EAST WEST UNIVERSITY

INTERNSHIP REPORT

ON

Generation Section of Ashuganj Power Station Company Limited (APSCL)

By

Shamsul Arifin Chowdhury

2008-1-80-029

Mahmudur Rahman Rana

2008-2-80-007

Arif Ahmed

2008-1-80-031

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)

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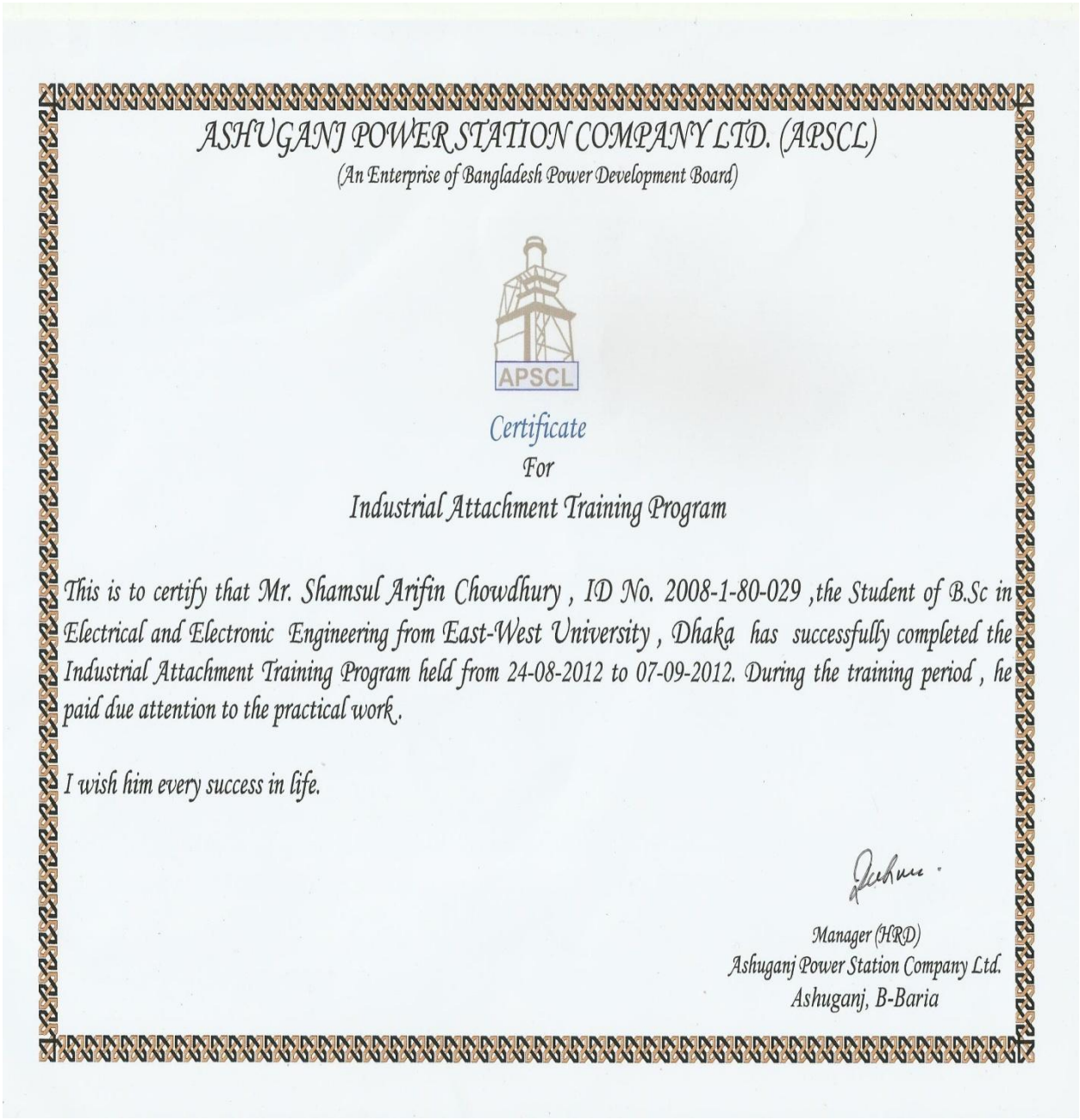
Approval Letter



ASHUGANJ POWER STATION COMPANY LTD. (APSCL)

(An Enterprise of Bangladesh Power Development Board)

APSCL

Certificate

For

Industrial Attachment Training Program

This is to certify that Mr. Shamsul Arifin Chowdhury , ID No. 2008-1-80-029 ,the Student of B.Sc in Electrical and Electronic Engineering from East-West University , Dhaka has successfully completed the Industrial Attachment Training Program held from 24-08-2012 to 07-09-2012. During the training period , he paid due attention to the practical work .

I wish him every success in life.

Manager (HRD)
Ashuganj Power Station Company Ltd.
Ashuganj, B-Baria

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Manager (HRD)
Ashuganj Power Station Company Ltd.
Ashuganj, B-Baria

Acknowledgment

At first, we would like to thank almighty Allah for giving us the opportunity to finish our internship program properly. Then we would like to thank our parents for supporting us to proceed with our study.

We would like to place our great pleasure and sincere gratitude to Engr. Md. Mahfuzur Rahman, Finance Director of APSCL and Md Lutfar Rahman (HRM), who helped us to get permission and allowed us to do the internship.

We would also like to thank Engr. Md. Kamruzzaman, Senior Engineer (Generator and Switchgear Protection.), and Engr. Md. Rokonuzzaman, Senior Engineer (Generator and Switchgear Protection) for guiding us properly. They gave us their valuable time and helped us to learn properly internship related issues.

We would also like to thank our advisors Ms. Tahseen Kamal, Senior Lecturer and Ms. Sohana Tanzeem, Lecturer, Department of Electrical and Electronic Engineering of East West University. They helped us to solve different sort of academic problems and motivated us to study. They are not only our advisors but also our perfect guardians.

We would also like to express our gratitude to Dr. Mohammad Mojammel Al Hakim, Chairperson and Associate Professor of the department of Electrical and Electronic Engineering, East West University.

We would like to express our special thanks to Dr. Anisul Haque, Professor of Electrical and Electronic Engineering department who always motivated us to learn and showed us the ways to build up our knowledge.

Above all, we are grateful to all of our teachers and friends for their co-operation and encouragement throughout our whole academic life at EWU.

Executive Summary

Bangladesh is a densely populated country. Load-shedding is one of the major problems of our country. Now a day, the maximum power demand is almost 4500 MW to 5600 MW and it will rise to 7000 MW in few years. But our power sector provides only 3800 MW to 4600 MW which is one third of the demand. Here, we observed a huge difference. Ashuganj Power Station Company Limited (APSCL) where we have completed our internship is the second largest power plant in Bangladesh. It has 9 units with 777 MW capacities. But its present de-rated capacity is 731MW and dependable capacity is 624MW at a deliver point. Ashuganj Power Station fulfills about 15% of power requirements of the total country.

In our internship, we have learnt about the whole power plant system focusing on the Generation section mostly. Here, we came to know how a power station can generate power and how they distribute this power around the country, also about the maintenance and the protection of power system equipments, which are used for generating or distributing power. Here, we were not permitted to operate or touch the equipment but saw how these equipments work. At APSCL, we have seen the control rooms, generator rooms etc. We have also learnt about winding shop, battery room, substation, Combined Cycle Power Plant (CCPP), turbine, boiler, water treatment system etc. We were able to combine our theoretical and practical knowledge and also gain knowledge about the whole power system of Bangladesh.

Schedule of the internship work

The following table represents our internship schedule.

Date	Section	Time	Mentor
24-08-2012	Visiting APSCL	8.00am - 4.00pm	Md. Rokonuzzaman
25-08-2012	Generator Section	8.00am - 4.00pm	Md. Rokonuzzaman
26-08-2012	Generator Section	8.00am - 4.00pm	Md. Rokonuzzaman
27-08-2012	Winding Shop	8.00am - 4.00pm	Md. Rokonuzzaman
28-08-2012	Control Unit 1 and 2	8.00am - 4.00pm	Md. Rokonuzzaman
29-08-2012	Control Unit 3 and 4	8.00am - 4.00pm	Md. Rokonuzzaman
30-08-2012	Control Unit 5	8.00am - 4.00pm	Md. Rokonuzzaman
31-08-2012	Combined Cycle Power Plant	8.00am - 4.00pm	Md. Rokonuzzaman
01-09-2012	Battery Room	8.00am - 4.00pm	Md. Rokonuzzaman
02-09-2012	Generator Section	8.00am - 4.00pm	Md. Rokonuzzaman
03-09-2012	Generator Section	8.00am - 4.00pm	Md. Rokonuzzaman
04-09-2012	Boiler Section	8.00am - 4.00pm	Md. Rokonuzzaman
05-09-2012	Steam Turbine Section	8.00am - 4.00pm	Md. Rokonuzzaman
06-09-2012	Water Treatment Plant	8.00am - 4.00pm	Md. Rokonuzzaman
07-09-2012	Substation	8.00am - 4.00pm	Md. Rokonuzzaman

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CHAPTER 1

INTRODUCTION

During our fifteen days internship experience at Ashuganj Power Station Company Limited (APSCL), our learning was mainly focused on generation sector. We gained practical knowledge about power generating system in a power station. We came to know about how the main and auxiliary parts of a generator work. We also learnt about the generator maintenances and protection procedures. At APSCL, we observed how an engineer operates the generating section when a fault occurs. Besides, we also observed some important sectors like boiler, turbine, Combined Cycle Power Plant (CCPP), water treatment plant and substation. Now, we are familiar with working process of different sectors in a power plant.

Above all, the internship program was successful for us under the caring supervision of our instructors at APSCL. We have now the practical knowledge regarding the generation section particularly and also the whole working process of the power station.

1.1 Company Profile

Ashuganj Power Station is the second largest power station in Bangladesh. The present total power (electricity) generation capacity of its 9 units is 674 MW. As a part of the Power Sector Development and Reform Program of the Government of Bangladesh (GOB) Ashuganj PowerStation Company Ltd. (APSCL) has been incorporated under the Companies Act 1994 on 28 June 2000. The Registration No. of APSCL is 40630 (2328) / 2000. Ashuganj Power Station (APS) Complex (with its Assets and Liabilities) had been transferred to the APSCL through a Provisional Vendor's Agreement signed between BPDB and APSCL on 22 May 2003. All the activities of the company started formally on 01 June 2003. From that day the overall activities of the Company along with operation, maintenance and development of the Power Station are vested upon a Management Team consisting of the Managing Director, the Director (Technical) and the director (Finance) [1].

Here, the following table depicts the overall specification summary of APSCL (Table 1.1).

Table 1.1: Company Profile of APSCL [1].

Corporate Office	Ashuganj Power Station Company Ltd., Ashuganj, Brahmanbaria, 3402
Registration No.	C-40630 (2328)/2000
Date of Incorporation	28 June 2000
Status	Public Limited Company
Business	Power Generation
Number of Generating Units	• 9 (6 Steam Turbine + 2 Gas Turbine+ 1 Gas Engine) • Two Steam Units of 64MW- Unit # 1 and 2 each-commissioned in 1970. • 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. • 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. • 50MW Gas Engine Power Plant was commissioned in 2011
Installed Capacity	777 MW
Present de-rated capacity	731 MW
Area of Land	263.55 Acres
Company Website	www.apscl.com

1.1.1 Vision

To become the leading power generation company in Bangladesh [1].

1.1.2 Mission

To increase the generation capacity of Ashuganj Power Station to 1500 MW with in 2014 [1].

1.1.3 Future Plans of APSCL

The name of the new project of APSCL is Ashuganj 200±10% MW Modular Power Plant Project. This project highlights the Generation capacity of Ashuganj will be 1500 MW by 2015. The plant efficiency will increase with the use of modern technology. The objectives of this project are:

- To narrow the ever increasing gap between the demand and supply of electricity through gas based low cost generation in the north east zone of the country.
- To meet up increasing power demand in the country by adding local generation.

- To increase the power generation of the country through utilization of country's natural gas resources available nearest to the proposed power plant site with requisite pressure.
- To accelerate the economic development of the country by adequate and reliable power generation and to support the planed target of power demand.
- To overcome the present generation shortage by increasing generation and to minimize load shedding.
- To enhance the stability and reliability of the national grid system and reduce the transmission loss by local generation.
- To increase energy efficiency of power generation [1].

1.2 Objective of the Internship

The main objective of our internship is to learn about the practical knowledge that is based on our theoretical knowledge. In this internship program we mainly learned about the generation section of a power plant. We also learned about the protection and maintenance of a power plant in the generation section. Now, we know that how a power plant station distributes power to national grid. In this internship report, we are trying to discuss the whole knowledge of us which we gathered during the internship.

1.3 Scope and Methodology

This internship report is mainly focused on the power generating section of Ashuganj power station company limited (APSCL). Here we will discuss about the generator including its working principle, capacity, unit control rooms, generator maintenance and protection. We will also discuss briefly about the other sections like boiler, turbine, Combined Cycle Power Plant (CCPP), water treatment plant, substation etc.

During our internship period our instructors Engr. Rokonuzzaman and Engr. Kamruzzaman demonstrated us various kinds of equipment and generation sections. Every day they took some theoretical classes about the day’s visitation fields such as the units, sections and sites of APSCL. Several times they provided us some tables, figures and various types of data. To complete this report we have used information from two sources. Firstly we used the information that we collected from our instructors at APSCL as primary source and secondly we collected information from different websites, specially the official website of Ashuganj Power Station.

CHAPTER 2

GENERATOR

2.1 Introduction

The working process of a generator is based on the principle of electromagnetic induction which was discovered by Micheal Faraday. An electric generator is a device that converts mechanical energy into electrical energy as the output.

Generator does not create any electricity rather it actually converts the mechanical energy to electrical energy through an external electric circuit. The main mechanism of a generator is creating a magnetic flux in a static stator. The flux is created by a rotating rotor surrounded by a stator through copper winding in three phases, and then when the flux is cut, the electricity will be gained from the output of a generator. Here, in Figure 2.1, we see the whole generator of control room 1 (unit 1 and 2) at APSCL.

Figure 2.1: The whole generator of control room 1 (unit 1 and 2).

There are two types of generator:

- AC Generator: It generates alternative current (A.C.) and
- DC generator: It generates direct current (D.C.).

At Ashuganj Power Station Company Ltd (APSCL), there are five generators in steam power plant section and three generators in Combined Cycle Power Plant (CCPP) section. All the generators produce AC current. So, during our visit we learnt about AC generator only.

The description of generators at APSCL is given in table 2.1. From Table 2.1, we learn about the rated condition and other fundamental characteristic of the generators of steam power plant at APSCL.

Table 2.1: Specification of generators of steam power plant at APSCL [APSCL].

Description	Steam power plant	
	Units 1 and 2	Units 3, 4 and 5
Rated terminal output	64 MW	150 MW
Rated terminal voltage	11 KV±5%	15.75KV±5%
Rated power factor, cosφ	0.8	0.8
Rated current	4200 A/4690 A	6965 A
Rated frequency	50Hz	50Hz
Number of poles	2	2
Cooling system	Hydrogen cooled	Air cooled
Insulation class	F (It is a state of temperature tolerance class. There are four classes. These are A,B,F and H. F means the temperature tolerance is 155° C or 311° F)	F
Excitation voltage	249 V/267 A	323 V
Excitation current	1238 V/1327 A	1500 A

2.2 Generator Main Parts

The main parts of generators that we have seen at APSCL are,

- Stator,
- Rotor,
- Armature,
- Carbon brushes and
- Collector Slip Rings.

2.2.1 Stator

The stator is one of the basic elements of a generator. It consists of a cylindrical ring which is made of iron, has only one coil which consists of a number of turns, and a stator core which is constructed of thin sheets of magnetic steel. The cylindrical ring provides an easy path for the magnetic flux. When the rotor is rotated, a voltage is induced in the stator coil. In Figure 2.2, we see the process of creating magnetic flux with stator.

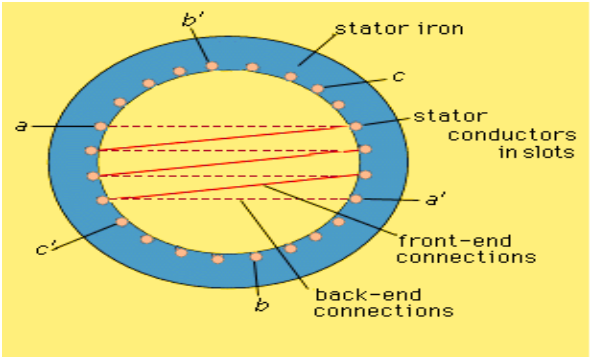

Figure 2.2: Stator Winding of the Generator [2].

2.2.2 Rotor

The rotor is also a basic element of a generator. It is situated inside of a stator. It is always rotating and creates a magnetic field with the stator. The central shaft of the rotor is coupled to the mechanical prime mover. The magnetic field is produced by conductors or coils. This set of coils, connected in series, is thus known as the field winding. In Figure 2.3, we see the process of creating magnetic flux with rotor.

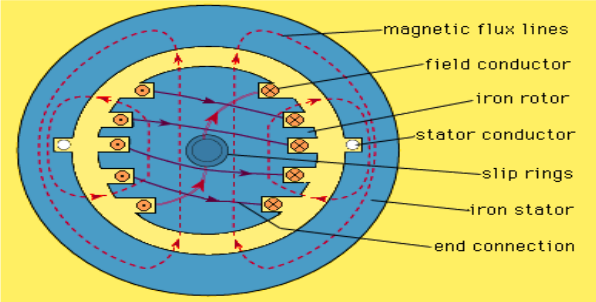

Figure 2.3: Rotor Winding of the Generator [3].

2.2.3 Armature

Armature is a rotating part of an electromagnetic device consisting of copper wire wound around an iron core. It carries the current of the generators.

2.2.4 Carbon Brushes

Carbon Brush is consisted with the small block of carbon. It is used to convey the current between the stationary and moving parts of the generator.

2.2.5 Collector Slip Rings

Slip rings are circular rings, similar to a tube, that are connected to the armature and rotate with it, if it is rotating. Slip rings are usually made of nonferrous metal (brass, bronze or copper) and also iron or steel is sometimes used. Slip rings usually do not require much servicing.

2.3 Other important Parts of Generation Section

There are also few important parts of generation section. These parts are common and act as a significant role in generation section like system of KVA rating, De-humidity fire, Jacking oil pump, condenser, relay, circuit breaker, unit auxiliary switchgear, station auxiliary switchgear and many others. The description of some important parts are mentioned below which have been learnt at APSCL during internship period.

2.3.1 KVA Ratings

The capacity of a synchronous generator is equal to the product of the voltage per phase, the current per phase, and the number of phases. It is normally stated in megavolt-amperes (MVA) for large generators or kilovolt-amperes (KVA) for small generators. The voltage rating of the generator is normally stated as the operating voltage between two of its three terminals. For a winding connected

in delta, phase to phase voltage is equal to the phase-winding voltage. For a winding connected in wyes, phase to phase voltage is equal to √3 times the phase-winding voltage.

2.3.2 De-humidifier

De-humidifier is used to absorb the moisture when the generator will be off. If moisture is inside the generator, then the generator will be faulted. Here automation technique has been given inside the de-humidifier to absorb the moisture.

2.3.3 Jacking Oil Pump

A jacking oil pump is commonly used on rotor shafts. It is also known as lift pump. It is eliminating the rotor distortion caused by weight and uneven cooling. The jacking oil pump uses high pressure oil supplied at the bearing. It also helps to maintain the oil film between shaft and the bearing. At that time, the rotor speed is adequate enough to maintain the film thickness and protect the shaft and bearing.In Figure 2.4, we see the jacking oil pump at APSCL.

Figure 2.4: Jacking oil pump.

2.3.4 Condenser

The main purposes of the condenser are to condense the exhaust steam from the turbine to reuse in the cycle and to maximize turbine efficiency by maintaining proper vacuum.

At APSCL, there are two types of condensers. These are:

- Surface condenser and
- Jet condenser.

2.3.4.1 Surface Condensers

Steam surface condensers are used at Asuganj power station company limited (ASPCL). The exhaust steam from the turbine flows on the shell side (under vacuum) of the condenser, while circulating water of plant flows in the tube side (the source of the circulating water is a closed-loop).

The following are the advantages of surface condenser:

- Increased turbine output.
- Increased plant efficiency.

The following are the disadvantages of surface condenser:

- High initial cost.
- Requires large floor area and high maintenance charges.

2.3.4.2 Jet Condenser

Jet condenser is another condenser which is also used at APSCL. In a jet condenser, cooling water and exhaust steam are kept together. Therefore, the temperature of cooling water and steam is the same when leaving the condenser.

The following are the advantages of jet condenser:

- Low initial cost,
- Less flow area required,
- Less cooling water required,
- Low maintenance charges and
- Condensate can be used as feed water, less pumping power required and creation of better vacuum at the turbine exhaust.

The following are the disadvantages of jet condenser:

- condensate is wasted,
- High power is required for pumping water and
- High initial cost requires large floor area and high maintenance charges.

2.4 Excitation

Generator needs direct current to energize its magnetic field and the direct current is obtained from another mechanical instrument. This mechanical instrument is known as exciter. For AC power generation, we can use two types of exciters either static or rotating type. Here, the exciter is supplied from the excitation transformer and the primary winding of an excitation transformer is supplied from the stator of the main generator. In an exciter, there are primary winding fuses and temperature sensors which protect the excitation transformer.

At APSCL three types of excitation systems are used. These are:

- AC Excitation System (ST-1, 2) : Consists of a sub-pilot exciter of permanent magnet type, pilot exciter and the main ac exciter all coupled to the main generator on the same shaft.
- Static Excitation System (ST-3, 4 and 5): The generator field is fed from a thyristor network via brushes.
- Brushless Excitation System (GT-1, 2): Consists of an exciter having stationary field system and a rotating armature diode rectifier assembly solidly coupled to the main generator rotor.

2.4.1 Types of Excitation

According to the instructor of our internship, generally the number of excitation system is six. These are:-

- Self-Excitation,
- DC Excitation,
- AC Excitation,
- Brushless Excitation,
- Static Excitation and
- Other excitation (Separate excitation, Thyristor excitation).

We learnt about three types of excitation systems properly during our internship program. These are AC excitation, brushless excitation and static excitation. These three types of excitation systems are described in the following subsections.

2.4.1.1 AC Excitation

AC exciter usually sits on the top of shift in a generator. The output of the AC excitation is alternating current (AC) which is flowing through the rotor excitation and also rectified at this time. The ac system of excitation consists of a sub-pilot exciter of permanent magnet type, pilot exciter and the main ac exciter all coupled to the main generator on the same shaft.

2.4.1.2 Brushless Excitation

The exciter rotor which is the rotating part is about 400mm across and is fixed to the shaft of the main generator which rotates at 1500 revolution per minutes. Brushless excitation is such a system that consists of a 3-phase stationary field generator whose AC output is rectified by a group of rectifiers. The DC output from the rectifiers is fed directly into the field of the synchronization. There are 12 poles on the excitation stator and so the 3 phase output to the rectifier has a frequency of 150 Hz.

2.4.1.3 Static Excitation

The static excitation system has a capability of eliminating vibrations of a generator. Static exciters contain no moving parts and a portion of the AC from each phase of generator output is fed back to the field windings.

CHAPTER 3

Control Rooms of APSCL

3.1 Unit Control Rooms in APSCL in Steam Generation Section

At APSCL, there are 3 control rooms in total. Each of the rooms is individually known as a unit control room. Every generator is connected to bus bar that means it is connected with auxiliary transformer, unit transformer and bus system, excitation system, prime mover, voltage regulator, cooling system etc. This whole connected system of a generator is defined as a unit system. Here, unit 1 and unit 2 are operated by the control room 1. Unit 3 and 4 are operated by the control room 2 and unit 5 is operated by the control room 3.The capacity of unit 1 and 2 is 64 MW each and that of unit 3, 4 and 5 is 150 MW each.

3.1.1 Technical Data of Major Plant Equipments

Table 3.1 shows the technical data of major equipments of the five unit control rooms. From this table we can learn about the specifications of the boiler, turbine, generator, the unit step up transformer and the unit auxiliary transformer.

Table 3.1: Technical data of major plant equipments of unit control room [APSCL].

Description	Steam Power Plant	
	Unit-1 and 2	**Unit-3, 4 and 5**
(a) Boiler		
Type	Natural Circulation, Radiant Boiler (Pressurized)	IHI-FWSR-504 Single Drum, Natural Circulation, Single Reheat
Make	Babcock, Germany	IHI, Japan
Maximum Evaporation Capacity (Continuous)	270 t/h	500.4 t/h
Maximum allowable Steam Pressure, SH/RH	110 bar abs	171/50 bar abs
Normal working Pressure, SH/RH	93 bar abs	138.5/36.6 bar abs
Normal working Temperature, SH/RH	525 ºC	523/523 ºC

Feed Water Temperature	229 ºC	246 ºC
Efficiency (MCR)	90%	86.8%
(b) Turbine		
Type	D2Q 2G46Steam Regenerative	D2Y52 Steam Reheat Condensing
Make	BBC, Germany	ABB, Germany
Maximum continuous Output	71.425 MW	157.5 MW
Rated output	64 MW	150 MW
Live Steam Pressure (Pabs) Live Steam Temperature Reheat Steam Pressure Reheat Steam Temperature	890 bar 520 ºC	135 bar 520 ºC 35.5 bar abs 520 ºC
Exhaust Pressure	0.0742 bar abs	0.08 bar abs
Number of Stages	30/12/5	21/16/5
Flow	240 t/h	450 t/h
Rated Speed	3000 rpm	3000 rpm
Direction of Rotation Clockwise	Clockwise	Clockwise
(c) Generator		
Type	WT 572 h Self Excited	WX 21L-100LL Externally Excited/ Self
Make	BBC, Germany	ABB, Germany
Rated Terminal Output	64 MW	150 MW
Rated Terminal Voltage	11 KV± 5%	15.75 KV± 5%
Rated Power Factor, Cosφ	0.8	0.8
Rated Current	4200 A/ 4690 A	6965 A
Number of Poles	2	2
Rated Frequency	50 Hz.	50 Hz.

Cooling System	Hydrogen Cooled	Air Cooled
Insulation Class	F	F
Excitation Voltage	249 V/267 A	323 V
Excitation Current	1238 A/ 1327 A	1500 A
(d) Unit Step-Up Transformer		
Type	Single Phase Outdoor Type, ONAF/ ONAN Cooling.	Single Phase Outdoor Type, ONAF/ ONAN Cooling.
Make	Siemens, Germany	Hyosung, Korea.
Capacity Normal	90/3 MVA	200/3 MVA
Rated Voltage, LV/HV	11/132 KV	15.75/230 KV
No-Load Losses at Normal Voltage and Frequency	29.0 ± 14.3 % KW	157.2/3 KW
No Load Current at Nominal Voltage Ratio	11 A/Phase	45 A
Winding Resistance, LV/HV	0.002569/0.2198 Ohm/Phase	0.003/0.316 Ohm/Phase
Vector Group	YNd11	YNd11
% Impedance	11.8 %	14 %
(e) Unit Auxiliary Transformer		
Type	Three Phase Outdoor Type, ONAN	Three Phase Outdoor Type, ONAN
Make	Siemens, Germany	Hyosung, Korea
Nominal Capacity	6.3 MVA	15 MVA
Rated Voltage, HV/LV	11.00/6.9 KV	15.75/6.9 KV
No-Load Losses	7.9 KW	7.6 KW
No Load Current at Nominal Voltage Ratio	1.8 A	2.75 A

Winding Resistance, HV/LV	0.691/0.01355 Ohm/Phase	0.14/0.0047 Ohm/Phase
Vector Group	Dyn11	Dyn11
% Impedance	4.1 %	9 %

3.2 Unit 1 and 2 Control

Unit 1 and 2 are the oldest two units which were established in 1970. The capacity of these two units is 64 MW each. The control system of these two units is analog and they are operated manually. Usually 4 or 5 engineers are in the control room to operate the control operations. The equipments of these units, such as measurement instruments, voltage or current meter etc. are analog. From this control room they control all the auxiliaries such as boiler, condenser, burner, feed water pump, low pressure (LP) and high pressure (HP) heater etc of generator 1 and 2.

Operation unit cell of control unit 1 and 2 are shown in Figure 3.1. Here, we learnt how engineers operate and monitor problems of a unit control room. In Figure 3.1, we can see the operation unit of control room 1.

Figure 3.1: Operation unit of control unit 1 and 2.

These two unit control rooms are analog. We saw, when a problem occurred, they solved it manually which is really difficult with respect to other digitalized unit control rooms. Because of the backdated technology, it is difficult to locate damaged equipments/parts which are required to be repaired or replaced.

Here, in Figure 3.2, we see the measurement of total power output of unit control room 1 (unit 1and 2).

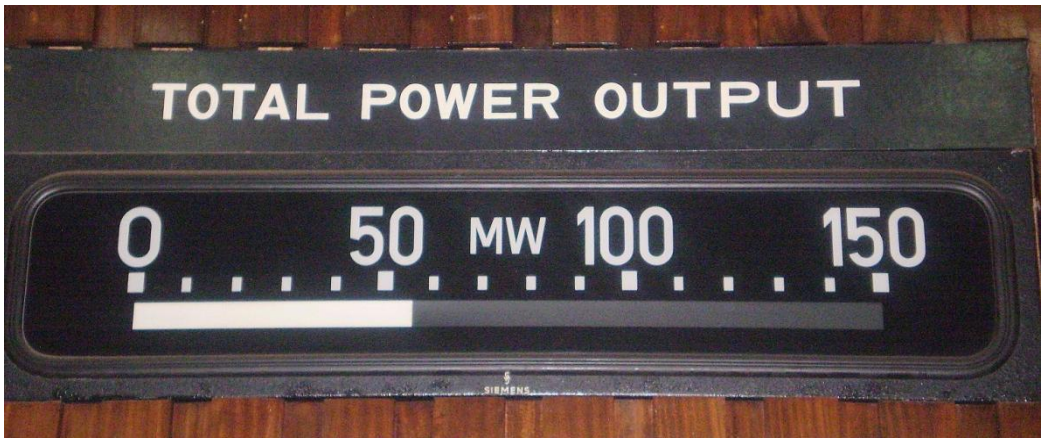

Figure 3.2: Total power output (Unit 1and 2).

3.3 Unit 3, 4 and 5 Control

Unit 3, 4 and 5 of APSCL were established in between 1986 and 1988. The capacity of each unit is 150 MW.

3.3.1 Unit 3 and 4

The control systems of unit 3 and 4 are digitalized. Here, they are using digital meter for measuring any data. In this control room, various types of auxiliaries like LP, intermediate pressure (IP), HP turbine, boiler control system, automatic tripping system and feed water flow transmitter are controlled. At APSCL, PLC (Programmable Logic Controllers) controller is used for the control systems of unit 3 and 4. It is a digital controller which is controlled by different switches. If any fault occurs, the control room will show the particular fault area. Then the control room will show the measuring data in digital meter automatically and the engineers will handle this problem manually. In this control room, 4 or 5 engineers are always available to operate. Here, in Figure 3.3, we see the control board of unit control room 2 (unit 3 and 4).

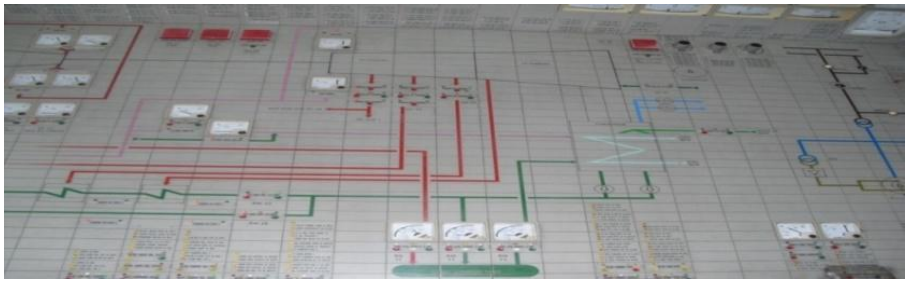

Figure 3.3: Control unit of 3 and 4.

3.3.2 Unit 5

The Control System of unit 5 is digitalized and uses the latest technology in power plant sector in Bangladesh. In this control system, linux based operating system is used. In this control room all the auxiliaries connected to the generator are controlled by computer. This software operating system directly handles the whole generation section of unit 5. Here, only one engineer is staying to operate and he is able to look after the condition of whole system in computer screen. Digital metering is more accurate and perfect than an analog meter and operation is also flawless.

The advantages of this unit control room are:

- Advance technology,
- Easy to upgrade the system,
- Less error and
- Perfect data measuring.

In Figure 3.4, we can see the output of a whole system of unit 5 in computer screen through software and one can control this whole system by this computer.

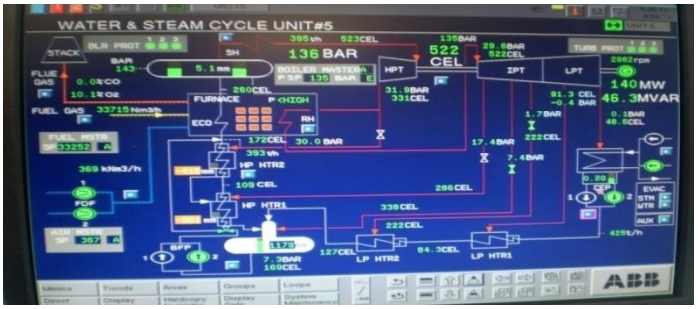

Figure 3.4: Control unit of 5 (operated by Digital and also software based).

Chapter 4

Generator Maintenance and Protection

4.1 Introduction

Ac generators are also called synchronous generators or alternators. Ac generators are the primary sources of electrical power throughout the world and range is fraction of a KVA to 1500 MVA. Alternator voltage is generated by rotating a coil in the magnetic field. Electrical generator is a device that converts mechanical energy to electrical energy. The reverse conversion of electrical energy into mechanical energy is done by a motor. Generator and motor have many similarities.

4.2 Generators at APSCL

The generator at APSCL has the output of 190 MVA. The generator has two poles. It runs at 3000 rpm and frequency is 50 Hz. The rotor is mechanically coupled with the turbine. At APSCL maximum rated speed of generator is 3600 rpm. At units 1 to 5 every generator is steam driven generator. Generating voltage is 15.75 KVA and capacity is 190MVA.Power factor is 0.8.

4.3 Generator connections in unit system

At APSCL generator is connected to bus bars. Generator is connected to low voltage side of the main step-up transformer and high voltage side of unit auxiliary step-down transformer. The high voltage side of the main transformer is connected to bus via switchgear, from where power is transmitted into the grid. The generator and main transformer form a ‘unit’ and each unit has a boiler, turbine, condenser and other auxiliary systems.

The following list indicates the important parts of generator connections of the unit system.

1. Generator,
2. Main transformer (outdoor),
3. Unit auxiliary transformer,
4. Station service transformer,
5. High voltage bus,

6. Transmission line,
7. Inter-connection between auxiliary switchgear and station service switchgear,
8. Circuit Breaker (indoor),
9. Station service switchgear (indoor) and
10. Unit auxiliary switchgear (indoor).

4.4 Relay

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and disconnects the switch contacts. At APSCL two types of relays are used. One is electrical relay and another is electronic relay.

4.4.1 Electrical Relay

At APSCL for the protection of unit 1 and 2 electrical relay is used. Electrical relays are larger in comparison to electronic relays. In this relay we need to adjust the tripping condition such as time and current manually.

4.4.2 Electronic Relay

Now this type of relay is enormously used. Microcontroller is used in this type of relay. So it is small in size. This relay is very fast and effective to trip the circuit. At APSCL this type of relay is used in units 3, 4 and 5.

4.5 Protection of Generator

In the steam turbine generator section of APSCL, there are 15-20 generator protections. If there is any abnormal condition then the generator will be disconnected from the grid. The protections are:

4.5.1 Overvoltage protection

At APSCL we observed overvoltage protection relay. Overvoltage occurs because of the increase in the speed of the prime mover due to sudden loss in the load on the generator. The over voltage protection is required for the hydro generator or gas turbine generators. The over voltage protection is provided by two over voltage relays. The relays have two units – one is the instantaneous relays which is set to pick up at 130 to 150% of the rated voltage and another unit is IDMT(Inverse definite minimum time)which is set to pick up at 110% of rated voltage.

4.5.2 IDMT operation

APSCL uses Inverse Definite Minimum Time (IDMT) operation. IDMT relay works on the induction principle, where a aluminum or copper disk rotates between the poles of an electromagnet and a damping magnet. The fluxes induce eddy currents in the disk which interact and produce rotational torque. The disk rotates to a point where it operates a pair of contacts that break the circuit and remove the fault condition.

4.5.3 Generator Differential protection

Differential protection is used for phase to earth and phase to phase fault of the generator. It is based on the circulating current principles. In this type of protection current at two ends of current transformer are compared. In normal conditions, currents at two ends will be same. When fault occurs current at one end will be different from the other end. The relays then close contacts and make the circuit breaker to trip, thus isolate the faulty section. In Figure 4.1, we see the diagram of generator differential protection which we collected from APSCL.

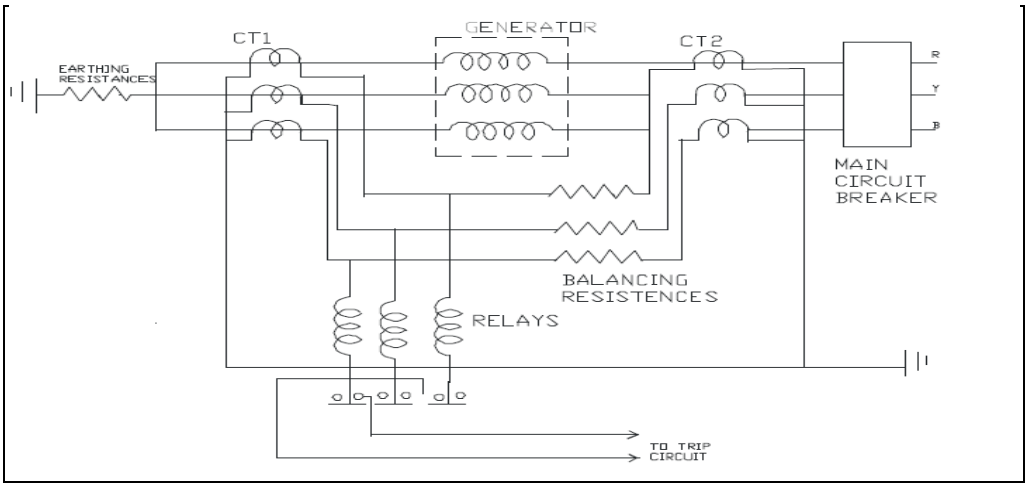

Figure 4.1: Generator Differential Protection [APSCL].

4.5.4 Under voltage protection

If more than one generator supply the load and due to some reason one generator suddenly trips, then another generator tries to supply the load. Each of these generators will experience a sudden increase in current and thus decreases the terminal voltage. Automatic voltage regulator connected to the system tries to restore the voltage. Under voltage relay type-27 is also used for the under voltage protection.

4.5.5 Minimum impedance and Distance protection

Minimum impedance relay always deals with ratio of voltages and current. Minimum impedance relay is generally used in transmission line, transformer, grid and generator. Minimum impedance means if voltages and current fluctuates then they always have a ratio. The ratio is called set point. APSCL uses terminal voltages of 110Vand current of 5A. Minimum impedance is R= V/I = 110V/5 = 22. So APSCL, uses set point of the value 22. If the ratio drops below the set point, the plant will trip. Distance protection relay works with the same principle. Distance protection indicates the direction of fault which occurs left or right side of generator. APSCL uses distance protection relay which senses 80% distance from the transformer winding. In Figure 4.2, we see the diagram of Minimum Impedance and Distance protection relays which we collected from APSCL.

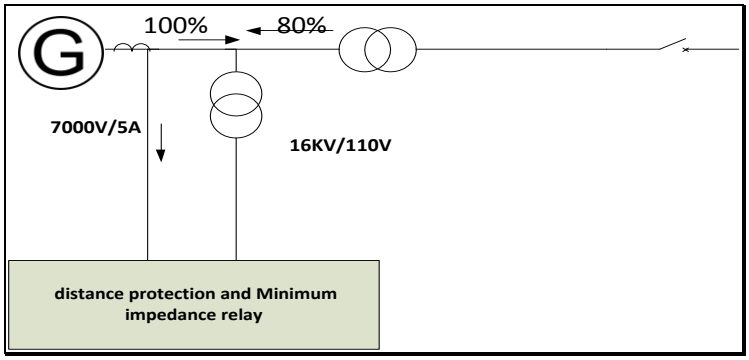

Figure 4.2: Minimum impedance and Distance protection [APSCL].

4.5.6 Stator over heating protection

Stator over heating is caused due to the overloads and failure in cooling system. Over current relays cannot detect the winding temperature because electrical protection cannot detect the failure of the cooling system. So to protect the stator against overheating, insert resistance temperature detectors are used below the stator coils. Detectors which provide the indication of temperature change are arranged to operate the temperature relay to sound an alarm.

4.5.7 Rotor Temperature protection

At APSCL rotor temperature protection is widely used to protect rotor. These type of protection resistance measurement are adopted. The rotor current and rotor voltages are compared by a moving coil relay. In Figure 4.3 current coils are connected across the shunt in the field circuit and voltages coil is connected across the slip ring brushes. Double activities quantity moving coil

relay is used. The warning coil is circuit coil and operating coil is voltage coil. Resistance increases with temperature. The relay measures the measures the ratio V/I=R. (which gives a measure of rotor temperature).

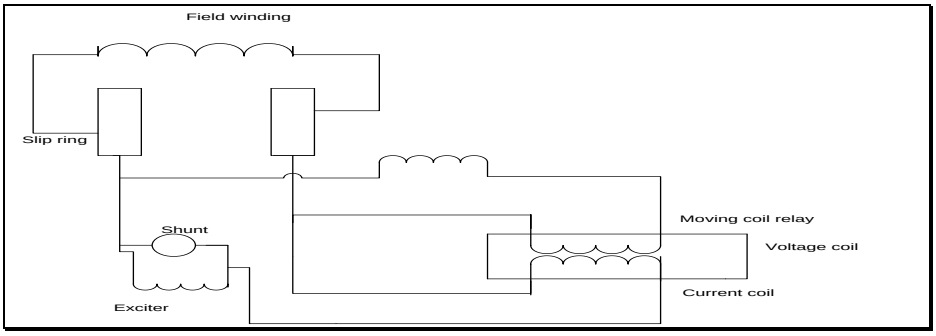

Figure 4.3: Rotor Temperature protection by measuring V/I [11].

4.5.8 Rotor Earth fault protection

At APSCL we observed rotor earth fault protection relay. Our instructor described about that type of protection. A single ground fault does not cause flow of current since the rotor circuit is ungrounded. When the second ground fault occurs part of the rotor winding is by-passed and the currents in the remaining portion may increase. This causes unbalance in rotor and may cause mechanical such as thermal stresses resulting in damage to the rotor. In some cases the vibrations have caused damage to bearings and bending of rotor shaft. Such failures have caused wide damage. There are two types of rotor earth fault protections used at APSCL. A high resistive load is connected across the rotor circuit. The center point of the circuit is connected to the earth through a sensitive relay. This sensitive relay detects the earth faults of the rotor circuit (Figure 4.4).

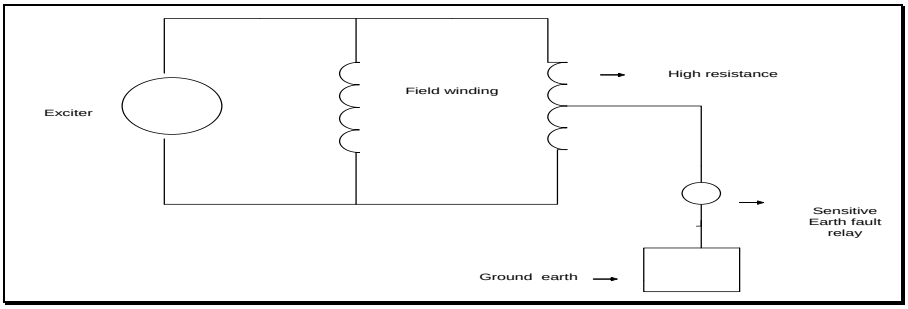

Figure 4.4: Rotor Earth fault protection relay [11].

4.5.9 Over Frequency Protection

Over frequency results from the excess generation and it can easily be corrected by reduction in the power outputs with the help of the regulator or manual control.

4.6 Other protections

There are some other protections in the generator section of APSCL. They are as follows.

- 230KV grid protection,
- Unbalanced loading protection,
- Definite/inverse time over excitation protection,
- Unit transformer protection,
- Unit auxiliary transformer protection,
- Bearing over heating protection and
- Magnetization fault protection.

4.7 Some abnormal condition of generator

There are some abnormal conditions of generator section at APSCL. They are as follows.

- Moisture in the generator winding,
- Over–voltage,
- Under frequency,
- Vibration,
- Thermal overloading and
- Unbalanced loading.

4.8 Battery Back-Up System

The DC power is used in control system always. If the control system fails the control power must not fail. The electricity that is coming from the battery is produced due to the chemical energy is converted into electrical energy. For the backup purpose we use the battery. In this power plant they use two kinds of batteries.

- Lead acid and
- Nickel Cadmium (NiCd) battery.

In Figure 4.5, we see the series connection of battery in battery room at APSCL.

Figure 4.5: Series connected battery.

In Figure 4.6, we see the parallel connection of battery in battery room at APSCL.

Figure 4.6: Parallel connected battery.

NiCd battery is costly. The difference is that in lead acid sulfuric acid is used and in NiCd battery potassium hydrochloric acid is used. The rectifier is used to convert DC signal to AC. The voltage of NiCd battery is 1.2 V. The steady condition when the constant voltage is given is called the floating position for energy gaining.

In the control room there are some mechanical works which are done for testing the battery:

1. The cleaning of the room.
2. The tightness capacity: When battery runs for long time a chemical coat tends to disconnect the poles of the battery. To test this disconnection, the tightness capacity is used.

3. Breathing test: If there is any chemical reaction inside battery then this test is done to remove the chemical reaction.
4. Specific gravity test (1180-1220): The specific gravity is tested by the hand hydrometer of the acid. The range of the specific gravity is 1180cc - 1220cc. Here, 1220 cc of acid is equal to the 1.2 liter of water.
5. Liquid level test: The nickel cadmium is emerged into potassium hydrochloric acid. There is a maximum point and a minimum point inside the battery. It means that the nickel cadmium is emerged in between two points. If acid level is higher than the maximum level, the breathing test will be needed and when the acid level is lower than the minimum level, the specific gravity test is needed.

4.9 Motor Winding and Testing

There are various types of motors used in the power station for power generation purposes. The maintenance of these motors is very important. At APSCL there is a motor winding shop or section which repairs the damaged motors. Engr. Md. Rokonuzzaman showed us the motor winding shop of APSCL and gave us information about motor repairing and winding.

4.9.1 Motor Repairing

At APSCL we observed motor repairing room. We learnt how faulty motor is repaired. The steps of the repairing procedure are as follows.

4.9.1.1 Identifying the Damaged Portion of Motor:

The first and most important job of the motor repairing procedure is to identify the damaged part of the motor. For this purpose the following steps are taken.

- **Observation**

  Observation of the motor is very important to identify the damaged part. If the motor is burnt then by observing the internal and external part of the motor one can easily find out the damaged part.

- **Megger Test**

  The head worker of the winding shop told us that this is the most efficient test for identifying the damaged part of the motor. Megger is a measuring device which measures resistance of coil and other device. By using it one can measure the winding resistance of

the stator and rotor of the motor. When the resistance is infinity or very large then it is assumed that there is a disconnection inside the coil which is a fault of the motor. If the resistance is not infinite or a reasonable value the motor winding is free from fault.

In Figure 4.7, motor winding and repair section are shown.

Figure 4.7: Motor winding and repair section.

4.9.1.2 Opening and Megger testing of Transformer Cooling Fan Motor

Engr. Md. Azizur Rahman, a senior engineer of the Combined Cycle power Plant (CCPP) at APSCL gave us a faulty transformer cooling fan motor to observe the damaged part and Megger test.

We performed the testing by ourselves properly. There was damaged winding which was solved by re-winding the coil of the stator.

- After opening the rotor we observed whether the rotor is jammed or not.
- We tested the winding of stator with Megger test. We found a little resistance as 27 ohm for short circuit and an infinity resistance for open circuit.

In Figure 4.8, the meter of the Megger test is shown.

Figure 4.8: The meter of Megger Test [3].

4.10 Generator Cooling System

Efficiency of generator is strongly related to the cooling system of the generator. At APSCL, there are two types of generator cooling systems. These are as follows:

- Water cooling system and
- Air cooling system.

4.10.1 Water cooling system

The stator winding of the generator is cooled by circulating demineralized water through hollow conductors of stator winding bars in a closed loop. The pump drives the water through the coolers filters and windings and discharge into a separate compartment of the sealed expansion tank. If the pressure of demineralized water falls in the system below particular value, the other pump automatically starts. The closed circuit demineralized water is in turn cooled by demineralized water supplied from the station demineralization plant. The use of demineralized water on secondary side eliminates any accidental contamination of the closed circuit demineralized water which calls for tripping and shut down of the machine. The mechanical filters remove foreign particle in the water. These filters are periodically cleaned one by one. Figure 4.9 show the water cooling pump used at APSCL.

Figure 4.9: Water cooling pump used for water cooling at APSCL.

4.10.2 Air Cooling System

Air is used to cool a generator by circulating it 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. The air entering the generator is cooler than the generator. In Figure 4.10, air cooling system of APSCL is shown.

Figure 4.10: Air cooling system in APSCL using external fan.

4.11 Mechanical Speed Checking

The frequency of the generator depends on the prime mover speed. The speed is kept 3000 rpm. So using a Tachometer the speed is always monitored. This meter is set beside the generator. The operator always checks this meter and if any abnormal reading is found, he informs it to the respective engineer. In Figure 4.11, we can see the tachometer which is used to measure the rotating speed.

Figure 4.11: Tachometer at APSCL.

CHAPTER 5

Other sections of APSCL

In this part of our internship training Mr. Rokonuzzaman (Senior Engineer) was our instructor. We visited boiler, water filter house, water tube, burner, pressure gauge and condenser.

5.1 Boiler

A boiler is a device used to create steam by applying heat energy to water. The boiler is considered as a prime mover. By burning the fuels heat is generated, the heat is transferred to water and thus steam is produced. Thus steam is used to rotate the turbine.

There are five boilers at APSCL for generating power. Among five boilers, three boilers are shown in Figure 5.1.

Figure 5.1: Boiler section of unit 3, 4 and 5 [1].

5.1.1 Water Filter House

At APSCL water comes from Meghna river and this water first goes into the basin. Then that water is filtered in two stages. After filtering water it is taken to the filter house for another two more filtering processes and then it goes to the reserve tank. This water is reserved and then water is cleaned by different chemicals which are used in water treatment tank and this water is

converted into distilled water (DH_2O) and after that it is passed to the feed water pump. The feed water pump is to deliver the distilled water (DH_2O) to the boiler.

5.1.2 Water Tube

Water tubes pass the water. These tubes are surrounded by another core of pipes. Hot gases are passed through these pipes. Thus this heats up the water of the water tube. During this process the gases give up their heat, get cooled and discharged to the stack. At APSCL water tube boilers are used for steam power plant.

5.1.3 Burner

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

5.1.4 Pressure Gauge

In Figure 5.2 the Pressure gauge is shown which helps to evaluate boiler performance. At APSCL, pressure gauges are used to measure the:

- Steam Pressure,
- Feed water Pressure and
- Gas Pressure.

Figure 5.2: Pressure Gauge.

5.2 Water Treatment Plant

Water treatment process is very important in a steam power plant. River water contains various solid materials (silt, sand, mud etc.), mineral materials (ions like Fe, Ca, K, Mg, Mn etc.) and gases (CO_2, CO, O_2, NH_3, H_2 etc). But pure water is needed to generate stream which contains no solid materials and minerals. In Figure 5.3, the filtration process of the water treatment plant is shown.

Figure 5.3: Water Treatment Plant.

5.2.1 Working principle of Water Treatment Plant

There are several steps for producing distilled water. These steps are as follows.

1. At first raw water is mixed with $Al_2 (SO_4)_3$ and polyelectrolyte to remove sludge rapidly.
2. In sedimental basin the sludge is clarified and separated to get clean water (shown in Figure 5.4).

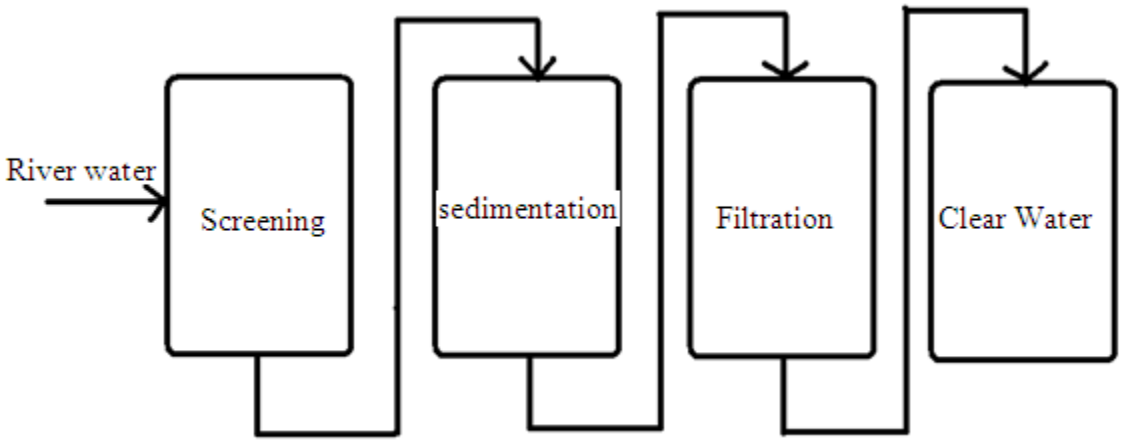

Figure 5.4: Process of finding Clear Water [APSCL].

3. Clean water is separated in other basin and sludge is removed from basin by a pump.

4. Finally the water passes through scavenger, cation, anion and mixed bed filter (shown in Figure 5.5 and Figure 5.6) and thus minerals and gases get removed.

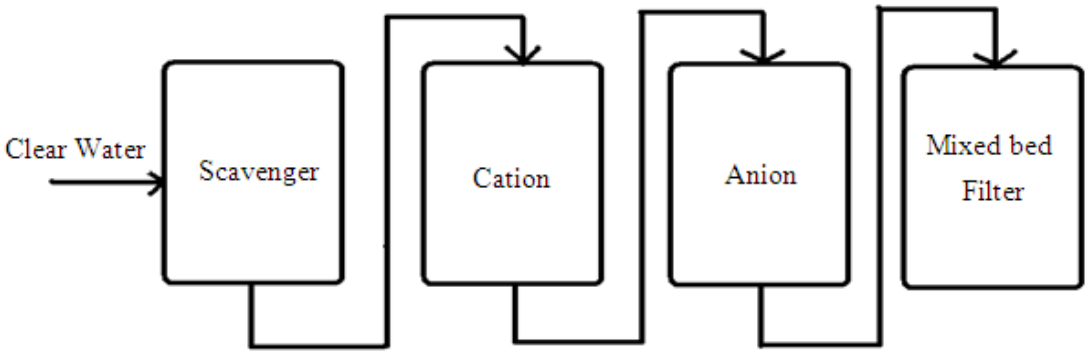

Figure 5.5: The scavenger, cation, anion and mixed bed filter process [APSCL].

Figure 5.6: The Scavenger, Cation, Anion and Mixed bed filter.

5.3 Turbine

A steam turbine is a mechanical device that extracts thermal energy and converts it into rotary motion. Turbines have one moving part, a rotor assembly, which is a shaft with blades attached. Moving fluid acts on the blades, moves it and creates rotational energy to the rotor.

5.3.1 Working principle of Turbine

There are three types of turbines at APSCL. Those are High pressure turbine (HPT), Low pressure turbine (LPT) and Intermediate pressure turbine (IPT). The heat energy is used to run the LPT and the IPT. Then HPT is run by the help of low pressure and intermediate pressure turbine. Then generator rotor is run by the help of the pressure of HPT. 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. In figure 5.7, we see the turbine of unit 1.

Figure 5.7: Turbine of unit 1.

5.3.2 High pressure system turbine

From the super heater the high speed steam first enters into the high pressure turbine. The blades in the high pressure turbine are the smallest of all turbine blades; this is because the incoming steam has very high energy and occupies a low volume. The blades are fixed to a shaft and as the steam hits the blades it causes the shaft to rotate. In Figure 5.8, we can see the high pressure system turbine of unit 3.

Figure 5.8: High pressure system turbine in unit 3.

5.3.3 Intermediate pressure system turbine

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

5.3.4 Low pressure system turbine

From the intermediate pressure turbine steam enters into the low pressure turbine and continues its expansion. The blades of the turbine of this section are larger than the previous two sections but the energy of steam is lesser than the previous two sections. In Figure 5.9, we can see the low pressure system turbine of unit 3.

Figure 5.9: Low pressure system turbine in unit 3.

5.4 Combined Cycle Plant at APSCL

At Ashuganj Power Station Company Limited (APSCL) the combined cycle plant has two gas turbines (GT-1 and GT-2) and one steam turbine. During our internship we have also visited the combined cycle. The power generation capacity of these units is given in Table 5.1.

Table 5.1: Power generation capacity of combined cycle power plant of APSCL [APSCL].

Units	Date of Commission	Year of last Overhauling	Capacity(MW)		Generation (Kw.h.)	Fuel Consumption	
			Commissioned	De-rated (present)		MCF	m^3/kwh
GT-1	15.11.1982	2008	56	35	846774	14007.69	0.4684
GT-2	23.03.1986	2004	56	40	774542	1812	0.4684
CC-ST	28.03.1984	2000	34	16	400525		CC 0.3180

At Combined Cycle Power Plant of APSCL, the main raw material of plant is gas, which comes from Titas Gas.

5.4.1 Gas turbine engine

A gas turbine plant consists of compressor, combustion chamber and a turbine. The compressor takes air from the atmosphere and supplies combustion chamber in under pressure. The fuel which is natural gas is injected into the combustion chamber. Once the combustion is started by an igniter, it is self-sustained. The hot gas formed in the combustion chamber expands through the turbine, producing mechanical power. The compressor is connected to the shaft and the turbine supplies power to compressor.

5.4.2 Steam Turbine Section

In combined cycle power plant the exhaust gas comes out from the gas turbine and is used to produce steam and run a steam turbine. The exhaust gas has very high temperature which can be used to create steam. In steam turbine section there is no furnace, steam is produced by the heat of exhaust gas. In combined cycle power plant of Ashuganj Power Station Company Ltd (APSCL) there is one steam turbine section which runs by the exhaust gas of gas turbine- 1 and 2.

5.4.3 Some Basic System of Combined Cycle

There are three main basic systems of combined cycle. These are:

- Compressor,

- Combustion chamber and
- Super heater.

5.4.3.1 Compressor

Compressor is a device in the gas turbine section which is used to compress the air. This compressed air is expanded with the help of combustion of fuel and converting mechanical energy by rotating the turbine. 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 rotator 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.

5.4.3.2 Combustion chamber

The combustion chamber consists of a vessel which pressurizes air and fuel such as oil, natural gas. The pressurized air and fuel mixed inappropriate proportions are ignited and fed into the turbine at correct turbine entry temperature. The pressure in the combustion chamber is decided by the outlet pressure of the compressor, which feeds air directly to the chamber. About 30% of the main flow of air passes into the burner area as primary air. The air fuel ratio in the area is maintained at about 15:1.

5.4.3.3 Super heater

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

5.5 Substation

After generation of electricity it is distributed to the consumer by substation. Generated electricity voltage is 15.6KV goes to the substation. Generated electricity is transformed from 15.6 KV to 132 KV and 230KV by step up transformer. 132 KV line is used for medium distance transmission for example for transmitting power to Brahmanbaria and 230 KV line is used for long transmission for example transmit power to Dhaka or Sirajganj.

The list of the equipments we saw at APSCL are:

- Transformer,
    - Current Transformer,
    - Potential Transformer,
- Circuit Breaker,
- Relay,
- Lightning Arrester,
- Isolator and
- Bus Bar.

5.5.1 Transformer

In substation current transformer and voltage transformer are widely used. Details about these two kinds of transformer are discussed.

5.5.1.1 Current Transformers

At Ashuganj Power Station Company, we have seen various types of Current Transformers. Current transformers are step down transformer. The uses of current transformer are in series with equipment for the protection. Current transformer (CT) is used for measuring the current of electric equipment. In Figure 5.10, we see the current transformers at APSCL.

Figure 5.10: Current Transformer.

5.5.1.2 Potential Transformer

The potential transformer (PT) steps down voltage of a circuit to a low value that can be effectively and safely used for operation of instruments such as ammeters, voltmeters,

wattmeters, and relays used for various protective purposes. At APSCL, there are many potential transformers with various ratings such as 132KV, 230KV. In Figure 5.11, we see the potential transformers at APSCL.

Figure 5.11: Potential Transformer.

In Table 5.2 name plate data of 132 kV single phase outdoor type Potential Transformer is given.

Table 5.2: Name plate data of 132 kV single phase outdoor types Potential Transformer

Rated voltage	132 kV
Construction	Out door
No. of phase	Single
Ratio	(132000/1.73) / (110/1.73)
Burden	60 VA
Serial no.	132 P.S.
Highest system voltage	145 kV
Insulation level	275/650 kV
Rated frequency	50 Hz
Total weight	600 Kg
Class of accuracy	0.2
Years of manufacturing	2009

Ratio	Primary Connection	Secondary Connection
(132000/1.73) / (110/1.73)	A-N	a-n

5.5.2 Circuit Breaker:

The most important part of the substation is Circuit Breaker (CB). A circuit breaker is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by overload or short circuit. When the fault current occurs, then electric circuits detect the leakage current and give a trip signal. If it senses that the over current is flowing through the circuit, then in response of trip signal, it will separate breaker contacts.

Circuit Breakers which are used by APSCL are as follows –

- Low Voltage Circuit Breaker,
- High Voltage Circuit Breaker,
- Magnetic Circuit Breaker,
- Thermal Circuit Breaker,
- Oil circuit breaker,
- SF6 circuit breaker and
- Air blast circuit breaker.

5.5.3 Relay:

A relay is an electrical switch which is used where several electrical circuits are controlled by one signal. Relays are used on both side of the circuit breaker. At APSCL three types of relays are used. One is primary relay and other two are back up relay for each protection part. We observed relay panel and learned how to operate it. Relay panel is operated by DC power supply. There are three different sources of DC power supply which are connected in parallel with relay panel. The DC power sources are grid, DC battery and generator, when one is inactive then another one is active automatically. Relay or protective relay is necessary with almost every electrical plant. Relay those are used by APSCL are as follows:

- Classical relay,
- Induction type relay,

- Percentage differential relay,
- Impedance type distance relay and
- Pilot relay.

5.5.4 Lightning Arrester

Lightning is a huge spark and takes place when clouds are charged to such a high potential with respect to ground or earth. A lightning arrester is a device used on electrical power system to protect the insulation system and other equipment from the damaging effect of lightning. Lightning arrester is also known as surge arrester. It has a high voltage terminal and a ground terminal. One end of the arrester is connected to the terminal of equipment to be protected and the other end is grounded. In Figure 5.12, we see the picture of Lightning arrester at APSCL.

Figure 5.12: Picture of Lightning arrester.

5.5.5 Isolator

The isolators consist of separate poles which can be arranged for single pole operation or linked together by operating rods.

At APSCL we have seen three types of isolators. They are:

- Center break isolator,
- Pantograph isolator and
- Double break isolator.

5.5.6 Bus Bar

Bus bar is used to carry a very large current or to distribute current to multiple devices within switchgear or equipment. There are several types of bus bar like single bus bar, double bus bar, double bus bar with reserved bus bar, ring bus bar etc. APSCL uses double bus bar. Because, APSCL is a generation company, it generates power and distributes to the grid. If any generator needs power for starting then it collects the power from the grid by bus bar.

CHAPTER 6

Conclusion

Before internship we knew theories and working principles of power system and related equipments but from internship we acquired practical knowledge about power system engineering and its equipment. We also faced some practical problems. Our communication skill has also improved through communication with different instructors. Therefore, we made good achievements with our industrial training which will help us in future.

6.1 Problems

At APSCL we have been introduced with the power generation, power distribution, and power maintenance and control operation. During our internship program, we faced some problem at APSCL. These problems are:

- Not sufficient time as the duration was only 15 days.
- Because of the company confidentiality, we could not achieve some important information about the equipment though we were much interested to know these things.

6.2 Recommendations

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

- Student must have a clear theoretical knowledge about a power station before the internship.
- At the stationary thing should not be touched without permission because this is high voltage power station.
- If any problem is faced to understand the relevant topics then the student should ask the supervisor.
- Student should complete power station, switchgear, power electronics courses before going for internship at a power station.

6.3 Conclusion

We passed some remarkable days at APSCL during our internship program. The theories that we learned at the university could be observed at APSCL. We consider ourselves very much lucky to have our internship program with a reputed power station company like APSCL. Industrial training provided by APSCL has enriched our practical knowledge. It has opened our eyes about practical operation of different equipments. The authorities at APSCL were very concerned about all kinds of safety. The friendly environment in APSCL encouraged us to co-operate with each other. We learned a lot and obtained practical knowledge from our internship at APSCL, which will help us in our professional life.

References:

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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:	Arif Ahmed
ID:	2008-1-80-031

Date:	07-09-2012
Start time/End time	8.00am-4.00pm
Location:	Substation
Mentor:	Rokon-uz-zaman

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 activites to visit the arrangement and also learn the process of water treatment and also saw the working prineiple of water teatment.

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.

An water treatment plant has four steps:

(i) Sereming: remove the visiable compound.

(ii) elearefication: Here use chemical named Alum[$Al(SO_4)_3 24H_2O$]

(iii) filteration: It has three step → (i) Gravel (ii) Sand (iii) Special coil

(iv) Dis-solve invisiable compound:
1. Seanenger
2. eataione
3. anaione
4. Mix bed

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

We learnt these things in introduction chemistry eourse.

26/09/12

Signature of the mentor with date
Name: Rokon-uz-zaman
Designation: Senior officer
Contact Phone #: 01736247503

29/9/14

Signature of academic supervisor with date
Name:
Designation:

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:	APSCL
Name of the student:	Arif Ahmed
ID:	2008-1-80-031

Date:	06-09-12
Start time/End time	8.00am - 4.00pm
Location:	Water treatment plant
Mentor:	Rokon-uz-zoman

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 activites was to visit the turbine section of APSCL.

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 turbine section we have been seen such thing:

(i) Low pressure turbine
(ii) High pressure turbine
(iii) Intermediate pressure turbine
(iv) Turbine efficiency
(v) Turbine construction
(vi) Turbine steam flow
(vii) Condenser
(viii) Lubrication oil system
(ix) Turbine control system
(x) Speed changer.
(xi) Dump valve

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

Theses things are related to the power station and switchgear courses.

05/09/12

Signature of the mentor with date
Name: Rokon-uz-zaman
Designation: Senior officer
Contact Phone #: 01736247593

29/4

Signature of academic supervisor with date
Name:
Designation:

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:	APSCL
Name of the student:	Arif Ahmed
ID:	2008-1-80-031

Date:	05/09/12
Start time/End time	8.00 - 4.00
Location:	Steam turbine Section
Mentor:	Rokon-uz-zaman

General Instructions:

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

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East West University

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

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

The objective of this day's activites was to visit the boiler section.

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.

There are 5 boiler is the APSCL of generating power plant.
The boiler section produce the steam and use to run the turbine.
The component of Boiler:

(i) Water filter house
(ii) Water Teatment ptank
(iii) De-Hydronization
(iv) Water tube
(v) Furnace
(vi) Pressure Gauge
(vii) Safty tank
(viii) Condenser.

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

Theses topic is related in the power station courses.

04/09/12

Signature of the mentor with date
Name: Rokon-U2-Zaman
Designation: Senior officer
Contact Phone #: 01736247503

29/11

Signature of academic supervisor with date
Name:
Designation:

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

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

Name of the company:	APSCL
Name of the student:	Arif Ahmed
ID:	2008-1-80-031

Date:	04-09-12
Start time/End time	8.00am-4.00pm
Location:	Boiler Section
Mentor:	Rokon-uz-zaman

General Instructions:

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

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East West University

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

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

The objective of the day's Activities was to visit Generator maintenance sauch as Brush maintenance, cleaning, overhaul maintenance.

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. Hydrogen is removed from a typical Ac Generator prior to overhaul
2. Typical disassembly procedure.
3. megohmmeter tests.

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

We studied Electrical machines course and Electrical measurements course.

02/09/12

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

Signature of academic supervisor with date
Name:
Designation:

10/12

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

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

Name of the company:	APSCL
Name of the student:	Shamsul Arefin Chowdhury
ID:	2008-1-80-029

Date:	3-09-2012
Start time/End time	8.00 AM – 4.00 PM
Location:	Generator
Mentor:	Rokon-uz-Zaman

General Instructions:

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

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East West University

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

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

the objective of the day's Activities was to visit Generator maintenance Auxiliary system and also knew factors that determine Output Voltage.

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 Hydrogen cooling system operates
② Hydrogen seal oil system
③ Stator cooling system that uses water to cool the stator windings.
④ typical voltage control system operates

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

we studied the theoretical knowledge Electrical machines-1 courses and power electronics (EEE447).

02/09/12

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

Signature of academic supervisor with date
Name:
Designation:

10/12

Department of Electrical and Electronic Engineering
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Industrial Training
Daily Activity Report

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

Name of the company:	APSCL
Name of the student:	Shamsul Arifin Chowdhury
ID:	2008-1-80-029

Date:	2-09-2012
Start time/End time	8.00 Am – 4.00 pm
Location:	Generator
Mentor:	Rokon-uz-Zaman

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 at the day's activities was visited to battery room

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

1. total battery 184
2. each cell rated voltage 1.5v.
3. battery type Ni-cd.
4. we saw the hydrometer which is used for Gravity test of Acid in the battery.
5. back-up duration of unit 3, 4 is 10-12 hours.
6. we also know how check the Amp. of the battery using Amp meter.

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

we studied in Electrical measurement and Teneable Energy course (EEE445)

01/09/12

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

Signature of academic supervisor with date
Name:
Designation:

10/12

Department of Electrical and Electronic Engineering
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Industrial Training
Daily Activity Report

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

Name of the company:	APSCL
Name of the student:	Shamsul Arifin Chowdhury
ID:	2008-1-80-029

Date:	01-09-2012
Start time/End time	8.00 A.m – 4.0PM
Location:	Battery Room
Mentor:	Rokon-uz-Zaman

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 activite was to visit and learn about the combined cycle section of the power station (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.

We have seen the flowing things:

(i) Gas turbine
(ii) Steam turbine
(iii) 10 burnner configaration through turbine.
(iv) Generator rating. (13.75KVA)
(v) WNRU
(vi) Boiler temperature and pressure rating.

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

These topic was studies in power station courses.

01/09/12

Signature of the mentor with date
Name: Rokon-uz-zaman
Designation: Senior officer
Contact Phone #: 01736247503

Signature of academic supervisor with date
Name:
Designation:

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:	Arif Ahmed
ID:	2008-1-80-031

Date:	31-08-2012
Start time/End time	8.00 am – 4.00 PM
Location:	CEPP
Mentor:	Rokon-uz-zaman,

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 dy was to visit and learn about the Unit Control Room-5.

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.

→ Unit-5 is the computed based operated. They used POS operation which lines based operating system. The list of specifying equipments is giving below –

i) Water and steam cycle.
ii) Super heater system.
iii) Burners Previews
iv) Boiler and flu gas system.
v) Feed water system.
(vi) Lube Oil system.
(vii) Synchronization.
(viii) Bearing temp.
(ix) Shaft turning gear.
(x) Gland System
(xi) Vibrations.
(xii) Sequence of events.

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

→ We were learn about these before in some machine, switch gear and power station courses.

30/08/12

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

Yahseen Kamal 25.09.2012

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

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

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

Name of the company:	APSCL
Name of the student:	Mahmudur Rahman Rana
ID:	2008-2-80-007

Date:	30-08-2012
Start time/End time	9 a.m. – 4 p.m.
Location:	Unit - 5
Mentor:	Rokon-Uz-Zaman

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 to introduce with the 3 & 4 Control room and also learn how to work this unit. and also saw the 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 3 & 4 Unit has a generator each unit. The capacity is 150 MW.

i) whole Control daigm board.
ii) 3 type of turbine (LP, HP, IP)
iii) different parameter indicator
iv) generator rating 15.75 KVA
v) Air and low transmitter (0-8.1 meter)
vi) Pressure switch
vii) Boiler Control system.
viii) Line steam flow transmitter. (operates at 220V).
ix) Automatic tripping system.
x) photo receive
xi) Ignitor
xii) range value
xiii) feedwater bypass control Value.

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

→ we ~~can~~ were learn this before theoritically in our machine, switch gear and power station courses.

29/08/12
Signature of the mentor with date
Name:
Designation:
Contact Phone #:

Tahseen Kamal 29.08.2012
Signature of academic supervisor with date
Name: Tahseen Kamal
Designation: Senior Lecturer

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

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

Name of the company:	APSCL
Name of the student:	Mahmudur Rahman Rana
ID:	2008-2-80-007

Date:	29-08-2012
Start time/End time	8 a.m. - 4 P.M.
Location:	Unit 3 & 4
Mentor:	Rokon-Uz-Zaman

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 today was to introduce and to learn about whole system of unit 1 & 2 control room.

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

→ The capacity of unit 1 & 2 is 64MW each. We have seen some equipment in this unit. these are –

(i) Vaccum pump
(ii) Oil pump
(iii) Cooling water boiler pump
(iv) LP Heater.
(v) HP Heater
(vi) Condencer
(vii) Condencate pump.
(viii) Feed pump
(ix) FD Fan (Forced draft Fan)
(x) Controllen compresser
(xi) service compressure.
(xii) Deaerator (dissolve oxigin remove)

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

→ we learn this in theoretical & in our power station and machine course.

28/08/12
Signature of the mentor with date
Name:
Designation:
Contact Phone #:

Tahseen Kamal
25.09.2012
Signature of academic supervisor with date
Name: Tahseen Kamal
Designation: Senior Lecturer

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

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

Name of the company:	APSCL
Name of the student:	Mahmudur Rahman Rana
ID:	2008-2-80-007

Date:	28/08/2012
Start time/End time	08.00 A.M. – 4.00 P.M.
Location:	Control unit 1 & 2
Mentor:	Rokon-Uz-Zaman

General Instructions:

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

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East West University

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

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

the objective of the day's activities was to know how to repair faulty motor and visited faulty motor checking room.

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

1. Faulty motor checking equipment
2. Panel board
3. different types of motor winding wire number (such as 17 SWG, 29 SWG wire etc)
4. ~~diode~~ unbalance winding resistance test.
5. ~~megar test~~ megger tester, also know winding resistance test by AVO meter. motor insulation test using

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

we studied faulty motor or equipment checking in electrical measurement (EEE 311)

27/01/12

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

Signature of academic supervisor with date
Name:
Designation:

27/01/12

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:	APSCL
Name of the student:	Shamsul Arifin Chowdhury
ID:	2008-1-80-029

Date:	27-08-2012
Start time/End time	8.00Am - 4.00 Pm..
Location:	winding shop
Mentor:	Rokon-uz-Zaman

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 days activities was to know different types of Generator protection system and knew different types of exciter and visited whole ~~power~~ Generator system.

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. under frequency protection
2. differential protection
3. rotor earth fault.
4. over load protection
5. under voltage "
6. over current "
7. reverse power "
8. short circuit protection

9. winding temperature

* 4 types of exciter:
a. dc exciter
b. Ac exciter
c. brush less exciter
d. static exciter.

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

those types of protection we have studied switch gear protection relay course (EEE 442).

26/08/12

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

Signature of academic supervisor with date
Name:
Designation:

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:	APSCL
Name of the student:	Shamsul Arifin Chowdhury
ID:	2008-1-80-029

Date:	26-08-2012
Start time/End time	8.00 AM - 4.00 P.M
Location:	Generator section
Mentor:	Rokon-uz-Zaman

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 this day to learn about the principle and construction of a generator.

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

→ we (group-2) have seen the ~~on~~ different kinds of construction equipments of generator. Some of these was given below:

i) shaft
ii) slip ring
iii) Carbon brush
iv) Rotor
v) Stator
vi) Exciter
vii) turbine
viii) Coolers

We also seen the dummy ~~o~~ model of the whole generation section.

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

→ we already seen these type of equipment in our machine course and also power electronic.

25/09/12
Signature of the mentor with date
Name:
Designation:
Contact Phone #:

Tahseen Kamal
25.09.2012
Signature of academic supervisor with date
Name: Tahseen Kamal
Designation: Senior Lecturer

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

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

Name of the company:	APSCL
Name of the student:	Mahmudur Rahman Rana
ID:	2008-2-80-007

Date:	25/08/2012
Start time/End time	8 a.m. – 4 P.M.
Location:	Generation Section
Mentor:	Rokon-Uz-Zaman

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 day's was to visit and to introduction with the substation section.

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 specific equipment of substation:

(i) Bus Bar
(ii) current transformer(CT)
(iii) Potential transformer(PT)
(iv) Circuit Breaker (CB)
(v) Isolator
(vi) lighting arrester
(vii) Grounding
(viii) Transformer
(ix) Sky-wire
(x) Battery room
(xi) Earth grounding.

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

These topic was related to the power station, switchgear, Electronic machines.

07/09/12

Signature of the mentor with date
Name: Rokon-U-Zaman
Designation: Senior officer
Contact Phone #: 01736247593

29/9

Signature of academic supervisor with date
Name:
Designation:

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:	APSCL
Name of the student:	Mahmuder Rahman Rana
ID:	2008-2-80-007

Date:	24-08-2012
Start time/End time	8a.m. – 4p.m.
Location:	APSCL (visiting)
Mentor:	Rokon-Uz-Zaman

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)

→ Our objective was the know the historical background of APSCL (Asuganj Power Station Company Limited)

Also known about the whole section of Power station and the future plan of APSCL.

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.

→ There are three types of Generation Section. They are steam turbine, Gas turbine and combine cycle. There are almost nine units. The generation capacities are:

i) Unit 1 = 64 MW
ii) Unit 2 = 64 MW
iii) Unit 3 = 150 MW
iv) Unit 4 = 150 MW
v) Unit 5 = 150 MW
vi) Gas turbine 1: 56 MW
vii) Gas turbine 2: 56 MW
viii) Steam station: 34 MW
ix) Gas engine: 50 MW

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

→ These were the introductory knowledge about the APSCL and also learnt about the basic knowledge of APSCL.

24/08/12
Signature of the mentor with date
Name:
Designation:
Contact Phone #:

Tahseen Kamal
25.09.2012
Signature of academic supervisor with date
Name: Tahseen Kamal
Designation: Senior Lecturer