Cylindrical Rotor, Brush less |
| Output | 64MW | 150MW | 55.67MW | 55.67MW | 34MW |
| Voltage | 11KV | 55.75KV | 13.8KV | 13.8KV | 13.8KV |
| Excitation voltage | 249/267V | 323V | | | |
| Current | 4690A | 6965A | 2911A | 2911A | 1799A |
| Excitation current | 1238A/1327A | 1500A | - | - | - |
| Frequency | 50Hz | 50Hz | 50Hz | 50Hz | 50Hz |
| Poles | 2 | 2 | 2 | 2 | 2 |
| cos $\varphi$ | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 |
| Cooling system | $H_2$ cooled | Air cooled | Air cooled | Air cooled | Air cooled |

## 2.2 Working Principle of Generator

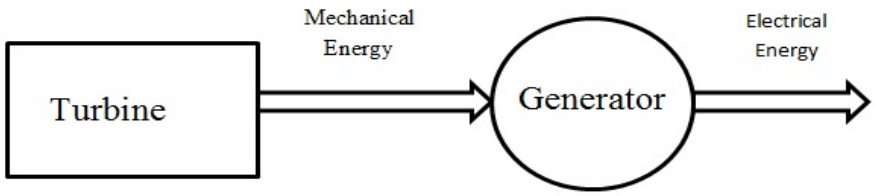


Figure: 2.2 Producing electricity by using generator

In the APSCL, turbine is coupled to the generator (figure 2.2). The generator converts mechanical energy of the turbine into electrical energy. The output from the generator is given to the bus-bars through transformer, circuit breakers and isolators.

### 2.3 Cooling System of Generator

In the APSCL, generator cooling system is an important part of thermal power units, which are given below:

#### 2.3.1 Hydrogen Cooling System

In the APSCL, we saw the hydrogen cooling system as generator cooling system. Our mentor gives us theoretical knowledge about hydrogen cooling system. He says that when current flows in a conductor, heat is generated. A generator has a lot of conductors and a lot of current flowing through the conductors, generating a lot of heat. So, if we don't remove the heat the generator windings will be damaged.

To solve this problem, the hydrogen is circulated by fans on the ends of the generator rotor, and as it's circulated around the generator it passes over coolers which have water circulating through them. The heat which is absorbed by the hydrogen gas as it passes through the generator and around the rotor is transferred to the water in the cooler. As the hydrogen exits the coolers, it's recirculates back to the generator and rotor, in a continuous cycle.

#### 2.3.2 Air Cooling System

In the APSCL, air cooling system is used to cool a generator. In this case, when the generator is operating and producing electricity, it produces heat. As the heat increases, generator efficiencies decrease. To solve this problem, air is circulated through the generator to absorb heat and then exhausting the air to another area outside the generator. A continuous flow of air from outside the generator, through the generator, to another area outside the generator will cool the generator and rotor.

### 2.4 Turbines

In the APSCL, there are five units and five turbines. A turbine is defined as a device which draws energy from a fluid moving at a high speed and converts that energy into work. The purpose of turbines is basically to produce electricity and to propel various machinery and objects via the mechanical energy produced.

Every turbine has a one basic principle that is: a moving fluid which can be water, steam, wind or gas is made to run over blades at a high speed, the blades induced by the moving fluid start

rotating and as a result they start the rotor engine attached to the device which is responsible for converting the energy into work.

### 2.4.1 Working Principle of Turbine

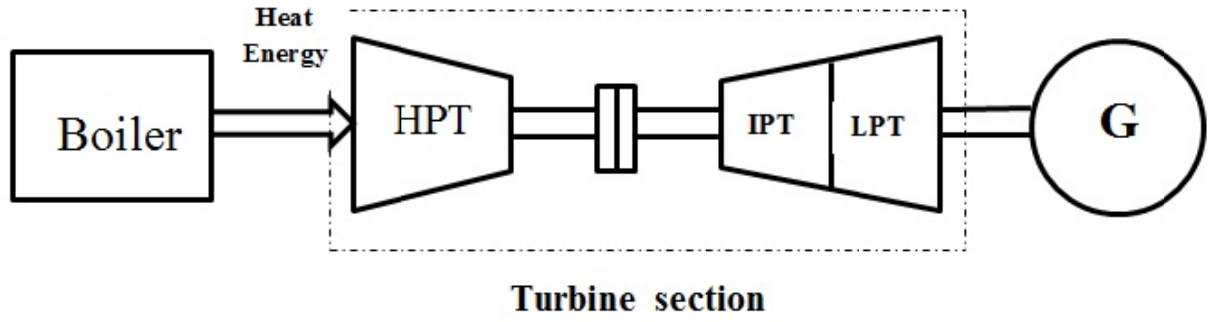


Figure 2.3: Arrangement of turbine section

In the APSCL generator section we saw that after finishing the task of boiler section we get heat energy. The heat energy is used to run the high pressure turbine (HPT). HPT is coupling to the intermediate pressure turbine (IPT) and low pressure turbine (LPT). Finally, LPT & IPT are run by the help of HPT. Now, generator rotor is run by the help of the turbines section. At the end of this stage mechanical energy is produced. This energy is used to run the generator and the output of the generator gives us electrical energy.

### 2.4.2 Uses of Steam Turbine in APSCL

Figure 2.4: High pressure steam turbine

In the Ashuganj Power Station Company Limited, reaction turbine is used as a low pressure turbine and impulse turbine is used as a high pressure turbine. Most types of turbine exploit the principles of both impulse turbines and reaction turbines.

## 2.5 Generator Protection

### Introduction

The generating units are a large unit in APSCL power station. It is desirable and necessary to protect each element from a variety of fault conditions which may occur in power station sooner or later. In the APSCL we visited the steam turbine generator section. There are different types of generator protections. If there is any abnormal condition then the generator will be disconnected from the grid. There are more than 15 protections in the generator of the steam power plant which are used at APSCL. These protections are given below:

- Generator Differential Protection

  Consequences:

  - Tripping of breaker
  - Tripping of Field breaker
  - Stop command to Turbine

  Status:

  - Unit is at shut down.
- Loss of Field Or Excitation Protection

  Consequences:

  - Tripping of breaker
  - Tripping of Field breaker
  - Stop command to Turbine

  Status:

  - Unit is at shut down.
- Negative Sequence Or Current Unbalance Protection

Consequences:

- Tripping of breaker
- Tripping of Field breaker

Status:

- Unit is at shut down.

- Over Frequency Protection

Consequences:

- Tripping of breaker
- Tripping of Field breaker
- Stop command to Turbine

Status:

- Unit is at shut down.

- Under Frequency Protection

Status:

- Unit is at lower speed with potential.

- Stator Earth Fault Protection

Consequences:

- Tripping of breaker
- Tripping of Field breaker
- Stop command to Turbine

Status:

- Unit is at shut down.

- Rotor Earth Fault Protection

Consequences:

- Tripping of breaker

- Tripping of Field breaker
- Stop command to Turbine

Status:

- Unit is at shut down.

- Reverse Power Protection

  Consequences:

  - Tripping of 220KV breaker
  - Tripping of Field breaker

  Status:

  - Unit is at coasting down.

- Pole Slipping Protection in Generator

  Consequences:

  - Tripping of 220KV breaker
  - Tripping of Field breaker

  Status:

  - Unit is at coasting down.

The unit trips on the Pole slip protection, Re-synchronous the machine after stabilization of the grid parameters.

# Chapter 3

## 3. Steam Power Plant

### 3.1 Introduction

A generating plant which converts heat energy of natural gas combustion into electrical energy is known as steam power plant.

In the Ashuganj Power Station Company Limited, steam power plant is the most vital parts for operating section. In internship period we stay this plant, 4th January, 2012 to 8th January, 2012.

**Mentor:** Engr. Md. Anwar Hossain Manager (Operation), Jr. Engr. Md. Julhash Uddin.

Steam Power Plant of APSCL

APSCL has nine (9) units among them there are five (5) steam turbine generator units. Which are given below:

Table 3.1: Units characteristics of APSCL

| **Units** | **Installed Capacity** | **Total units Capacity** | **Generating Voltage (Each Units)** |
|---|---|---|---|
| 1-2 | 64MW | 128MW | 11KV |
| 3-4-5 | 150MW | 450MW | 55.75KV |

### 3.2 Main Parts and Working Principle of Steam Power Plant

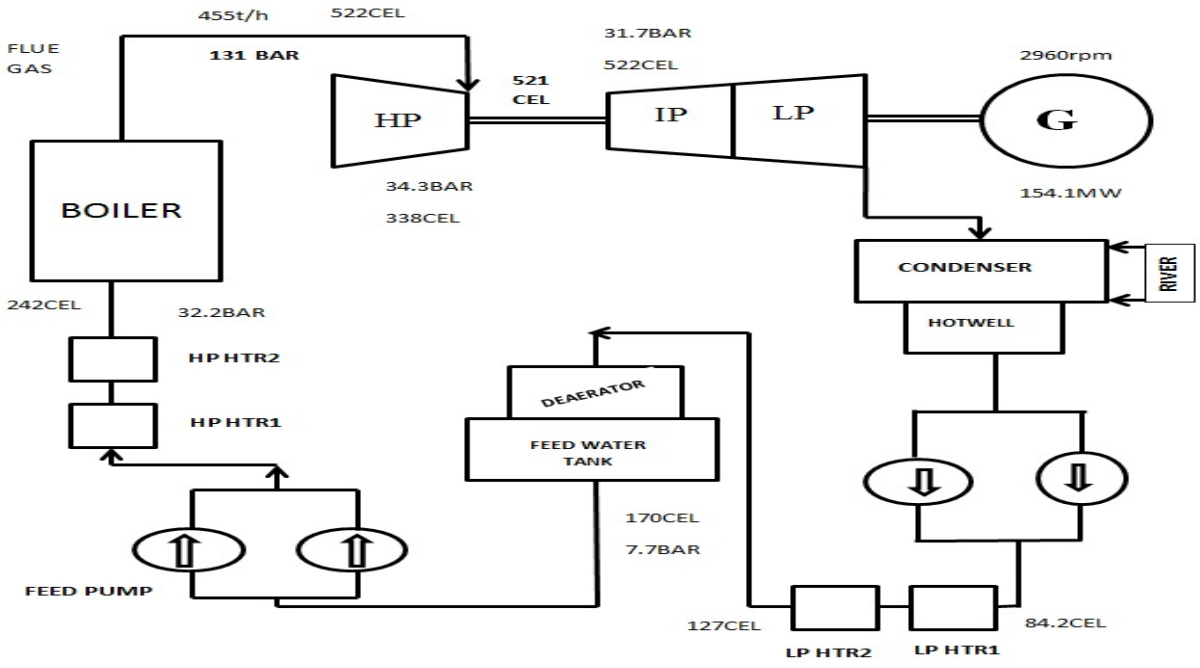


Figure 3.1: Schematic arrangement of water and steam supply in APSCL (Unit-5)

In this above figure shows the condenser water are coming from river (Meghna) for the purpose of condensate the water. This water passes through the LP Heater-1 & LP Heater-2 by using the condensate pump. After that water are coming from the deaerator to feed water tank when the water temperature is$127^0C$. Now the feed water pump is used for the purpose of water passes through the HP Heater-1 & HP Heater-2. Next, $242^0C$ temperature and 32.2 bar pressure water passes through the boiler.

Now, the main parts of a steam station are the boiler or steam generator, the steam turbine and the electric generator which is coupled to it. The fuel is burned and the heat in the fuel is used in the boiler to convert water into steam at the required pressure 131 bars and temperature $521^0C$. The steam is supplied to the turbine, where its expansion produces mechanical power at the turbine shaft. This power is used to drive the generator, which in turn produces electric power.

The steam generation plant consists of a boiler for the production of steam and other auxiliary equipment for the utilization of the flue gases.

Figure 3.2: Boiler in APSCL

### 3.3 Boiler

There are five boilers in the APSCL of generating power plant. Here in the boiler section we produce the steam and it is used to run the turbine. The flue gases from the boiler make their journey through super heater, economizer, and air pre-heater and are finally exhausted to atmosphere through the chimney.

Table 3.2: Boiler characteristics of units in APSCL

| Characteristics | Units 1-2 | Units 3-4-5 |
|---|---|---|
| Manufacturers | Babcock, Germany | IHI, Japan |
| Efficiency | 90% | 86.8% |

### 3.3.1 Air Preheater

Figure 3.3: Inside view of air pre-heater in APSCL.

In APSCL, we saw the inside view of air preheater. Our mentor says that the function of an air pre heater is to extract heat from the flue gases and give it to the air being supplied to the furnace for natural gas combustion.

Super heater and economizer generally cannot fully extract the heat from flue gases. Therefore, pre-heaters are employed which recover some of the heat in the escaping gases. Because of this technique the furnace temperature increases which increases the efficiency of the plant.

### 3.3.2 Economizers

In the APSCL, when we visit thermal power plant our mentor gives us theoretical knowledge about economizers. He says, the economizer is a device which serves to recover some of the heat being carrying by exhaust flue gases. The heat thus recovered is utilized in raising the temperature of feed water being supplied to the boiler. If the feed water at raised temperature is supplied to the boiler, it needs less heat for its conversion into steam and thus there is saving in the consumption of fuel. This is done by hot flue gases exciting the last super-heater of re-heater at a temperature varying from $242^0C$ to $522^0C$.

### 3.3.3 Super-heater

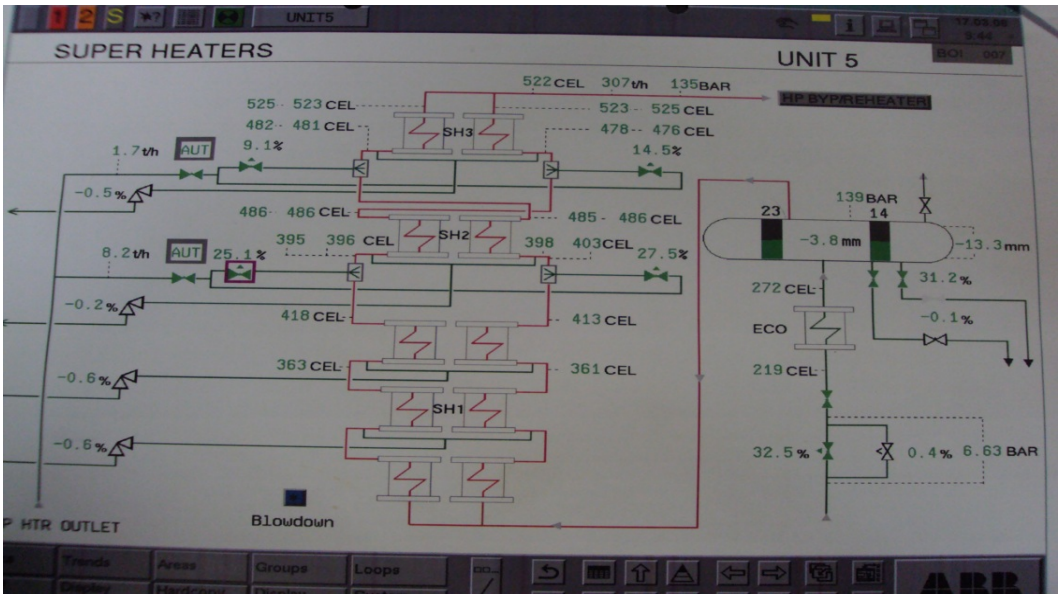


Figure 3.4: Super heater (Unit-5)

In the APSCL when we visit the control room of unit-5 we saw the super heater section. Our mentor says that the super-heater is the last stage of heat exchanger in which heat is transferred to the saturated steam to increase its temperature ($523^0C$). It raises the overall cycle efficiency. In addition, it reduces the moisture content in the last stages of the turbine and thus increases the turbine internal efficiency.

There are three super heaters inside the boiler section of every steam power plant of APSCL. SH3 produces the highest heat. There are bundle of tubes inside the super heater which carries the saturated steam and the flue gas passes through these tubes. While passing the tubes the flue gas releases heat and the saturated steam receives the heat and becomes dry and super-heated.

In each steam power plant of Ashuganj Power Station Company Ltd (APSCL), the temperature of the super-heated steam inside the super heater is about 523°C. This super-heated steam is then supplied to the high pressure turbine at a pressure of 135 Bar.

### 3.4 Condenser

Figure 3.5: Condenser of steam power plant

A condenser where the exhaust steam from the turbine is condensed operates at a pressure lower than atmosphere. There are two objects of using a condenser in steam power plant:

Firstly, it creates a very low pressure at the exhaust of turbine, thus permitting expansion of the steam in the prime mover to a very low pressure. This helps in converting heat energy of steam into mechanical energy in the prime mover.

Secondly, the condensed steam can be used as feed water to the boiler.

### 3.5 Water Treatment Plant

Figure 3.6: Cooling arrangement of steam power plant

In Ashuganj Power Station Company Ltd (APSCL) water treatment plant used for cooling and condensing purpose. The water is pumped from the Meghna River. Water is drawn from a natural source of supply such as a river, canal or lake and is circulated through the condenser. Boiler requires clean and soft water for longer life and better efficiency. Therefore, it is very important that water is first purified and softened by chemical treatment and then delivered to the boiler. The circulating water takes up the heat of the exhausted steam and it becomes hot. This hot water coming out from the condenser is discharged at a suitable location down the river. In case the availability of water from the source of supply is not assured throughout the year, cooling towers are used. During the scarcity of water in the river, hot water from the condenser is passed on to the cooling tower where it is cooled. The cold water from the cooling tower is reused in the condenser.

### 3.6 Feed water heater:

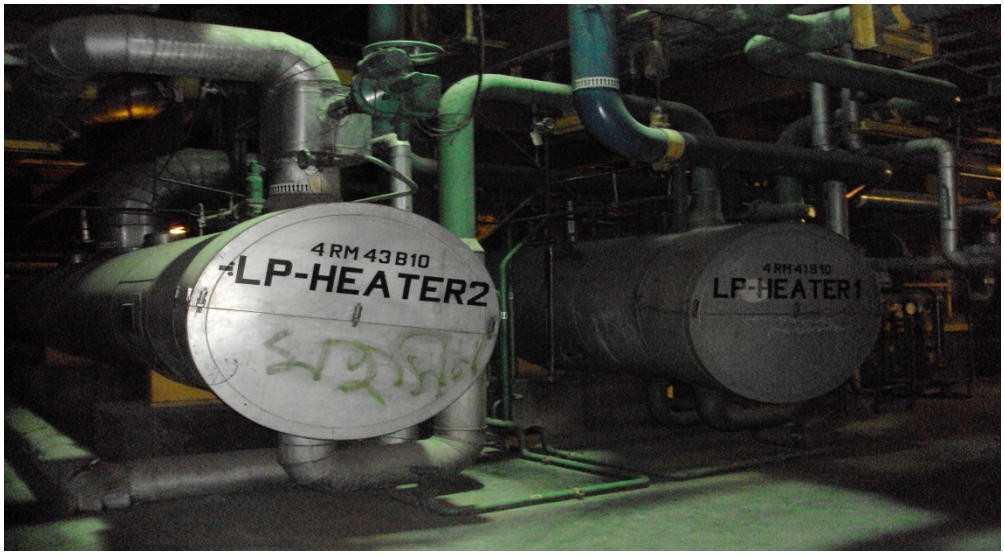


Figure 3.7: LP heater of steam power plant of APSCL

In the APSCL we saw the feed water heater as LP-HEATER 1 & LP-HEATER 2. Here, feed-water heater is a power plant component used to pre-heat water delivered to a steam generating boiler. Preheating the feed-water reduces the irreversibility involved in steam generation and therefore improves the thermodynamic efficiency of the system. This reduces plant operating costs and also helps to avoid thermal shock to the boiler metal when the feed-water is introduced back into the steam cycle.

The heating of feed water is done by using steam which comes from high, intermediate and low pressure turbine through steam extraction line. The steam is flowed over the surface of the tubes containing feed water. Steam releases heat and the feed water receives heat.

In steam and combined cycle power plant of Ashuganj Power Station Company Ltd (APSCL) two types of feed water heater is present which is shown in the above figure 3.7

These are:

1. Low pressure heater (LP heater)

2. High pressure heater (HP heater)

**3.7 Feed water tank:**

The feed water is reserved inside this feed water tank which comes from LP heater. From feed water tank feed water is transferred to the HP heater. Boiler feed pump (BFP) is used to transfer feed water to the HP heater.

**3.8 Gas Treatment Plant**

Figure 3.8: Gas pressure reducing plant.

In APSCL the main raw material of steam power plant is ‘GAS’. This gas is collected from Titas Gas. The gas pressure reducing plant consists of different type of actuator and valve.

These are:

- Gas control actuator
- Filter inlet shut off valve
- Isolating valve
- Filter differential pressure indicator.
- Flow indicator
- Temperature control actuator

### 3.9 Steam Auxiliaries

#### 3.9.1 Deaerator

One of the feed-water heaters is a contact- type open heater, known as deaetator, others being closed heaters. It is used for the purpose of deaerating the feed water.

The presence of dissolved gases like oxygen and carbon dioxide in water makes the water corrosive, as they react with the metal to form iron oxide. The solubility of these gases in water decreases with increase in temperature and becomes zero at the boiling of saturation temperature. These gases are removed in the deaerator, where feed water is heated to the saturation temperature by the steam extracted from the turbine.

### 3.9.2 Boiler Feed Pump

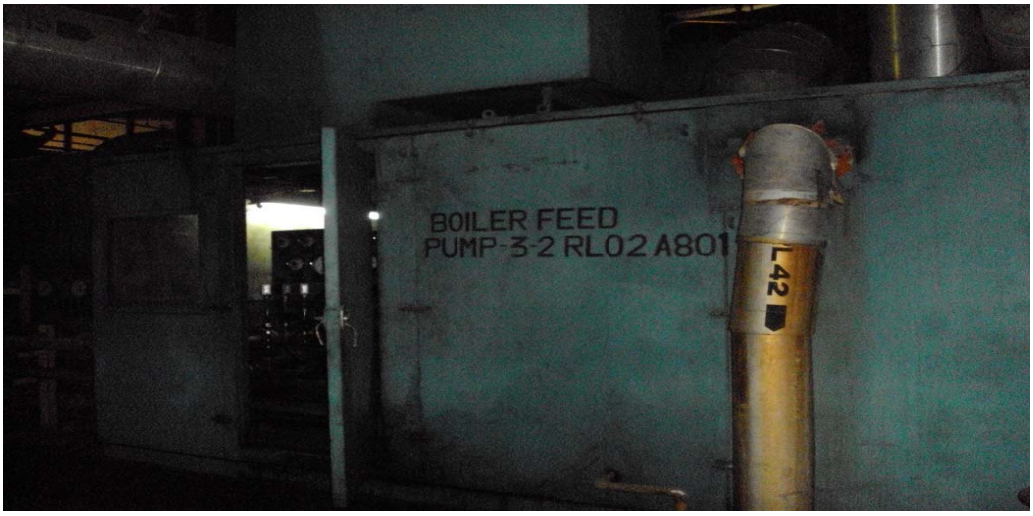


Figure 3.9: Boiler feed pump of APSCL

In the APSCL we saw the Boiler feed pump. Here, Boiler feed pumps are an important part of any boiler operation. They control the amount of water fed to the boiler and the manner in which it is fed. A boiler feed-water pump is a specific type of pump used to pump feed-water into a steam boiler. The water may be freshly supplied or returning condensate produced as a result of the condensation of the steam produced by the boiler. These pumps are normally high pressure units that take suction from a condensate return system and can be of the centrifugal pump type or positive displacement type.

### 3.9.3 Air Removal Pump

Figure 3.10: Air removal pump

In the APSCL we saw the Air removal pump. Here, Air leaks into the condenser shell through flanges, some air also comes along with steam, which has leaked into the exhaust end of the turbine along the shaft. This air affects the condenser performance badly because of the following reason.

- It reduces the heat transfer considerably.
- It reduces the condenser vacuum and increases the turbine exhaust pressure thus reducing the turbine output.

As air water vapor mixture approaches the cold tube surface, water vapor condenses. Air, being non-condensable, forms an air film around the condensate film. Since air has a low thermal conductivity, the heat transfer is greatly reduced.

### 3.9.4 Forced Draught Fan

In the APSCL of steam power plant unit 1,2 has one force draught fan but unit 3,4,5 has two force draught fan.

Figure 3.11: Force draught fan

### 3.9.4.1Working Principle of Force Draught Fan

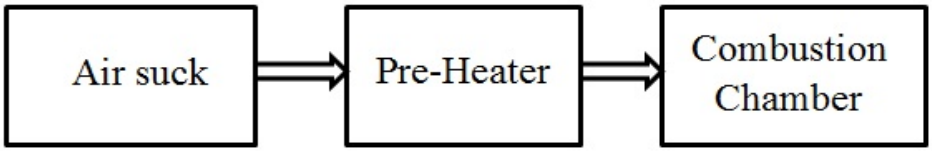


Figure 3.12: Working arrangement of force draught fan.

In this above figure, FD fan first suck the air and after sucking the air it's passes through the pre-heater. Finally, the fans draw warm air from the top of the boiler house through large air heaters becoming the primary and secondary air used for the boiler combustion process. Dampers are used to control the quantity of air admitted to the furnace. Forced draught furnaces usually have a positive pressure.

# Chapter 4

## 4. Combined Cycle Power Plant (CCPP)

### 4.1 Introduction

In the combined cycle power plant (CCPP), there are two gas turbines (i.e. GT-1 & GT-2) and one steam turbine plant. When we visit this plant the gas turbine-1(GT-1) was turned off & the gas turbine-2 was turned on.

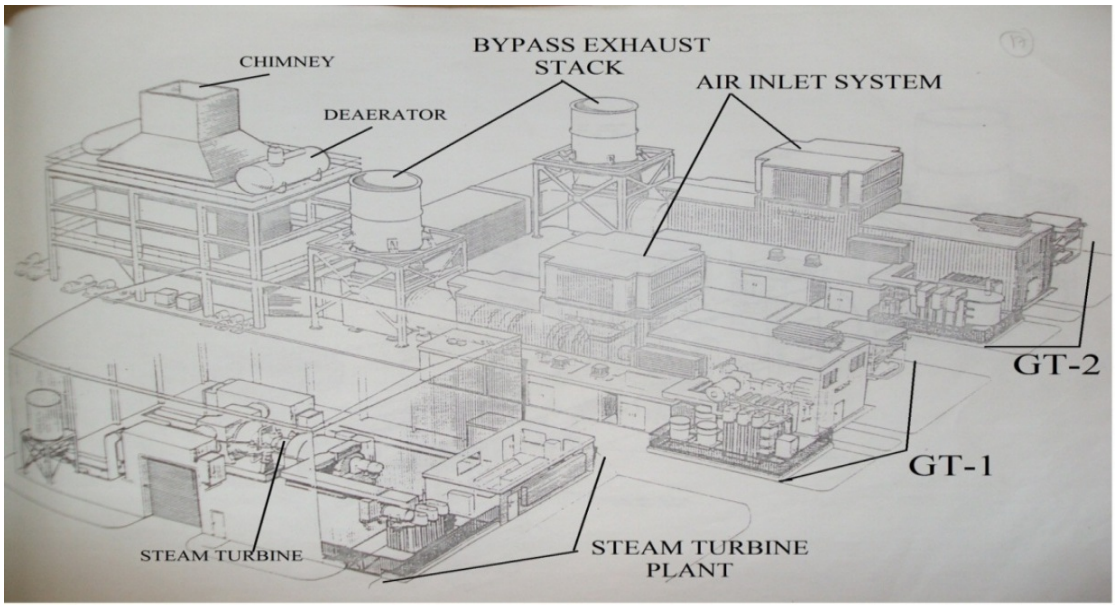


Figure 4.1: Combined Cycle Power Plant (CCPP)

### 4.2 Combined cycle power plant of APSCL

In APSCL the main raw material of combined cycle power plant is ‘GAS’. This gas is collected from Titas Gas (Old name Bakhrabad). As in simple cycle applications the gas turbine is the main drive for power generation. To improve overall efficiency, exhaust heat from the gas turbine is used to produce steam for the generation of additional electricity by a steam turbine.

### 4.3 Working Principle of Combined Cycle Power Plant

Structure of the combined cycle power plant consists of two plants. These are

- Gas turbine power plants.
- Steam turbine power plants.

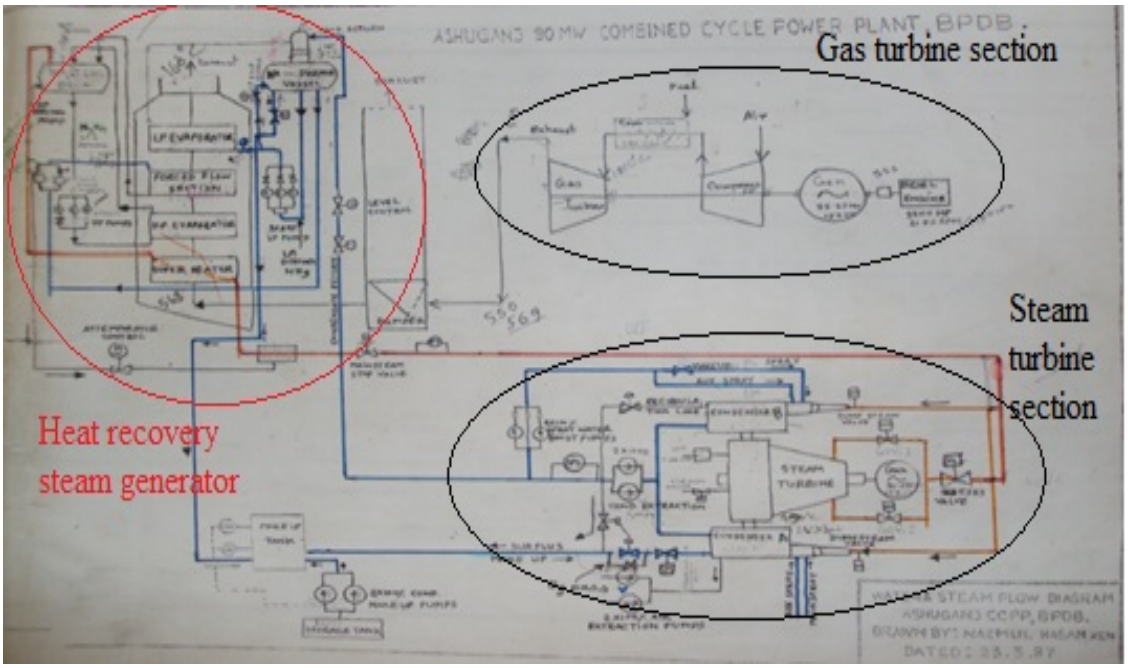


Figure 4.2: Water & Steam Flow Diagram of CCPP (Drawn by Nazmul Hasan).

In this above figure 4.3 we showed water & steam flow diagram of CCPP which is drawn by Engineer Nazmul Hasan. In this figure we mentioned the gas turbine section, steam turbine section and Heat Recovery Steam Generator (HRSG). Among their section we already described steam turbine section as steam power plant in chapter 3. Now we discuss gas turbine power plant and Heat Recovery Steam Generator (HRSG) which is described (section: 4.3.1 & 4.3.1.2.1) given below.

### 4.3.1 Gas Turbine Power Plant

A generating station which employs gas turbine as the prime mover for the generation of electrical energy is known as a gas turbine power plant.

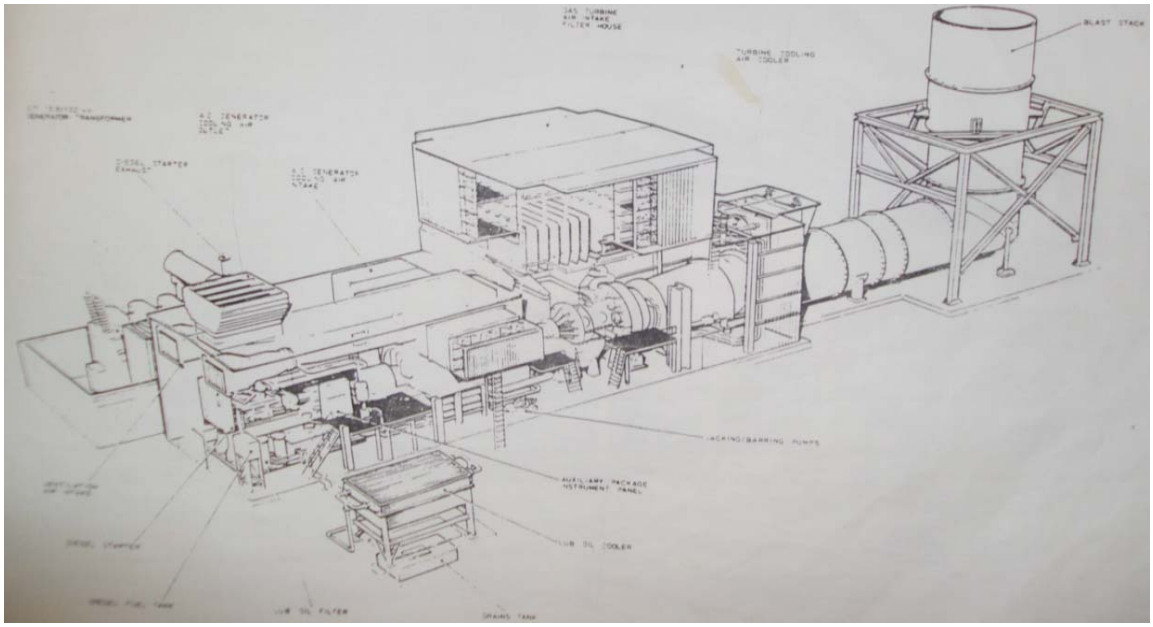

Figure 4.3: Top view of gas turbine power plant in APSCL

#### 4.3.1.1 Gas Turbine Power Plant of APSCL

In APSCL, there are two gases turbine these are

- Gas Turbine-1(GT-1) &
- Gas turbine-2 (GT-2).

Table 4.1: Characteristics of CCPP

| Unit | Date of commission | Installed capacity | Present capacity |
|---|---|---|---|
| GT-1 | 15.11.1982 | 56MW | (35-36)MW |
| GT-2 | 23.03.1986 | 56MW | 40MW |
| CC-ST | 28.03.1984 | 34MW | 16MW |

### 4.3.1.2 Working Principle of Gas Turbine Power Plant

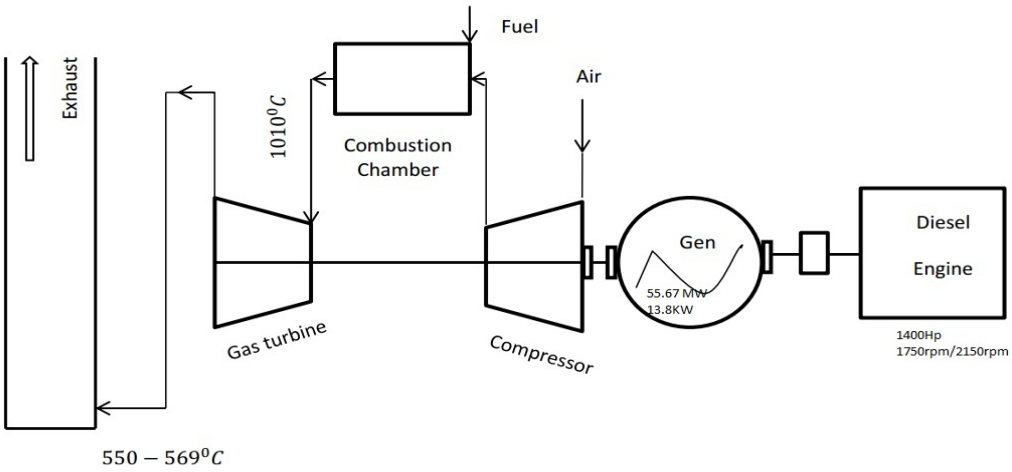


Figure 4.4: Simple flow diagram of gas turbine of APSCL

In this above figure 4.5 we showed simple flow diagram of gas turbine of APSCL. Here, in a gas turbine power plant, air is used as the working fluid. The air is compressed by the compressor and Compressed air is mixed with natural gas in the combustion chamber, and burns at high temperature (1010°C). The exhaust gas expands through a turbine. The turbine drives the compressor, but generates more work than what is used for compression, typically at 1:8 ratios. This is caused by the change of temperature in the air flow as it passes through the combustion chamber.

The hot exhaust gas expands though a Heat Recovery Steam Generator (HRSG) which generates steam at typically about 550 to 559°C and high pressure (40 bar), and is expanded through one

or several steam turbines. The gas turbine and the steam turbine may be fitted on the same drive shaft, particularly in smaller units.

#### 4.3.1.2.1 Heat Recovery Steam Generator (HRSG)

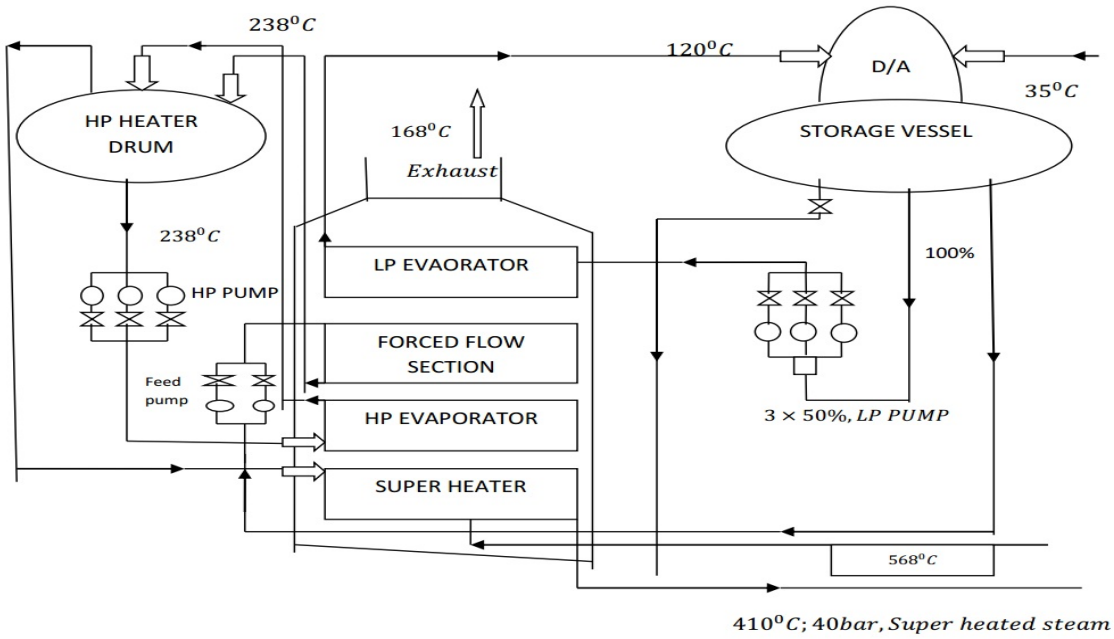


Figure 4.5: Waste Heat recovery unit

Heat recovery steam generator (HRSG) plays a very important role in recovering the sensible heat of gas turbine exhaust for generating steam, at required pressure and temperature, suitable to steam turbine for further power generation. A heat recovery steam generator or "HRSG" which are connected between the exhaust portion of the gas turbine and the inlet portion of the steam turbine for receiving the waste heat that is exhausted by the gas turbine, for generating the motive steam from a supply of feed water that is heated by such waste heat, and for supplying the motive steam to the steam turbine. A conventional deaerator (D/A) is connected to the condenser to receive there from the supply of condensate and for deaerating such condensate to provide the supply of feed water to the HRSG.

In combined cycle power plant $35^0C$ steams are coming from steam turbine to the deaerator, where, another ways are also coming from low pressure evaporator (Lp-Evaporator). Both these two different temperature steam is stored in deaerator storage vessel and this combined

temperature produce $100^0C$ temperature water. This $100^0C$ temperature water is flows to the Lp-evaporator & these processes are closed loop process. Now HP-Evaporator increases $238^0C$temperature steam. After that same temperature flows to the HP-Evaporator (here, HP pump is used). These processes are closed loop process. Finally,$238^0C$steam are coming from HP Heater drum to super heater and $568^0C$ super heater temperature produces $410^0C$ temperature and 40 bar super-heated steam passes through the condenser A and B and supplied to the steam turbine.

### 4.3.2 Working Component of APSCL Gas Turbine Power Plant

The simple flow gas turbine power plant is shown in Figure 1.3. The main components of the plants are:

- Diesel engine
- Generator
- Compressor
- Combustion Chamber
- Gas turbine

#### 4.3.2.1 Diesel Engine

Diesel engine is a very vital part in gas turbine power plant. 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.

Figure 4.6: Diesel engine of combined cycle power plant

So, 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 a rated speed which makes the compressor to suck air by itself then the diesel engine is turned off.

#### 4.3.2.3 Compressor

In the APSCL, the compressor is called heart of the plant. Two types of compressor are used in gas turbine plants centrifugal or axial. The centrifugal type of compressor were used, as they were easier to design and cheaper to manufacture & the axial flow type compressors are more efficient and have now reached a high stage of development and are used in most gas turbine. Each stage of an axial compressor consists of a row of rotor blades followed by row of diffuser blades. An axial compressor has a large number of stages, as many as 13 stages.

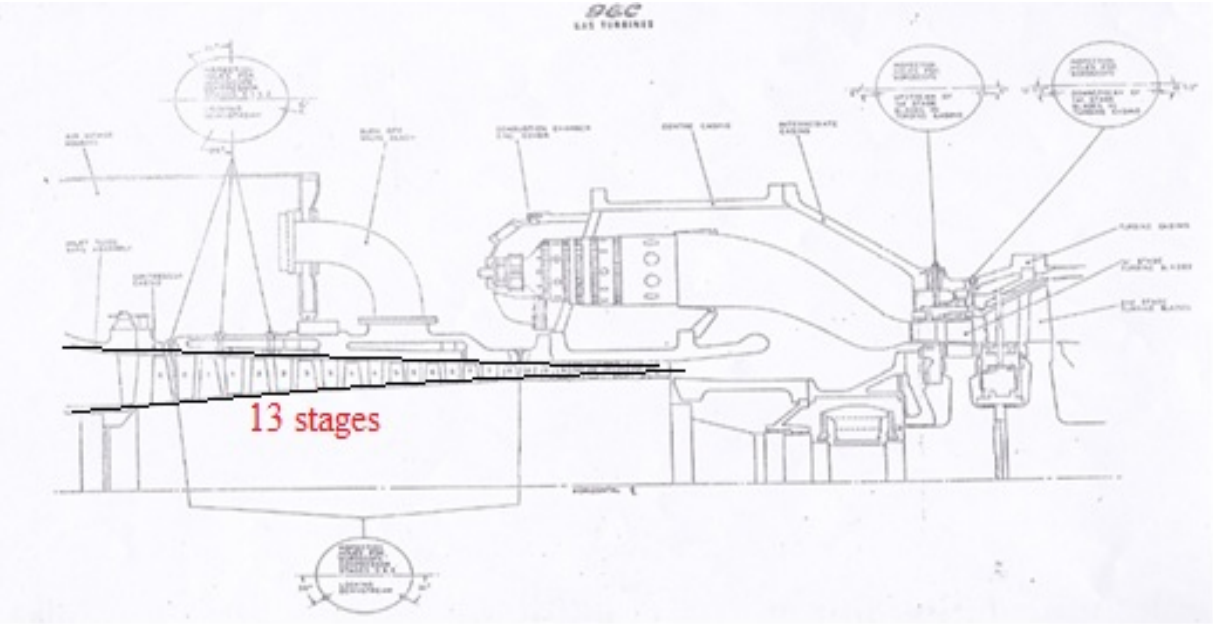


Figure 4.7: Air Compressor and turbine blades.

A gas compressor is a mechanical device that increases the pressure of a gas by reducing its volume. The compressor used in the plant is generally rotator type. The air at atmospheric pressure is drawn by the compressor via the filter which removes the dust from air. The rotatory blades of the compressor push the air between stationary blades to raise its pressure. Thus air at high pressure is available at the output of the compressor.

#### 4.3.2.4 Combustion Chamber

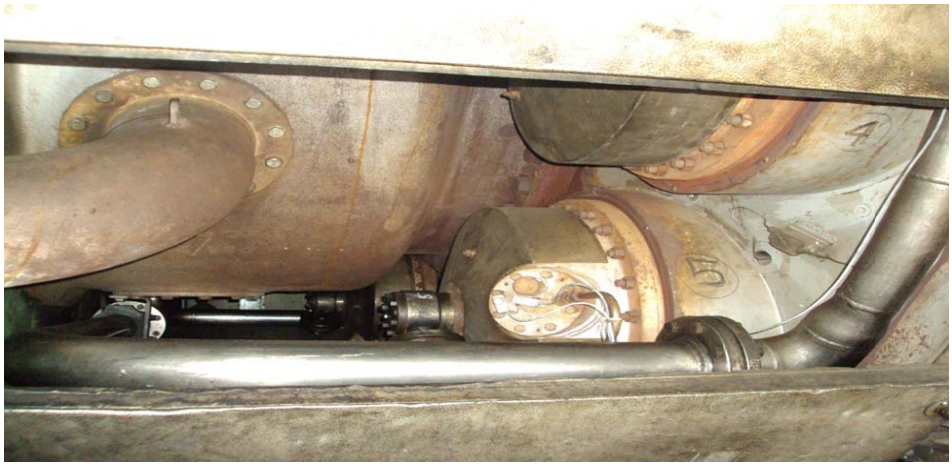

Figure 4.8: Inside view of combustion chamber in CCPP

In the Ashuganj power station company limited, combustion chamber is a very essential part of the gas turbine power plant. There are ten (10) combustion chambers. But virtually all combustion chamber have a diffuser. Which are given below:

##### 4.3.2.4.1 The Diffuser


Figure 4.9: Diffuser in APSCL

The gas entering the combustion chamber usually has quite a high velocity. This velocity will be responsible for a pressure drop. (This pressure drop is called the cold loss). Also the flame in the combustion chamber cannot survive if the air has a high velocity. Therefore, the air flow needs to be slowed down. And this exactly task of the diffuser.

# Chapter: 5

## 5. Instrumentation and Control System

### 5.1 Introduction

Instrumentation and control system is the most vital parts in the whole Ashuganj Power Station Company Limited. In internship period we stay this plant, 9th January, 2012 to 11th January, 2012.

**Mentor**: Engr. Bikash Ranjan Roy (Manager: Instrumentation & control).

Instruments are installed in a power station for a number of reasons. The main functions of the instruments are as follows:

- Operating guidance: The instruments are guide to safe continuous and proper plant operation.
- Performance calculation: The instruments furnish data for evaluating overall plant performance and checking the efficiency of individual plant components.
- Maintenance guidance: Instruments check on the internal condition of equipment and indicate when and where maintenance or repair is needed.

It is necessary to couple the measuring instruments to the auxiliary power devices to provide automatic control. Automatic controls of auxiliary apparatus are found essential for reliable performance of modern high pressure, high temperature, and high capacity steam turbo generator units.

### 5.2 Selection of Instrumentation

Several factors should be considered in deciding the proper type of instrumentation and controls for a steam station. Some of the factors are as follows:

- Boiler: Size, complexity, and operating conditions.
- Type of fuel used: Coal, gas, oil and fuel burning equipment.
- Feed-water system: Drum size pump characteristics.

- Auxiliary equipment: Such as fan arrangements, source of fan power, damper arrangements, etc.
- Load characteristics: Anticipated change, rate and magnitude of chance.

Moreover, I & C section in the APSCL we saw this different type of valve, pump, & protections which are given below:

- Valve
  - Binary control valve (Fully open or closed valve)
  - Analog control valve
  - Temperature control actuator valve
  - Make up water flow control valve
  - Auxiliary steam drain shut off valve
- Pump
  - Air preheater driver pump
  - Booster pump
  - Cooling water pump
  - Air removal pump (water side)
  - Air removal pump (steam side)
  - Feed water pump
  - Condensate pump
- Protections

  Motor protection

  When winding temperature more than $80^0C$ then motor will be trip. So we needed to remove the generated heat.

  Boiler protections
  - Force draught fan
  - Flue gas damper
  - Air pre heater
  - Boiler drum level

  Turbine protections
  - Shaft position protection

- Shaft vibration protection
- Lube oil protection 40%
- Lube oil protection 60%
- Over speed protection 110%
- Over speed protection 112%

Turbine metal temperature protection

- Vacuum protection trip 1
- Vacuum protection trip 2

### 5.3 Control Room

In the Ashuganj Power Station Company limited there are two operating systems used for most machine or devices. These are given below:

- Directly operating system.
- Digital control room.

Figure 5.1: Control room of unit-5

From the control room, the plant operators monitor and operate the facility, via the plant's "Distributed Control System", with the click of a mouse, viewing graphic representations of all digital systems on various screens.

The system gives operators both audible and visual signals to keep them informed of plant conditions at all times and to determine when preventative maintenance is required.

### 5.3.1 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.

### 5.3.2 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.

### 5.4 Safety Valve

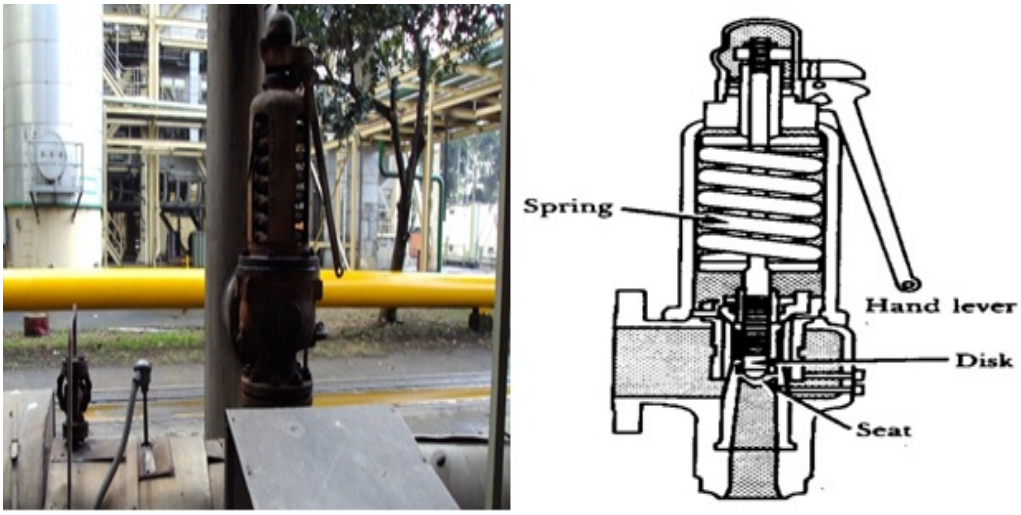


Figure 5.2: Safety valve

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. The boiler which are equipped with at least one or more safety valves and used for 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.

### 5.5 Pressure Gauge

In the APSCL, Most of this data is measured by pressure gauges which are given bellow-

**Pressure gauges are used to determine:**

- Steam Pressure
- Feed water Pressure
- Gas Pressure


Figure 5.3: Measuring the different types of pressure

Pressure may be recorded as gauge pressure or as absolute pressure. Gauge pressure is the pressure above that of the atmosphere. Absolute pressure is the pressure above zero pressure, equal to gauge pressure plus the atmospheric pressure. At sea level, atmospheric pressure is 14.7 psi (which means that a column of air one square inch in area rising from the Earth's atmosphere to space weighs 14.7 pounds.). Pressure gauges include many pressure measurement devices including bellows, Bourdon tubes, capsule elements and diaphragm element gages in the APSCL of boiler section.

### 5.6 Flame Detector

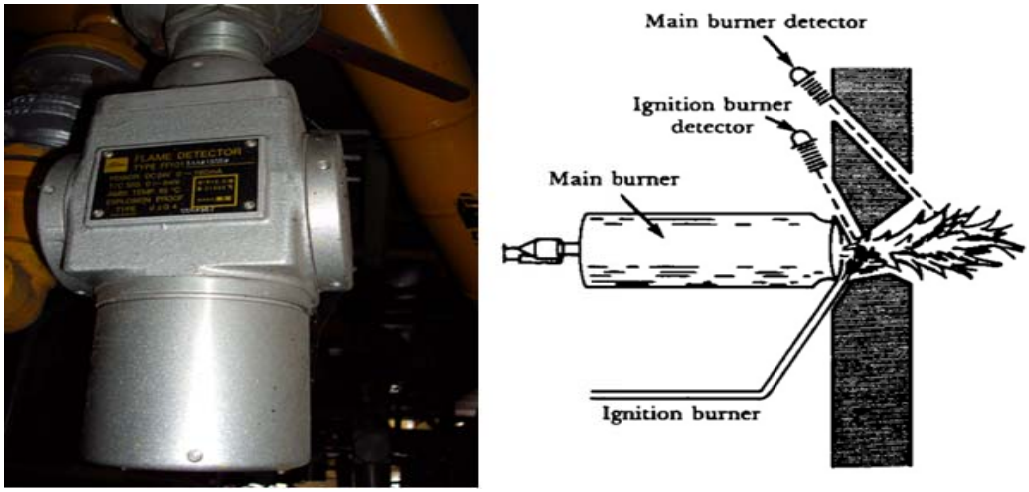


Figure 5.4: Flame detector

In the APSCL we saw the flame detectors. Here, Flame detectors, or scanners, monitor burner flames on all boilers and igniters on natural gas and oil- fired boilers. If the flame in a burner or igniter 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 igniter. These devices are installed in the furnace wall as shown in above figure 5.4.

# Chapter 6

## 6. Substation

### 6. 1 Introduction

Substation is one of the most important parts of the power system. The APSCL has its own substation. During our internship we worked at APSCL substation from 29th December, 2011 to 1st January, 2012. In the substation section our mentor was Engr. Noor Mohammed, Manager (Sub-Station). He tried to give us practical knowledge about the substation. We visited the control room, battery room and switchyard of the substation.

The substation in APSCL is outdoor type, step up, double bus bar type substation. APSCL uses double bus bar because it generates power and distributes the power by giving it to the grid. When generator starts it take power from the grid by bus bar one. The electric power is first produce at power station and then delivered to the consumers through a large network of transmission and distribution system. The electrical power distribution system is a.c. so the electrical power is generated, transmitted and distributed in the form of alternative current. This is accomplished by substation apparatus. In this chapter we will discuss about different equipments of the substation that are used by APSCL.

### 6.2 Equipment of Substation

There are different types of equipments which are used at the sub-station of APSCL .The major equipments list are given below:

- Transformer
    - Power transformers
    - Instrument transformers
        - Current Transformer
        - Potential Transformer
- Circuit Breaker
    - SF6 Circuit Breaker
    - Oil Circuit Breaker

- Air Blast Circuit Breaker
- Relay
- Lightning Arrester
- Control Room
- Battery and Battery charger room
- Bus-bar
- Transmission Line

### 6.3 Transformer

The transformer is used in APSCL substation to step-up or step down the voltage. In Ashuganj Power Station generated voltages are transformed from 31.15 kV, 15.75 kV, 13.8 kV and 11 kV to 132 kV, 230 kV using step-up transformer for long distance transmission. The step-down transformers which step down the voltage to 400V, 3-phase, 4-wire for internal use or supplying to the consumers. In substation mainly two types of transformers are used.

(i) Power transformers
(ii) Instrument transformers

### 6.3 .1 Power Transformer

The power transformer used in substation to step-up or step down the voltage. Step-up transformer is used to step-up generation voltage to a high voltage (132 kV or 230 kV or more) for transmission of electrical power. Except at the power station all the subsequent sub-stations use step-down transformers which are used to reduce the voltage of electric supply. Unit step-up transformer or 3 phase transformer can be used as power transformer. Modern practice is to use 3-phase transformer in substation although 3 single phase bank of transformer can also be used. There are two advantages if 3-phase transformer is used instead of 3 single phase bank of transformers. Firstly, only one 3 phase load tap changing mechanism can be used. A transformer tap is a connection point along a transformer winding that allows a certain number of turns to be selected. This means, a transformer with a variable turns ratio is produced, enabling voltage regulation of the output. The tap selection is made via a tap changer mechanism. Secondly, its installation is much simpler than the three single phase transformers. The power transformers are

generally installed upon lengths of rails fixed on concrete slabs having foundations 1 to 1.5 m deep. Most of the power transformers at the substation of APSCL are rated up to 100 MV. APSCL uses both single phase & 3 phase power transformers. Most of the power transformer has ONAF/ONAN cooling system.


(a)

(b)

Figure 6.1: Power Transformer: (a) Three Phase Transformer (b) Single Phase Transformer

#### 6.3.1.1Bushing Connection of Power Transformer

During our internship period we saw the bushing Connection of Power Transformer at APSCL substation. A bushing is often a large metal bar covered in a ceramic insulator that is sticking out of the transformer and is where the transformer is connected to electrical wires. We can also tell that the bushings are the things that have the electrical wires connected to them on top of the transformer. (Figure 6.2)

Figure 6.2 : Bushing is connected for power transformer at APSCL Substation

### 6.3.2 Instrument Transformer

The lines in sub-station operate at high voltages and carry current of thousand amperes. The measuring instrument and protective device are design for low voltages and currents. So they will not work if connected directly on the power lines. This problem is solved by installing instrument transformer on the power line. The function of the instrument transformer is to transfer the voltage or currents in power lines to values which are suitable for the operation of measuring instruments and relays. Instrument transformers are used in APSCL for measuring voltage and current in electrical power systems and for power system protection and control. Where a voltage or current is too large to be conveniently used by an instrument, it can be scaled down to a standardized low value. Instrument transformers isolate measurement, protection and control circuitry from the high currents or voltages present on the circuits being measured or controlled. There are two types of instrument transformer:

(i) Current Transformer

(ii) Potential Transformer

#### 6.3.2.1 Current Transformer

A current transformer (CT) is used for measurement of electric currents. A current transformer in essentially is a step-up transformer which steps down the current to a known ratio. When current in a circuit is too high to directly apply to measuring instruments, 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. In the APSCL sub-station there are different types of current transformers which are used in the switchyard of the substation. The current transformer is connected in series with equipment.

Figure 6.3: Current Transformer used at APSCL Substation

#### 6.3.2.2 Potential Transformer

Potential transformer or voltage transformer is used to step down voltage at a known ratio that can be effectively and safely used for operation of instruments such as ammeters, voltmeters, wattmeters, and relays used for various protective purposes. In APSCL there are many outdoor type potential transformers with various ratings such as 6 kV, 133 kV and 230 kV.

Figure 6.4: Potential Transformer used at APSCL Substation

(132 kV single phase outdoor types)

### 6.4 Circuit Breaker

A circuit breaker is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by overload or short circuit. Circuit breaker serves two basic purposes one of them is switching during normal operating condition for the purpose of operation and maintenance. Another purpose is to switching during abnormal conditions such as short circuit and interrupting the fault current. Its basic function is to detect a fault condition and by interrupting continuity, to immediately discontinue electrical flow. Unlike a fuse, which operates once and then has to be replaced, a circuit breaker can be reset (either manually or automatically) to resume normal operation. Circuit breakers are made in varying sizes, from small devices that protect an individual household appliance up to large switchgear designed to protect high voltage circuits feeding an entire city. There are different types of circuit breaker. It is classified on the basis of voltage level, construction type, interruption type and their structures. According to voltage range we can classify them into three types such as high, medium and low voltage circuit breaker. We saw the three types of circuit breaker in the switchyard of APSCL. We will discuss about these three types of circuit breakers that we have seen in the switchyard of APSCL.

(i) SF6 circuit breaker

(ii) Oil circuit breaker

(iii) Air blast circuit breaker

### 6.4.1 SF6 Circuit Breaker

The $SF_6$ circuit breakers are used at the substation of APSCL with 230 kV bus-bar. Sulphur hexafluoride ($SF_6$) gas is used as the arc quenching medium into the $SF_6$ circuit breakers. The Sulphur hexafluoride ($SF_6$) is an inert, heavy gas having good dielectric and arc extinguishing properties and has a strong tendency to absorb free electron. The dielectric strength of the gas increases with pressure. The contacts of the breaker are opened in a high pressure flow of $SF_6$ gas and an arc is stuck between them. The conducting free electrons in the arc are rapidly captured by the gas to form relatively immobile negative ions. The loss of conducting electrons in the arc quickly builds up enough insulation strength to extinguish the arc. The $SF_6$ circuit breakers have been found to be very effective for high power and high voltage service.

Due to the superior arc quenching properties of $SF_6$ gas, the $SF_6$ circuit breakers have many advantages over oil or air circuit breakers. Some advantages of $SF_6$ circuit breakers are given below:

(i) Due to the superior arc quenching properties of $SF_6$ gas, this type of circuit breakers have very short arcing time.

(ii) The dielectric strength of $SF_6$ gas is higher than air or oil so $SF_6$ circuit breakers can interrupt much larger current.

(iii) There is no risk of fire in $SF_6$ circuit breakers because $SF_6$ gas is non-inflammable.

(iv) The $SF_6$ circuit breakers have low maintenance cost, light foundation requirement and minimum auxiliary requirement.

(v) The $SF_6$ circuit breakers circuit breaker gives noiseless operation due to its closed gas circuit and no exhaust to atmosphere unlike the air blast circuit breaker.

Figure 6.5: $SF_6$ Circuit Breaker used at APSCL Substation

There are also some drawbacks of SF6 circuit breakers. SF6 circuit breakers are costly due to the high cost of SF6 gas. Since SF6 gas has to be reconditioned after every operation of breaker, additional equipment is necessary for this purpose.

### 6.4.2 Oil Circuit Breaker

The Oil Circuit Breakers are used at the substation of APSCL with 132 kV bus-bar. In such circuit breakers some insulating oil is used as the arc quenching medium. The contacts are opened under oil and arc is struck between them. The heat of the arc evaporates the surrounding oil and dissociates it into a subsequent volume of gaseous hydrogen at high pressure. The hydrogen gas occupies a volume about one thousand times that of oil decomposition. The oil is therefore pushed away from arc and expanding hydrogen gas bubble surrounding the arc region and adjunct portion of the contacts. The gas inside the bubble is around 80% hydrogen, which impairs ionization. The arc extinction is facilitated mainly by two purposes. Firstly hydrogen gas has high heated conductivity and cools the arc, thus adding the de-ionisation of the medium between the contacts. Secondly, the gas setup turbulence in the oil and forces into the space between the contacts, thus eliminating the arcing products from the arc path. The result is that the arc is extinguishing and current interrupted. There are some advantages of oil as arc quenching medium. It absorbed the arc energy to decompose the oil into gases which have excellent cooling properties. It acts as insulator and permit smaller clearance between the live conductors and earthed components. There are also some drawbacks of oil as arc quenching medium. It is flammable and there is a risk of fire. It may form an explosive mixture of air. The arcing

products (carbon) remain in the oil and its quality deteriorates with successive operations. In this case to remove the problem periodical checking and replacement of oil are necessary.

Figure 6.6: Oil Circuit Breaker used at APSCL Substation

### 6.4.3 Air Blast Circuit Breaker

The Air Blast Circuit Breakers are also used at the substation of APSCL with 132 kV bus-bar. These circuit breakers use a high pressure air-blast as an arc quenching medium. In the air blast circuit breakers the arc interruption takes place to direct a blast of air, at high pressure and velocity, to the arc. Dry and fresh air of the air blast will replace the ionized hot gases within the arc zone and the arc length is considerably increased. Consequently the arc may be interrupted at the first natural current zero. In air blast circuit breakers, the contacts are surrounded by compressed air. When the contacts are opened the compressed air is released in forced blast through the arc to the atmosphere extinguishing the arc in the process. A compressor plant is necessary to maintain high air pressure in the receiver. Air blast circuit breaker is better than oil circuit breaker. The growth of dielectric strength is so rapid that final contact gap needed for arc extinction is very small. This reduces the size of device. The risk of fire is eliminated. Due to lesser arc energy, air blast circuit breakers are very suitable for conditions where frequent operation is required. The arcing products are completely removed by the blast whereas the oil deteriorates with successive operations; the expense of regular oil is replacement is avoided. The energy supplied for arc extinction is obtained from high pressure air and is independent of the current to be interrupted. The arcing time is very small due to the rapid buildup of dielectric strength between contacts. Therefore, the arc energy is only a fraction that in oil circuit breakers,

thus resulting in less burning of contacts. There are some drawbacks of Air Blast Circuit Breaker. Considerable maintenance is required for the compressor plant which supplies the air blast. Air blast circuit breakers are very sensitive to the variations in the rate of restriking voltage. Air blast circuit breakers are finding wide applications in high voltage installations. Majority of circuit breakers for voltages over 110 kV are of this type.

Figure 6.7: Air Blast Circuit Breaker used at APSCL Substation

### 6.4.4 Megger Test of Circuit Breaker

During our internship period we saw the megger test of circuit breaker at APSCL substation section. Megger test is one of the best methods to test electrical insulation condition. It is well known as insulation resistance meter test. For finding defects and punctures in insulation of electric wires, motor winding, circuit breakers etc. this test is done.


(a) (b)

Figure 6.8 : Megger Test for circuit breaker (a) Connection (b) Reading of Megger Meter

### 6.5 Protective Relay

Protective relay is device that detects the fault and initiates the operation of the circuit breaker to isolate the defective element from the rest of the electrical network. There are different types of relay at the substation of APSCL. There are two principle regions for it. Firstly if the fault is not cleared quickly, it may cause unnecessary interruption of service of customers. Secondly, quick disconnection of faulted apparatus limits the amount of damage to it and prevents the effects of fault from spreading into the system.

Figure 6.9: Different types of relay used at APSCL

### 6.5.1 Classical relay

There are several types of classical relays in power system, but electromagnetic attraction type double quantity classical relays are used at APSCL substation. Classical relay is the first protection device. It is the most effective relay. This relay has instantaneous operation, means operation time is constant. The construction of this relay is very simple and operating current can be adjusted easily

### 6.5.2 Buchholz Relay

A Buchholz relay is a safety device connected on some oil-filled power transformers and reactors, equipped with an external overhead oil reservoir called a conservator. The Buchholz Relay is used as a protective device sensitive to the effects of dielectric failure inside the equipment.

### 6.5.3 Over Current Relay

Over current relay is a type of protective relay which operates when the load current exceeds a preset value. In a typical application the over current relay is connected to a current transformer and calibrated to operate at or above a specific current level. When the relay operates, one or more contacts will operate and energize to trip a circuit breaker.

### 6.5.4 Distance Relay

The most common form of protection on high voltage transmission systems is distance relay protection. Distance protection detects both voltage and current. Power lines have set impedance per kilometer and using this value and comparing voltage and current the distance to a fault can be determined. If the ratio of voltage to current measured at the relay terminals, which equates to impedance, lands within a pre-determined level the circuit breaker will operate. This is useful for reasonable length lines, lines longer than 10 miles, because its operating characteristics are based off of the line characteristics. This means that when a fault appears on the line the impedance setting in the relay is compared to the apparent impedance of the line from the relay terminals to the fault. If the relay setting is determined to be below the apparent impedance it is determined that the fault is within the zone of protection. When the transmission line length is too short, less

than 10 miles, distance protection is becomes more difficult to coordinate. In these instances the best choice of protection is current differential protection.

### 6.5.5 Percentage Differential Relay

Percentage differential relays are used at APSCL to provide protection of power transformer. This type of relay is capable of identifying internal fault. There are two current transformers (CT) connected to the two end point of the protection part. The difference between two CTs current passes through the operating coil of the percentage differential relay. If difference is greater than zero then relay will operate. In percentage differential relays, the current from each current transformer flows through a restraint coil. The purpose of the restraint coil is to prevent undesired relay operation due to current transformer errors. The operating coil current $| i_1 - i_2 |$ required for tripping is a percentage of the average current through the restraint coils.

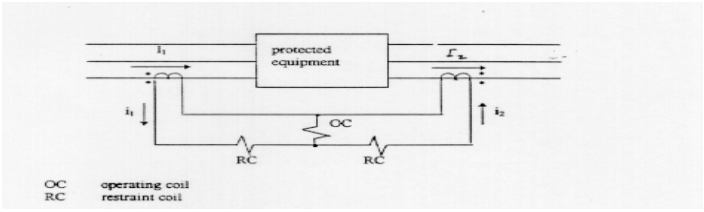


Figure 6.10: Percentage Differential Relay Internal Connection

### 6.5.6 Pilot or Slave Relay

Many of the valves and solenoids the speed switch operates have high currents and it may become necessary to “buffer” the control against harmful currents. The Pilot or Slave relay simply “relays” the signal to the high current load. The input to the pilot relay can be small but it can control currents up to 100’s of amps. If any kind of fault occurs in any zone of transmission line, immediately the fault should be cleared by using a signal, which comes from pilot relay. Microwave type pilot relay and power line carrier type pilot relay used for protecting the transmission line at APSCL.

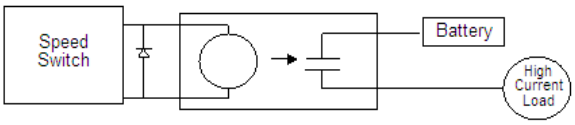


Figure 6.11: Pilot Relay with diode

A diode is shown in the above illustration. The diode channels the surges of the slave relay into a harmless dissipation as opposed to causing arcing in the control contacts of the engine control. By placing the pilot relays close to the loads other electrical benefits occur when the system is in an environment where electrical interference should be minimized.

### 6.6 Lightning Arrester

Lighting Arresters are used at APSCL substation to protect the equipments of substations from lighting surge. Lightning arresters are protective devices for limiting surge voltages due to lightning strikes or equipment faults or other events, to prevent damage to equipment and disruption of service. Also called surge arresters. Lightning arresters are installed on many different pieces of equipment such as power poles and towers, power transformers, circuit breakers, bus structures, and steel superstructures in substations. Lightning is a huge spark and takes place when clouds are charged to such a high potential with respect to ground or earth. It has a high voltage terminal and a ground terminal. Under the normal condition lightning arrester does not work but when the high voltage or thunder strike occur then air insulation of the gap breaks and arc is formed for providing a low resistance path for surge the ground. In this way the excess charge is grounded.

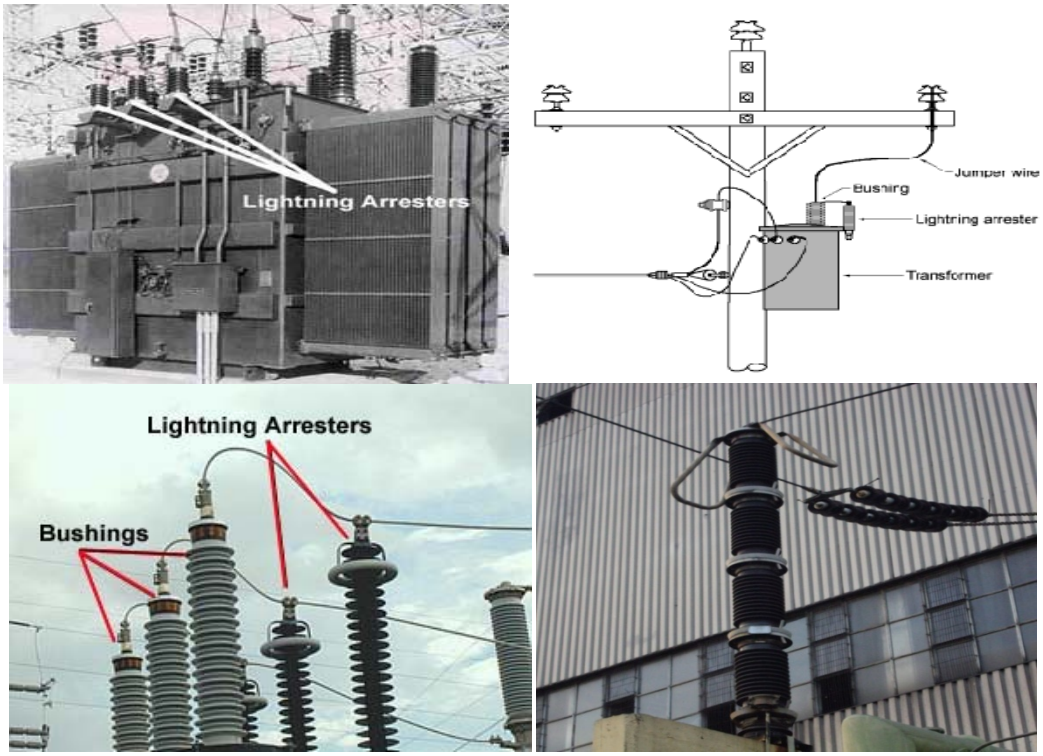


Figure 6.12: Different types of Lighting Arrester

### 6.6.1 Types of Lightning Arrester

There are different types of lightning arresters. At the substation of APSCL we saw the following two types of lightning arresters.

### 6.6.2 Rod Gap Arrester

It is a very simple type of diverter and consists of two 1.5 cm rods, which are bent at right angles with a gap in between as shown in Figure 6.13. One rod is connected to the line circuit and the other rod is connected to earth. The distance between gap and insulator must not be less than one third of the gap length so that the arc may not reach the insulator and damage it. Generally, the gap length is so adjusted that breakdown should occur at 80% of spark-voltage in order to avoid cascading of very steep wave fronts across the insulators. The string of insulators for an overhead line on the bushing of transformer has frequently a rod gap across it. Figure 6.13 shows the rod gap across the bushing of a transformer. Under normal operating conditions, the gap remains non-conducting. On the occurrence of a high voltage surge on the line, the gap sparks over and the surge current is conducted to earth. In this way excess charge on the line due to the surge is harmlessly conducted to earth.

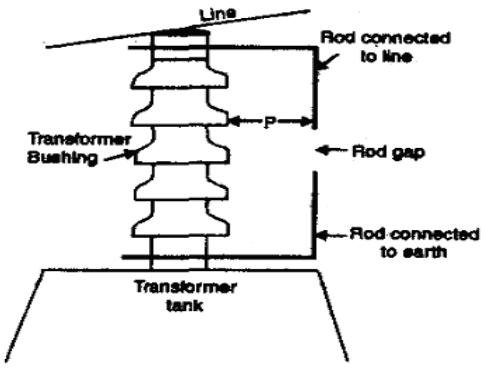


Figure 6.13: Rode Gap Arrester

### 6.6.3 Horn Gap Arrester

Horn gap arresters are named for their two horn-shaped metal rods. It consists of a horn shaped metal rods A and B separated by a small air gap. These rods are arranged around a small air gap, and the distance between the two rods increases as they rise from the gap. The rods are placed on porcelain insulators. One end of horn is connected to the line through a resistance and choke coil L while the other end is effectively grounded. The resistance R helps in limiting the follow current to a small value. The choke coil is so designed that it offers small reactance at normal power frequency but a very high reactance at transient frequency. Thus the choke does not allow the transients to enter the apparatus to be protected. The gap between the horns is so adjusted that normal supply voltage is not enough to cause an arc across the gap.

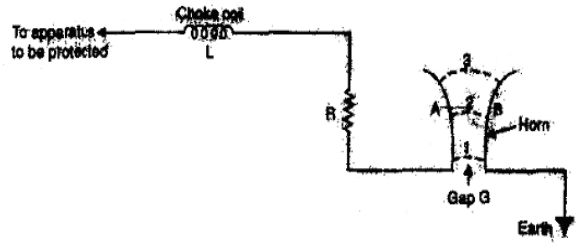


Figure 6.14: Horn Gap Arrester's internal mechanism

Under normal conditions, the gap is non-conducting i.e. normal supply voltage is insufficient to initiate the arc between the gap. On the occurrence of an over voltage, spark-over takes place across the small gap G. The heated air around the arc and the magnetic effect of the arc cause the arc to travel up the gap. The arc moves progressively into positions 1, 2 and 3. At some position

of the arc (position 3), the distance may be too great for the voltage to maintain the arc; consequently, the arc is extinguished. The excess charge on the line is thus conducted through the arrester to the ground.

### 6.7 Bus-bar Arrangements in Substation

Bur-bars are the important elements in the electrical substation. Bus-bars act as nodal point in the substation which connects different incoming and outgoing circuits. Substations present in the power system performs various operations depends on the application such as stepping up the voltage, stepping down the voltage, high voltage transmission and switching stations to route the power to desired load center.

#### 6.7.1 Bus-bar in Substation

Bus-bars used in the substations are generally rectangular or circular cross section bars. These bus-bars can be either solid or hollow structures. Hollow circular cross section bus-bars are employed in EHV substations to reduce the corona effect.

#### 6.7.2 Switching Schemes

Switching schemes implies different methods employed to connect electrical circuits in the power system to transfer the electrical power in reliable manner. Switching schemes helps in deliver the electrical power to power system if any part of the system is faulty or under maintenance. 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 substations bus-bar plays a common role to connect different circuits. However switching is possible in the power system with the help of circuit breakers and isolators.

#### 6.7.3 Considerations for Selection of Bus-bar Arrangement

Different types of bus-bar arrangements are employed based on the voltage, reliability of the supply, flexibility in transmitting power and cost. The other aspects considering in designing the bus-bar arrangements are:

(i) Simplicity in the design

(ii) Maintenance of different elements without interruption in the power supply

(iii) Future expansion feasibility

(iv) Economical in cost of installation and operation

### 6.7.4 Different Bus-bar Arrangements

Some of the switching schemes are bus-bar arrangements employed in the substations are listed below:

(i) Single Bus-bar arrangement

(ii) Double Main Bus-bar scheme

(iii) Main and Transfer bus-bar scheme

(iv) One and half breaker scheme

(v) Ring Main arrangement scheme

Double bus bar arrangement is used at APSCL substation. Here we will discuss about the double bus-bar arrangement because our mentor gave us knowledge about double bus-bar arrangement only.

#### 6.7.4.1 Double Bus-bar Scheme

Normally in double main bus-bar scheme each circuit is connected to both the buses. In some cases half of the circuits can be connected and operated on each bus, in these cases bus or circuit breaker failure would cause loss to half of the circuits. In double main bus-bar arrangement one or two breakers can be provided for each circuit. Double main bus-bar and double breaker scheme provides high reliability in the case of fault or outage of one of the breaker.

Figure 6.15: Double Bas-bar Connection used at APSCL Substation

There are some advantages of double Bus-bar Scheme. Here we mentioned some advantages of Single Bus-bar Scheme.

(a) Any circuit can be taken out of circuit for maintenance
(b) Flexibility in connecting the feeder circuit to either of the bus-bars

There are also some disadvantages of double Bus-bar Scheme. Here we mentioned some disadvantages of Single Bus-bar Scheme.

(a) Most expensive
(b) Loose circuits connected to bus-bar when fault occurs on the bus-bar

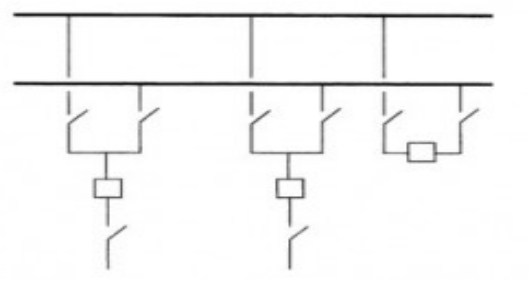

Figure 6.16: Double Bus-bar Single Breaker Scheme

### 6.8 Isolators

Isolators are provided for isolation from live parts for the purpose of maintenance. Isolators are located at either side of the circuit breaker. Isolators are operated under no load. Isolator does not have any rating for current breaking or current making. Isolators are interlocked with circuit breakers.

### 6.9 Earth Switch

Earth Switch is used to discharge the voltage on the circuit to the earth for safety. Earth switch is mounted on the frame of the isolators. Earth Switch is located for each incomer transmission line and each side of the bus-bar section.

Figure 6.17: Earth Switch

### 6.10 Control Room

A control room is a room serving as an operations center where a facility or service can be monitored and controlled. Every section of a power station has a control room. There is a control room to control the substation of APSCL. We were able to know about the electric panels' configuration that they have in the control room. The electric panels can be seen in the Figure 6.18. We were able to observe that all the electrical equipments switches had two switching options: local and remote. When it is set to local, one of the operators has to go physically to the device, which is somehow distant from the control room, and turn it on/off there. While, if it is set to remote, the operator can turn the device on/off from the control room by just rotating and pressing a button. Furthermore, after a maneuver in the system one of the system operators must write down everything that has happened and fix a security card in a button if it is pressed in order to avoid accident.

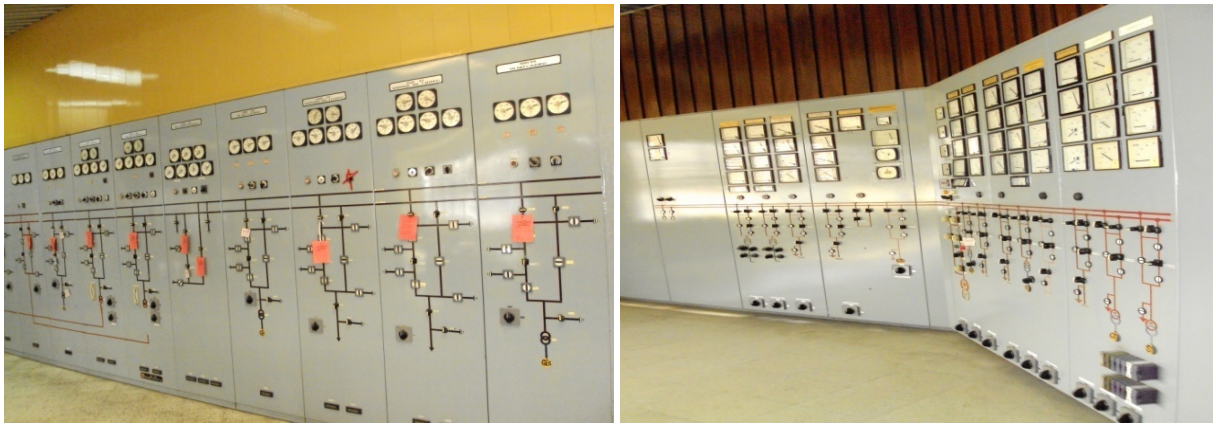

Figure 6.18: Control room of APSCL substation

### 6.11 Control Cables

Control Cables are for protection, control and measurement etc. They are of low voltage and PVC insulated. Control Cables are Multi core and Shielded.

Figure 6.19: XLPE insulated Control Cables

### 6.12 DC Power Supply Room

There is DC power supply Room at APSCL Substation. Battery is the most important part of a substation. Battery is the only back up source of DC supply. It is the heart of the substation because most the equipment is run on DC power. Without DC power supply, the grid will be unprotected because security lighting, fire alarm circuit, circuit breaker, relay get energized by the DC supply. The batteries used at APSCL are made by Rahimafrooz Bangladesh Limited.

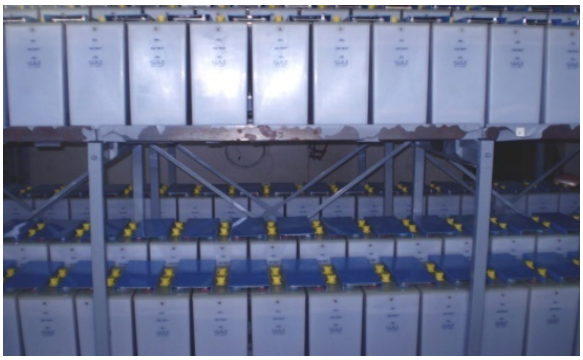

Figure 6.20: Battery room at APSCL substation

### 6.13 Transmission Line

Transmission line is a material medium or structure that forms a path for directing the transmission of energy from one place to another electric power transmission. Electrical power can be transmitted or distributed either by means of underground cables or by overhead lines. The underground system is much more expensive than overhead system. Therefore, it has limited used for distribution in congested area where safety and good appearance are the main consideration. In the overhead lines, bear conductor are used and air acts as the insulation. The

necessary insulation between the conductors can be provided by adjusting the spacing between them.

### 6.13.1 Overhead Lines

Overhead lines are used to transmit or distribute electric power. The successful operation of overhead line depends to a great extent upon the mechanical design of the line. Main component of Overhead lines are:

(i) Conductors.

(ii) Line Supporters.

(iii) Insulators

Figure 6.21: Overhead line of APSCL

#### 6.13.1.1 Conductor

Conductor carries electrical power from sending end to receiving end. Conductor cost is the most vital cost of the total transmission cost. Therefore proper choice of the material and size of the conductor is considerable importance. So, the conductor used for transmission and distributions of electrical power have the following properties:

(i) High electrical conductivity.

(ii) High tensile strength in order to withstand mechanical stress.

(iii) Low cost so that it can be used for long distances.

(iv) Low specific gravity so that weight per unit volume is small.

#### 6.13.1.2 Line supporters

The supporting structures for overhead line conductors are various types of poles and towers called line supporters. There are many types of line supporters or towers that are used in

transmission line. Most commonly used supporters used in transmission lines are wooden poles, steel poles, and RCC poles and lattice steel tower.

Line supporters should have the following properties:

(i) High mechanical strength to withstand the weight of conductors and wind loads etc.

(ii) Light in weight without the loss of mechanical strength.

(iii) Cheap in cost and Economical to maintain.

(iv) Longer life.

(v) Easy accessibility of conductors for maintenance.

**6.13.1.3 Insulators**

Used for insulation purpose. The overhead line conductors should be supported on the poles or towers in such way that current from conductor do not flow to the earth through supports that is line conductor must be properly insulated from supports. This is achieved by securing line conductor to supports with the help of the insulator. The insulators provide necessary insulation between the line conductors and supports and thus prevent any leakage current from conductor to earth. Different types of insulators are porcelain, Glass, Epoxy according to the construction material of insulators. There are several types of insulators but most of the commonly used insulator at APSCL is pin type, suspension type and strained insulator.

Figure 6.22: Porcelain Insulators

**6.13.1.3 .1 Pin Type**

Pin type insulators are used for transmission and distribution of electrical power at voltages up to 33kV.

**6.13.1.3 .2 Suspension Type**

Voltages above 33KV, it is a usual practice to use suspension type insulator. They consist of a number of porcelain discs connected in series by metal links in the form of string. The conductor

is suspended at the bottom end of this string while the other end of the string is secured to the cross-arm of the tower. Each unit or disc is designed for low voltage (11kV) the number of disc connected in series would depend upon the working voltage.

#### 6.13.1.3.3 Strained

When there is a dead end of the line or there is corner or sharp curve, the line is subjected to greater tension. In order to relieve the line of excessive tension, strain insulators are used. For low voltage lines, shakle insulators are used as strain insulators. For high voltage transmission lines, strain insulators consist of an assembly of suspension insulators.

### 6.14 Underground Power Cables

There are different types of power cable. Power Cables are used to carry the power. They are single core and three cores. Types of power cables are PVC insulated, XLPE insulated. There are used XLPE cables at APSCL.

Figure 6.23: XLPE insulated Underground Power Cable used in APSCL

Underground cable should have the following properties:

(i) Copper or aluminum of high conductivity
(ii) Armoring required for better mechanical strength
(iii) Proper insulation thickness
(iv) Complete chemical and physical stability
(v) Economical cross-section

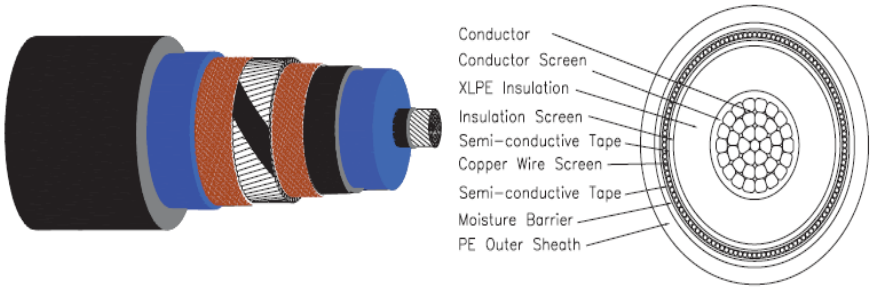


Figure6.24: Construction of 132KV XLPE Cable

### 6.15 Single Line Diagram

Single line diagram of a substation is the sketch of total substation that denotes how equipments are arranged in the field. It is helpful for understanding the total system because it gives a total overview of the system.

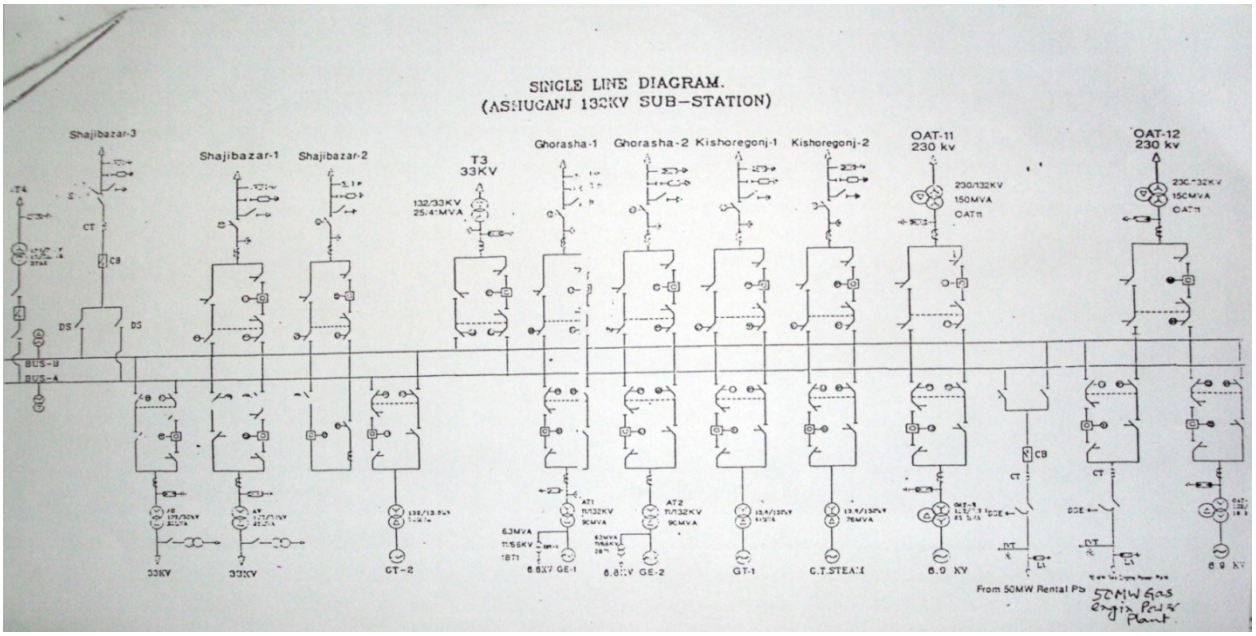


Figure 6.25: Single Line Diagram (Ashuganj 132KV Substation)

From the figure we see that here double bus bar system is used. Bus is present for incoming feeder from unit 1, 2, 3, 4, 5, GT-1, GT-2 & ST etc. The outgoing feeders are going to Shajibazar-1, Shajibazar-2, Shajibazar-3, Ghorashal-1, Ghorashal-2, Kishoregonj-1, Kishoregonj-2 etc.

# Chapter 7

## 7. Problems and Recommendations

### 7.1 Problems

There are some problems which we faced during internship period. The problems are given below:

- Practical participation (meaning hands-on experience) in different works of APSCL would give us more experience but practical participation was not allowed for internship students.
- There is too much sound at generating section when power plant is in operating mode. So it is difficult to communicate with others at that time.

### 7.2 Recommendations

There are some recommendations which will be helpful for students given below:

- Students should complete the Power Station related courses before internship program. Taking the internship related courses before the internship program will be helpful for the students to realize total power system of the power plant.
- The internship program should be taken in such a way that it does not clash with the time schedule of university class.

# Chapter 8

## 8. Conclusion

We are very lucky that we got chance to complete our internship program in APSCL, which is the second largest power station company in Bangladesh. APSCL is playing a vital role in producing power for the country. During internship we gathered the practical knowledge about the design, generation and distribution of the power station. We visited combined cycle power plant (CCPP), substation, generating section, operating section, instrumentation and control section (I & C). We also visited the control room of APSCL where engineers and technicians control and monitor the electricity flowing in and out of the substation and the functioning of all the electric equipments, through several panels in the control room. Now we are able to relate the practical experience with the theoretical experience in power sector. We believe that, the practical experience that we gathered from APSCL will help us in our professional life.

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# 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

# Appendix

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 Company Limited |
| Name of the student: | REZAUL ISLAM |
| ID: | 2007-2-80-001 |

| | |
|---|---|
| Date: | 26/12/2011 |
| Start time/End time | 8am to 4pm (1 hour gap) |
| Location: | APSCL |
| Mentor: | Achinta Kumer Sarker (Dy. General Manager) |

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)

This is the first day of our internship at APSCL. The main objective of the day is to know about the APSCL. Our mentor try to give us a complete overview of the power station. We also visite the different units of the power 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 APSCL established in 1976. There are ~~three~~ four types of power station: (i) gas turbine (ii) steam turbine (iii) Combined cycle (iv) gas engin.

There are tottal nine generating units. There are five steam turbins, two gas turbines, one gas engin and one combined cycle units. The installed capacity of the plant (by 9 units) is about 781MW. Unit 1 & 2 → Installed capacity → each 64MW, generating voltage 11KV; Unit 3 & 4 & 5 → ~~each~~ installed capacity → 150MW each, generating voltage → 15.75 KV each; Combined cycle installed capacity → 334MW generating volt. 13.8KV; GT 1 & GT 2 → Generating volt. → 12.8 KV, installed capacity - 58MW each, Gas engin → 14 generator, inst. capacity → 3.8MW each and Gen. volt. → 11KV.

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

This is the first day of our internship at APSCL. We visit different part of the power station and try to realise the ~~the~~ different part of the power station. ~~and~~ It develops our practical knowledge.

26.12.2018

Signature of the mentor with date
Name: ACHINTA KUMER SARKER
Designation: DGM (C&M)
Contact Phone #: 01711-425460.

উপ-মহাব্যবস্থাপক
যান্ত্রিক সংরক্ষণ
আশুগঞ্জ পাওয়ার ষ্টেশন কোং লিঃ
আশুগঞ্জ-৩৪০২, বি-বাড়ীয়া।

Tahseen Kamal 13.01.2019

Signature of academic supervisor with date
Name: Tahseen Kamal
Designation: Senior Lecturer

After visited the different part ~~of~~ or units of the power station we see that the practical knowledge and theoretical knowledge are almost same although there are ~~some~~ few difference bet' them.

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 Company limited. |
| Name of the student: | Ikhtiar Ahmed Sagar. |
| ID: | 2007-2-80-009 |

| | |
|---|---|
| Date: | 27.12.2011 |
| Start time/End time | 8 am to 4 pm |
| Location: | CCPP |
| Mentor: | Md. Fazle Hasan Siddiqui (A.E) |

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 main activities of this day is to know about the Combined cycle power plant (ccpp).

→ On this day we only observe the gas turbine powers plant which is a part of 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.

→ The equipments of the gas turbine powers plant are

1/ gas treatment plant
2/ Fuel valve package
3/ Battery room.
4/ Compressor
5/ Combustion
6/ Gas turbine
7/ Generators
8/ starting motors.

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

→ In gas turbine powers plant gas is used as a fuel and air is used as the working fluid. The air is used by the Compressor which is used for firing and Cooling system. The Compressed air led to the Combustion Chamber that rising the temperature. Then the flu

28/12/12
Signature of the mentor with date
Name: Md. Fazle Hassan Siddiqui
Designation: Asstt. Engineer.
Contact Phone #:

Alam 24/1/2012
Signature of academic supervisor with date
Name: Khairul Alam
Designation: Assoc. Prof.

gas passed to the gas turbine, where it is expand and work as a mechanical work. Now gas turbine drives the alternators which converted mechanical energy into electrical energy.

After the practical activities we can that there are similarities betn practical and theoretical knowledge.

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 company Limited. |
| Name of the student: | Ikhtiar Ahmed Sagar. |
| ID: | 2007-2-80-009 |

| | |
|---|---|
| Date: | 28-12-11 |
| Start time/End time | 8 am to 4 pm |
| Location: | ACPP |
| Mentor: | Khondaker Kazmul Amin, (A.E) |

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 main activities of this day is to know about the Combined cycle power plant (CCPP).

→ On this day, finally we observe the gas turbine power plant and steam turbine 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.

→ The function of the Combined cycle power plant are—

1/ Generator
2/ Compressor
3/ Combustion
4/ Exhaust
5/ D/A motors
6/ Vessel
7/ Drum
8/ Waste heat recovery Unit
9/ Convert isolating emergency stop valve
10/ steam turbine
11/ Condenser
12/ Make up tank.
13/ Dampers

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

→ In CCPP we used gas turbine and steam turbine. where gas turbine produces exhaust gas which are connected to the boiler (waste recovery Unit). This Unit, after four stages produces exhaust gas. Now close loop circulating using the equipments D/A storage vessel, Drum, waste recovery

Signature of the mentor with date
Name: Kh. Nazmul Amin
Designation: Assistant Engr.
Contact Phone #: 01913010193

Alam 24/1/2017
Signature of academic supervisor with date
Name: Khairul Alam
Designation: Assoc Prof

Units, steam turbine, Condensers are produce mechanical energy into electrical energy.

In practical and theoretical knowledge are mainly same from our academic Course.

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 Company Limited |
| Name of the student: | Rezaul Islam |
| ID: | 2007-2-80-001 |

| | |
|---|---|
| Date: | 29/12/2011 |
| Start time/End time | 8am to 4pm (1 hour gap) |
| Location: | Sub-station at APSCL |
| 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.
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 main objective of the day is to know about the equipments of substation. Sub-station is important part of power system. The continuity of supply depends to a considerable extent upon the successful operation of 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.

1. Transformer Sub-Station: (i) Step-up sub-station (ii) primary grid sub-station (iii) Secondary sub-station (iv) Distribution sub-station
2. Circuit breaker: (i) High volt. CB (ii) Low volt. CB (iii) Medium volt. CB
3. Cable: PVC, XLPE, ARMARD, NON-ARMERED
4. Bear conductor
5. Insulator
6. Battery or DC voltage
7. Rectifier
8. Bus-bar
9. Isolator
10. Transformer

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

This day we tried to learn and know about the pow sub-station. We are mainly acquire knowledg about transformer sub-station, cable, bear conductor, insulator, battery or DC voltage, rectifier, bus-bar, Isolator, lightning arrester, etc transformer etc.

29/2/2011
Signature of the mentor with date
Name: Noor Mohammad
Designation:
Contact Phone #:

সহকারী প্রকৌশলী (উপ-কেন্দ্র)
আশুগঞ্জ পাওয়ার ষ্টেশন কোং লিঃ
আশুগঞ্জ, ব্রাহ্মণবাড়িয়া

18.09.2012
Signature of academic supervisor with date
Name: Tahseen Kamal
Designation: Senior Lecturer

The majority of the sub-station in the power system are concerned with the changing of voltage level of electric supply. These are known as transformer sub-stations because transformer is the main equipment employed to change the voltage level. The theoretical knowledge and practical ~~exp~~ knowledge are almost same. Theoretical knowledge helps us to realise the practical activities properly.

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 Company Limited |
| Name of the student: | Rezaul Islam |
| ID: | 2007-2-80-001 |

| | |
|---|---|
| Date: | 31/12/2011 |
| Start time/End time | 8am to 4pm (1 hour gap) |
| Location: | Sub-Station |
| 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.
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 main objective of the day is to know about the sub-station. We observe different types of equipments of the sub-station such as transformer, Isolator, SF6 circuit breaker, minimum oil circuit breaker, bus-bar, bushing etc.

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. Transformer : (i) Single phase (ii) Three phase (iii) Auto transformer (iv) Core type (v) Shell type transformer.
2. Bus-bar : (i) Single bus-bar arrangement
(ii) Single bus-bar system with sectionalisation
(iii) Double bus-bar arrangement
3. SF6 circuit breaker
4. Minimum oil circuit breaker
5. Current transformer
6. Potential transformer
7. Insulator
8. Isolator

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

In our academic course such as power station course and Switchgear and protection relay course we learn about transformer, bus bar, SF6 circuit breaker, minimum oil circuit breaker, current transformer,

21/12/2011
Signature of the mentor with date
Name: Noor Mohammad
Designation:
Contact Phone #:

Tahseen Kamal
13 01 2012
Signature of academic supervisor with date
Name: Tahseen Kamal
Designation: Senior Lecturer

potential transformer, insulator, isolator etc. We see that the theoretical knowledge and practical knowledge are almost same. Theoretical knowledge helps us to understand the practical activities.

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 Company Limited |
| Name of the student: | Rezaul Islam |
| ID: | 2007-2-80-001 |

| | |
|---|---|
| Date: | 01/01/2012 |
| Start time/End time | 8am to 4 pm (1 hour gap) |
| Location: | Sub-Station |
| 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.
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 main objective of the day is to know about the protective relay, protection of generator and transformer and protection of Bus-bars and lines. There are two types of bus-bar in at APCL Sub-station. 132kV Bus bar and 230kV bus-bar. We also see the control room on this day.

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. ~~Minimum~~ oil circuit breaker
2. Insulation test
3. Buchholz relay.
4. Distance relay
5. Directional relay
6. Over current relay
7. differential relay.
8. Meter: Amp meter, Volt-meter, Mega-watt meter, Mega-var meter etc.
9. control system.
10. Instrument transformer: CT, PT
11. DC supply: 110V, 220V, 48V etc.
12. Lightning arrester
13. Oil temp. indicator
14. winding temp. indicator.
15. Pressure relived device (PRD)
16. Transmission line
17. Bushing connection
18. classical relay

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

In our academic course such as power station and switch gear and protection relay course we learned about the minimum oil ckt. breaker, buchholz relay, distance relay, directional

01/02/2012

Signature of the mentor with date
Name: Noor Mohammed
Designation:
Contact Phone #:

Tahseen Kamal
18.01.2012

Signature of academic supervisor with date
Name: Tahseen Kamal
Designation: Senior Lecturer

relay, ~~as~~ overcurrent relay, defferential relay, percentage differential relay, lightning or surge arrester etc. After the visite of the substation, we see that the theoretical and practical part both are important to realise the substation system. Theoretical knowledge helps us to realise the practical activities properly.

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 Company Limited. |
| Name of the student: | Ikhtiar Ahmed Sagar |
| ID: | 2007-2-80-009 |

| | |
|---|---|
| Date: | 02/01/12 |
| Start time/End time | 8am to 4pm |
| Location: | Generator Section |
| 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.
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 the day's activities was to learn about the classification of generators, Construction, working principle, Cooling System, maintenance and protection.

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.

→ In generator section, there are different types of generators. According to o/p power generators ① AC ② DC and according to rotor generator ① salient pole ② Non-salient pole.

→ For maintenance purpose we check Carbon brush, Air filters, shaft voltage measurement and finally checking the Dehumidifier.

→ Finally, On this day we learn about the cooling System which are ① Air Cooled and ② $H_2$ Cooled.

→ Then we learn about protection system.

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

→ In Our Academic Course, we learned about theoretical knowledge but in generators section, we learned about practical knowledge.

Signature of the mentor with date
Name:
Designation:
Contact Phone #:
04-01-12

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

Alam 24/1/2012
Signature of academic supervisor with date
Name: Khairul Alam
Designation: Assoc. Prof

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 company limited |
| Name of the student: | Ikhtiare Ahmed Sagar |
| ID: | 2007-2-80-009 |

| | |
|---|---|
| Date: | 03/01/2012 |
| Start time/End time | 8 am to 4 pm |
| Location: | Generator section |
| 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.
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)

→ On this day's we learn about the different type of protection System 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.

→ The function of generator protections are —

1. Over Current protection
2. Over Current with Under Voltage
3. Over voltage
4. Under frequency
5. Negative phase sequence
6. Reverse power
7. Minimum Impedance
8. Loss of excitation
9. Winding differential
10. Stator earth fault
11. Back up earth fault
12. Rotor earth fault
13. Distance protection
14. Unit transformer protection
15. Unit Auxiliary transformer
16. Grid protection.

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

→ In generator section we learn about different type of protection. More over, In switchgear and power station Course we achieved similar and details knowledge about generator protection system.

Signature of the mentor with date
Name:
Designation:
Contact Phone #:

Mohammad Kamruzzaman
Senior Engr. (Generator)
Ashuganj Power Station Co Ltd
Ashuganj, Brahmanbaria

Signature of academic supervisor with date
Name: Khairul Alam
Designation: Assoc. Prof.

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 Company Ltd. |
| Name of the student: | Ikhtiar Ahmed sagar |
| ID: | 2007-2-80-009 |

| | |
|---|---|
| Date: | 09/01/2012 |
| Start time/End time | 8 am to 4 pm |
| Location: | Generator Section. |
| 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.
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)

→ On this days the main activities were to learn about different type of protection, synchronization and rotors construction.

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 learned about last three protection —
① Unit transformer protection ② Unit Auxiliary transformer protection ③ Grid protection ④ Telephone protection
→ For Synchronization it's maintain three Condition ① Voltage level ② Frequency ③ phase angle.
→ In Apsel, every generator have two pole non salient type rotor. It creates North pole and South pole and it work as a electromagnet.
→ Finally, we visited the generator site and observe the equipments.

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

→ In academic Course we learned about the synchronisation and rotor. Our Apsel instructor gave us same type of knowledge. Alam 24/1/2012

Signature of the mentor with date
Name:
Designation:
Contact Phone #:
04-01-12
Mohammad Kamruzzaman
Senior Engr. (Generator)
Ashuganj Power Station Co. Ltd.
Ashuganj, Brahmanbaria-3402

Signature of academic supervisor with date
Name: Khairul Alam
Designation: Assoc. Prof.

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 Company Ltd. |
| Name of the student: | Ikhtiar Ahmed Sagar |
| ID: | 2007-2-80-009 |

| | |
|---|---|
| Date: | 05/01/12 |
| Start time/End time | 8 am to 4 pm |
| Location: | Operation section |
| Mentor: | Md. Anwar Hossain (Manager) |

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's was the function of steam power plant and working principle of this function.

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 function of the steam power plant
- Condenser
- Condenser pump
- Gland steam Condenser
- Hp heater and Lp heater
- Feed pump
- Boiler Drum
- Super heater
- Intermediate pressure turbine

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

→ In our Academic Course we learned about theoretical knowledge but in operation section we learned about practical knowledge.

05/11/12
Signature of the mentor with date
Name:
Designation:
Contact Phone #:

Alam 24/11/2012
Signature of academic supervisor with date
Name: Khairul Alam
Designation: Assoc. Prof

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 Company Ltd. |
| Name of the student: | Ikhtiar Ahmed Sagar |
| ID: | 2007-2-80-009 |

| | |
|---|---|
| Date: | 27/01/12 |
| Start time/End time | 8am to 4pm |
| Location: | Operation |
| Mentor: | Md. Anwar Hossain (Manager) |

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)**

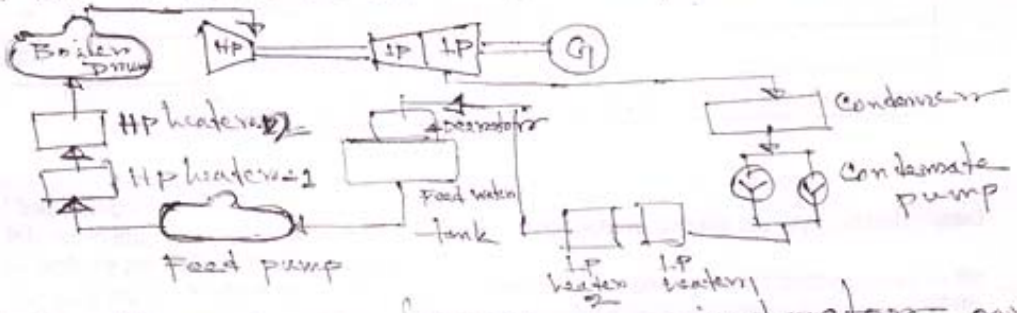
1 What was the objective of the day's activities? (If applicable. list multiple objectives)

→ The objective of the day's activities was to learn about the Construction and Working principal of steam power plant.

→ Finally visited the steam 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.

→ How to work steam power plant :-




→ In these above figure our instructor gave us total description of steam power plant.

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

→ In theoretical knowledge and practical knowledge both are same in the respective of academic course.

10/12/12

Signature of the mentor with date
Name:
Designation:
Contact Phone #:

Adam 24/11/2012

Signature of academic supervisor with date
Name: Khairul Alam
Designation: Assoc. Prof.

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 Company Ltd. |
| Name of the student: | Ikhtiar Ahmed Sagor |
| ID: | 2007-2-80-009 |

| | |
|---|---|
| Date: | 05/01/12 |
| Start time/End time | 8am to 4pm |
| Location: | operation Section |
| Mentor: | Md. Anwar Hossain (Manager) |

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)

→ On this day's we observe the overview of steam power plant and visited this site.

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 learnt about different type of valve how to work and activities.

→ We see the three stages nine burners and superheater and downcomer pipe.

→ Then we see the Feed tank, deaerators and flash vessel.

→ Then we observe the high pressure turbine and low pressure turbine.

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

→ In our academic course, we learned about theoretical knowledge but in operation section we learned about practical knowledge.

28/11/12

Signature of the mentor with date
Name:
Designation:
Contact Phone #:

Alam 24/11/2012

Signature of academic supervisor with date
Name: Khairul Alam
Designation: Assoc. Prof.

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 Company ltd. |
| Name of the student: | Ikhtiar Ahmed Sagar |
| ID: | 2007-2-80-009 |

| | |
|---|---|
| Date: | 09/01/12 |
| Start time/End time | 8 am to 4 pm (1 hour gap) |
| Location: | Instrumentation and Control |
| 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.

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 the day's activities was to learn about the instrumentation and Control system of steam 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.

- Gas pressure reducing plant
  - gas Control actuators
  - filters inlet shut off valve
  - isolating valve
  - filters differential pressure indicators (Inlet to Outlet)
  - flow indicators.
- Force Draught fans (air inlet actuators)
- Binarny Control Valve (Fully closed or open valve)
- Analog Control valve
- Waste drain basin.
- Temperature Control actuators valve.
- Air Pre-heater drivers pump.
- Motor protection.
  - when winding temperature above 80°c then motor will be trip.
- Boilers protection:—
  - FD fan
  - Flu gas dampers
  - Air pre heaters
  - Boilers Drum level
  - Junction Box (kx-6)
  - Steam pressure reducing valve.

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

→ In our academic Course we learned only theoretical background but here in APSCL (instrumentation and Control system) we gained practical knowledge of different type of valve and protection.

10-01-2012
Signature of the mentor with date
Name: Bikash Ranjan Roy.
Designation: Manager (I&C)
Contact Phone #: 01712887349

Alam 24/1/2012
Signature of academic supervisor with date
Name: Khairul Alam
Designation: Assoc. Prof.

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 Company Ltd. |
| Name of the student: | Ikhtiar Ahmed Sagar |
| ID: | 2007-2-80-009 |

| | |
|---|---|
| Date: | 10/01/12 |
| Start time/End time | 8 am to 4pm (1 hour gap) |
| Location: | Instrumentation and Control |
| 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.

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 the day's activities was to learn about the Instrumentation and Control system of thermal 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.

List of the day's activities are —

- Turbine Control Panel.
- → Local emergency push button
- → Test hub oil pressure switch
- → Test Vacuum trip-1
- → Exhaust steam Vacuum trip-1
- Solenoid Valve
- Regulating Valve
- Turbine speed sensors
- Pedestrisal bearing Vibration sensors
- Over speed trip-110%
- Over speed trip-112%
- Boiler Drum transmitters
- Drum safety valve
- Cooling water Pump
- Air removal valve Pump (water side)
- Air removal valve Pump (steam side)

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

→ In Apsch, we learn about different type of valve and protection from our Instrumentation Practically, But in the academic course we learn — theoretical knowledge.

11-01-2012
Signature of the mentor with date
Name: Bikash Ranjan Roy.
Designation: Manager
Contact Phone #: 01712687349

Signature of academic supervisor with date
Name: Khairul Alam
Designation: Asstor. Prof.

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 Company ltd. |
| Name of the student: | Ikhtiar Ahmed Sagar |
| ID: | 2007-2-80-009 |

| | |
|---|---|
| Date: | 11/01/2012 |
| Start time/End time | 8 am to 4 pm (lunch break 1:00 to 2:00 PM) |
| Location: | Instrumentation and Control. |
| 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 the day's activities was to learned about the Instrumentation and Control System of steam 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.

List of the day's activities are —

* Boiler feed pump
→ Voithgears actuator
* Booster pump
* Turbine protection:-
→ Shaft position protection
→ Shaft vibration protection
→ Lub oil protection → 40%
→ Lub oil protection → 60%
→ Over speed protection → 110%
→ Over speed protection → 112%
→ Turbine metal temp. protection
→ Vacuum protection trip-1
→ Vacuum protection trip-2
* Motor protection :-
→ Cooling waters pump motor winding protection.
* Make-up waters flow control valve
* Auxiliary steam drain shut off Valves
* Hot ~~sink~~ WC//

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

In our academic Course we learned about theoretical knowledge but in instrumentation and Control system we learned about Practical knowledge of thermal power plant.

11-01-2012
Signature of the mentor with date
Name: Bikash Ranjan Roy.
Designation: Manager.
Contact Phone #: 01712887949

Alam 24/1/2012
Signature of academic supervisor with date
Name: Khairul Alam
Designation: Assoc. Prof