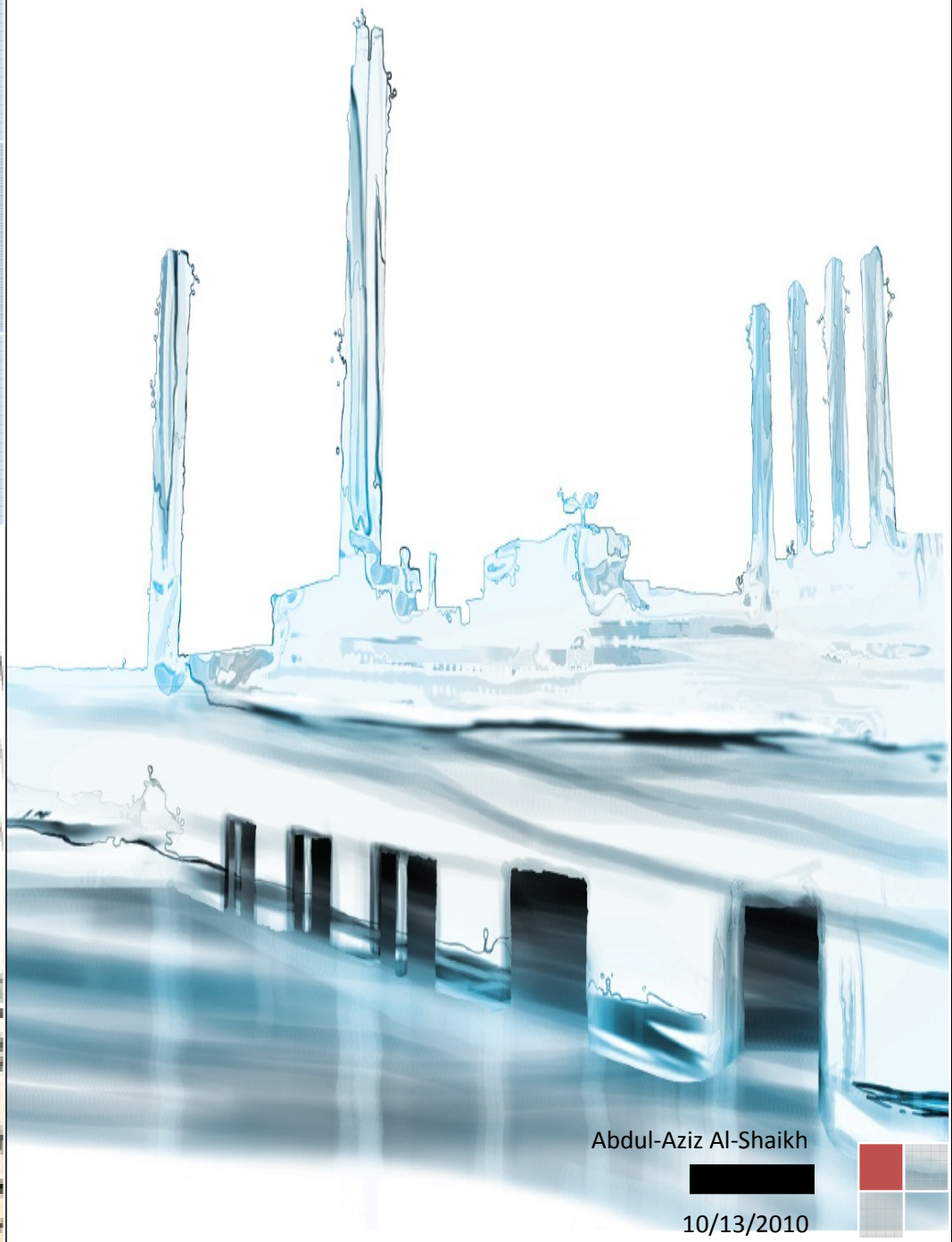
2010

King Fahd University of Petroleum and Minerals

Summer Training Report



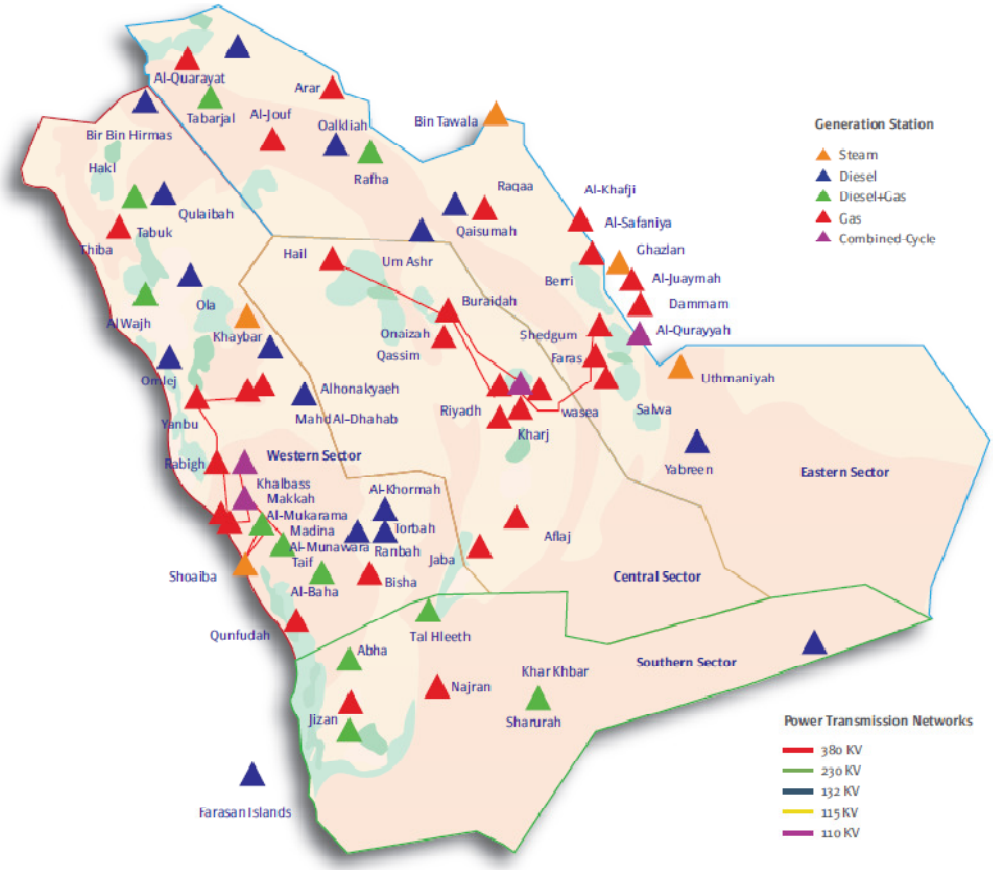
Abdul-Aziz Al-Shaikh
[redacted]

10/13/2010

Table of Contents

1. Introduction

King Fahd University of Petroleum and Minerals (KFUPM) give an opportunity to take summer training in one of the industrial companies. I did my summer training in Saudi Electricity Company (SEC) in Western Region Branch from the third of July to the first of June. The important of this opportunity is to relate between what you studied and the real thing that is going on. The mission of the company is to provide its customers with safe and reliable electric services and ensuring optimum utilization of available resources.



2. Saudi Electricity Company

SEC-WEST works in three systems which are:-

a. Generation

b. Transmission

c. Distribution

Although my training will be in Distribution sector, I will give a brief description for the other parts.

➢ *Generation System:*

Generation system is generating electrical power in (13.8KV) according to system demands and to deliver the generated power to the step up transformer to be (110KV).

➢ *Transmission System:*

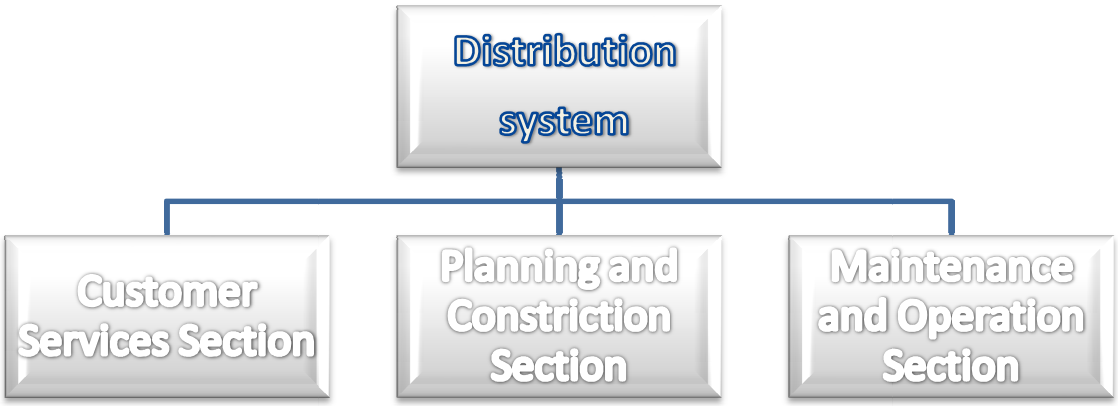
The purpose of Transmission system is to transmit the power from the generation part to the distribution sector. Transmission system is responsible to step up the voltage to (110KV) and transmitted to get less loses because as the voltage increases, the currant will decreases then the power losses will decreases according to the following relation:

$$\left(P\ (loses)\right) = \sqrt{3} * I^2 * R$$

After transmission phase is over, the voltage will be stepped down to (13.8KV) again.

➢ *Distribution System:*

Distribution system is delivering and distributes the electrical power from (13.8kv) to customers in 220/110 or 380/220, and that is usually the meter point. The distribution system consists of three sections.



a. Customer service section:

i. ***Customers affairs*** :

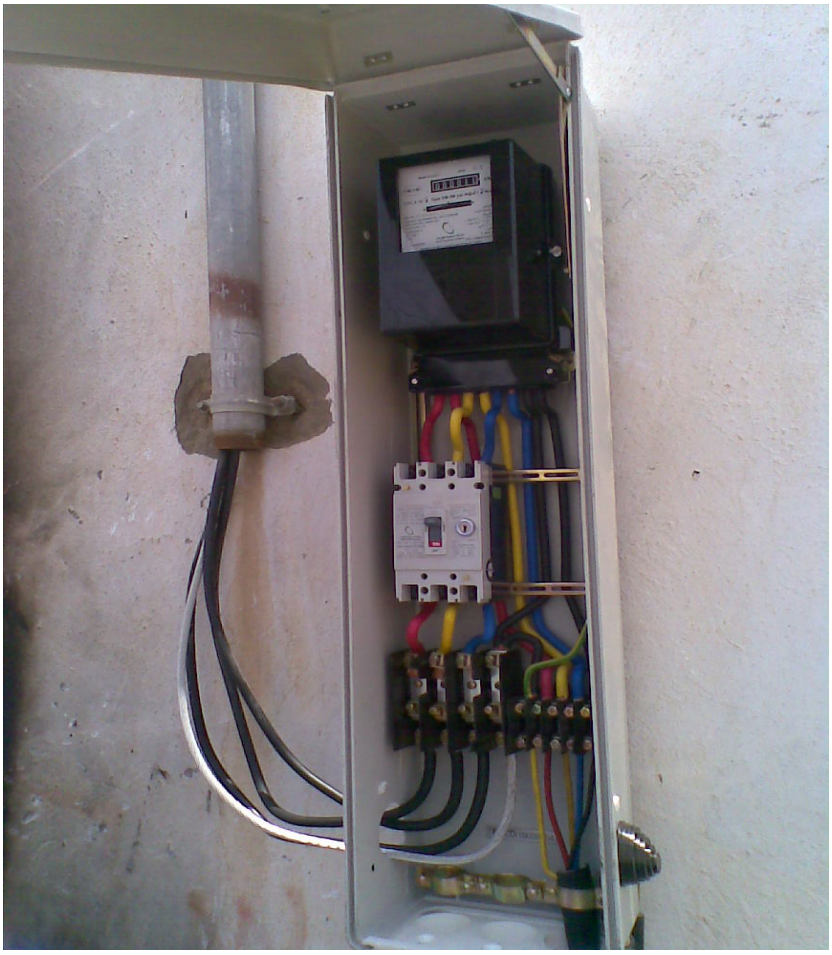
The mission of this department is to communicate with the customer and knew what type of service he needs. For example, the current that will be received is in many capacities (30, 60,100,150,200,300 and 400A). Also, this division takes care of the legal affairs of the municipality. This information will be sent to the scanning section.

ii. ***Request study :***

There are some teams that work in this section. A team consists of one engineer, technician adviser and four technicians. I worked with the team who are responsible about Kholise. First, we sketch the place of the request and show the nearest distribution points to the request in the sketch.

iii. Reading and distributing:

One of the way for company's incoming is meter bills. The company gives its employer devices to enter the reading from the meter and downloading it in the computer of the company.



b. Planning and Constriction Section:

i. ***Planning***

1. LOW VOLTAGE NETWORK DESIGN:

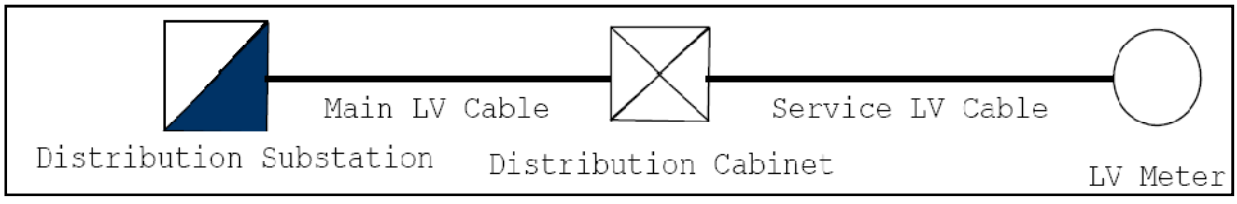
In Kholise, There are about 14000 customer meters are connected together by cable. To increase this reliability, continually safely and decrease the cost of connection, the connection between distribution substation and customer meter is divided into three configurations.

- *There are three ways of connection:*
  - *Direct Connection:*

Direct line is placed from distribution substation to low voltage meter. This method of connection is costly. Thus it is not suitable. But some time the company uses it for some customers.

  - *Connection through Distribution Cabinet:*

Cabinet is a point between substation and group of customers. In low customer load areas, the outgoing of the cabinet can feed the second cabinet to provide provision for more customer connection.



- *Connection through Distribution Box:*

In this method, the cable is connected from customer to another customer through distribution box.

2. Voltage drop calculation:

Voltage drop is the difference in voltage between one point in a power system and another. In SEC, the maximum allowable voltage drop is + or - 5 %. Voltage drop is caused by resistance in the conductor or connections leading to the electrical load. There are many causes of resistance in the conductor path. There are three fundamental causes of voltage drop:

1) Material:

Copper is a better conductor than aluminum and will have less voltage drop than aluminum for a given length and wire size.

2) Wire Size:

Larger wire sizes (diameter) will have less voltage drop than smaller sizes (diameter) of the same length.

3) Wire Length:

Shorter wires will have less voltage drop than longer wires for the same wire size (diameter).

ii. Constructions

Constructions sector is divided to three sections which

1-Substations composition

2- Civilization works

3- Connections section.

The work in this sector is in sequence. First, the substations are composed with different capacities and the bases are constructed by substations composition section. Next, the civilization works section achieves the digging works. Finally, the meters, boxes, interrupts and distribution cabinet composition are done by the connections section. The contractors achieve all these works.

c. Maintenance and Operation Section:

i. Maintenance:

The substations maintenance section can be divided into five parts which are periodic maintenance, loads reading, substations emergency, workshop and protection. Before I describe the works in these parts, I will give small view about the substations. The substations have different shapes and different capacities but in general they consist of two main parts:

1) Substation components

i. Transformer:

Transformer converts the voltage from medial voltage (13.8 KV) to low voltage (380 V/220 V or 220 V/110 V).

ii. Low voltage panel:

Low voltage panel contains main low voltage circuit breaker and eight or twelve low voltage switches which the cables are connected to them.

2) Periodic Maintenance Part:

There are two tasks of this section that clean and check the compact and regular (building) substations. Also, they clean and check the switching stations which are a building contain circuit breakers and feed directly by medial voltage (13.8 KV). The switching stations are for special customers who have high loads.

3) Loads Reading Part:

Loads reading part is informed about any increasing in the loads by low voltage emergency section. Then, this part take three reading of the loads in the day and send a report about the loads to the low voltage planning section.

4) Substations Emergency Part:

This part change the damage switches in the low voltage side of the substation and the damage fuses in the medial voltage side of the substation. Also, if there are big problems like substation fired or transformer damage, they change the substation.

5) Workshop Part:

There are many tasks of this section which are as follow:

- *Cleaning and lubrication.*
- *Change the transformer oil.*
- *Check the circuit breakers, switches and fuses.*
- *Check the CT.*
- *Check the ammeter and voltmeter.*
- *Check the inner lighting of the substation.*

ii. Operation:

The operation section is concerned about medial voltage network (13.8 KV). The three major tasks of this section are as follow:

1. Disconnection of medial voltage cable:

The disconnected cable can be between two substations or from the feeding source to substation. There are two reasons for disconnecting. The first reason is connecting new substation on this cable. The other is changing the route of the cable.

2. disconnection of distribution substation:

Disconnection of distribution substation is the most common task of the operation section. There are many reasons for disconnecting which are as follow:

- *Adding new switches to the substation.*
- *Old cable disconnection.*
- *New cable connection.*
- *Changing the place of the substation.*
- *Adding Earth Fault Indicator.*

3. Disconnection of cable or substation for maintenance.

3. Conclusion:

The opportunity of training in (SEC) is a great chance to relate what I studied in the university with the application of it. One of the things that I learned is if the power is needed to be transmitted, it is better to step the voltage up during the transmission process to reduce the losses of power. Also, I learned that (SEC) consists of the sectors:

a. Generation.

b. Transmission.

c. Distribution.