Over Head Transmission Line (OHTL)

Prepared By

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Background

Electrical Overhead Line consisting of cables and supports that are used to transmit and distribute electricity.

One of the first experimental overhead lines was built in *1882* by the French engineer Marcel Deprez, and carried DC at 1.5-2 kW over 57 km from Miesbach to Munich.

In *1991* the first three-phase AC overhead lines took place, over a distance of more than 170 km between Laufen and Frankfurt in a system designed and built by Russian-born engineer Mikhail Dolivo-Dobrovolsky. The line carried 15kV of electricity at a transmission capacity of 230 kWt and about 75% efficiency.

Overhead lines developed and improved rapidly as a result of the creation of developed electrical networks, which were combined into power systems.

Executive Summary

This project paper presents a study on Mechanical & Electrical design of Overhead line. Actually overhead line structures consisting of cables and supports that are used to transmit and distribute electricity. Transmission lines are a fundamental link in the power system; along with substations, they form electrical networks. In the case of overhead lines, electricity is transmitted over long distances through cables attached to pylons using isolators.

Overhead electricity transmission networks are one of the main links in modern power systems. Voltage depends on the length of the line and its transmission capacity. The construction parameters of overhead transmission lines depend on the nominal voltage of the line, the local terrain and climactic conditions, and also on technical and economic requirements. Overhead transmission lines use uninsulated cables.

The most important characteristics of overhead transmission lines are: a– distance between supports; b – maximum sag; c – lowest (overall) allowable distance between the lowest point of the wire and the ground; d – length of insulator chains; a – distance between adjacent wires (phases) of the line; and H – total height of the support.

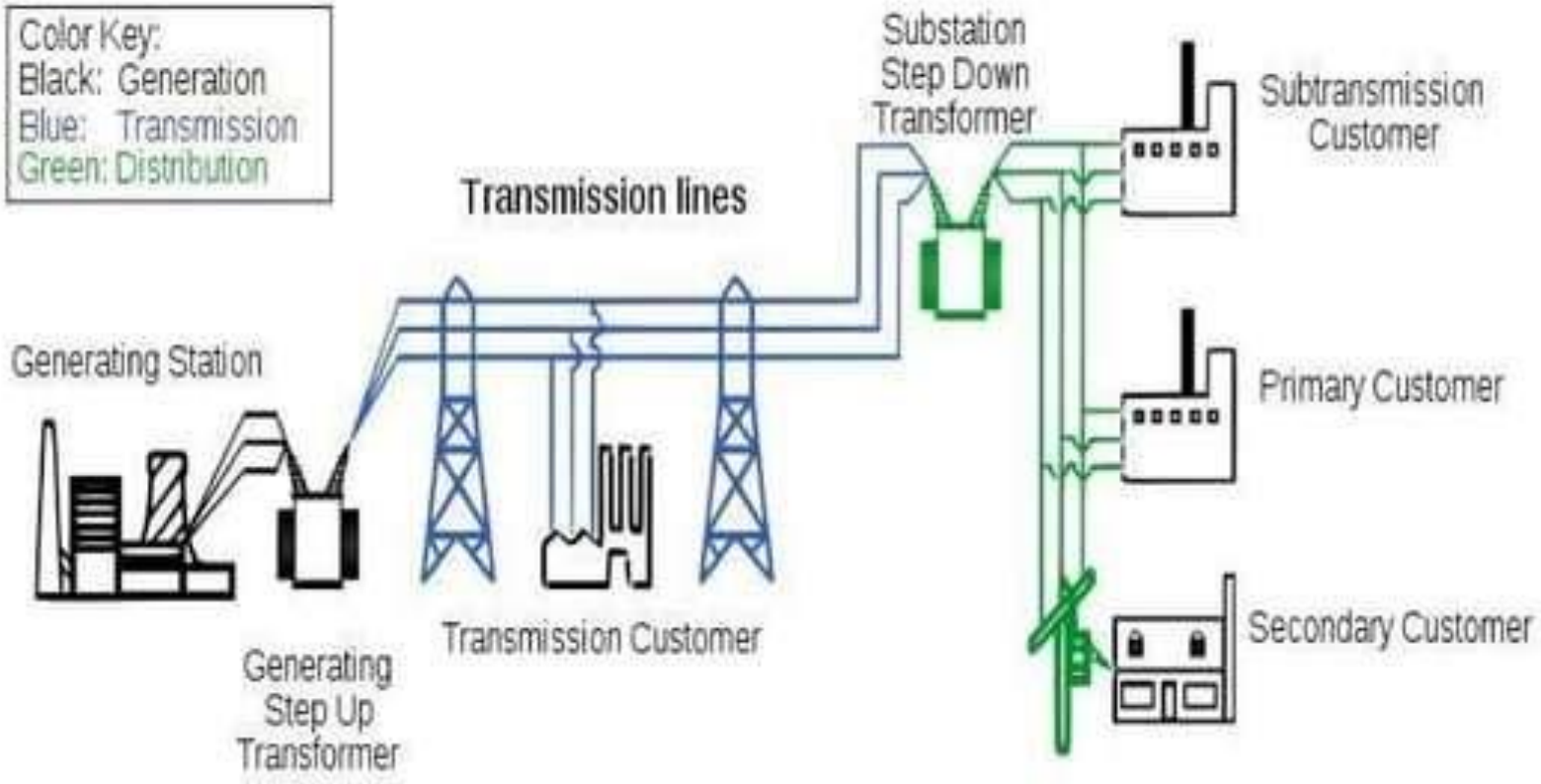
Objectives

To know-

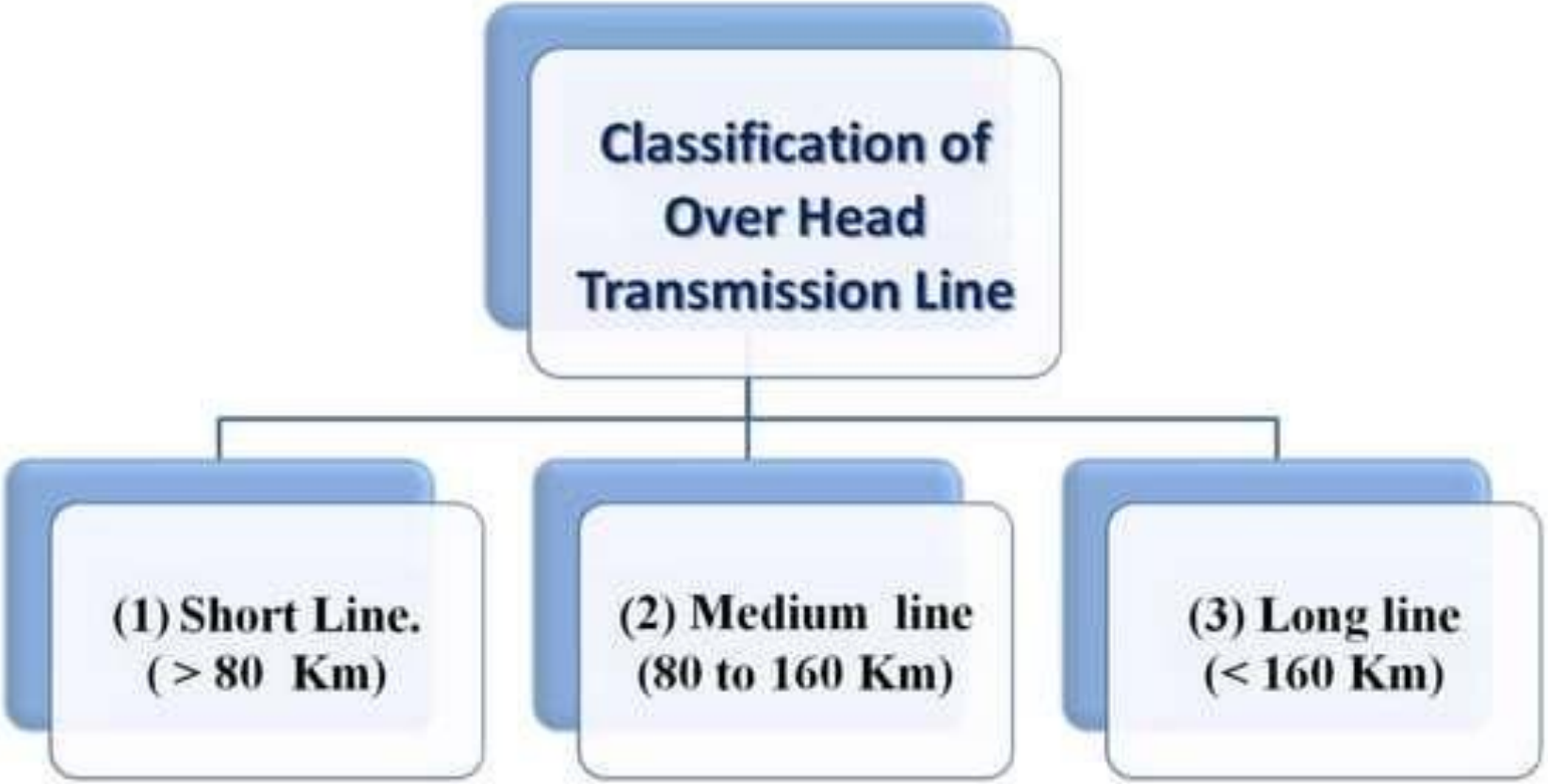
- **How power can be transmitted from generation station to industrial sites.**
- **How power can be distributed from substation to consumers.**
- **About the interconnect various areas of networks.**
- **About the interconnect one electric utility with another.**

Definition of Overhead Transmission Line:

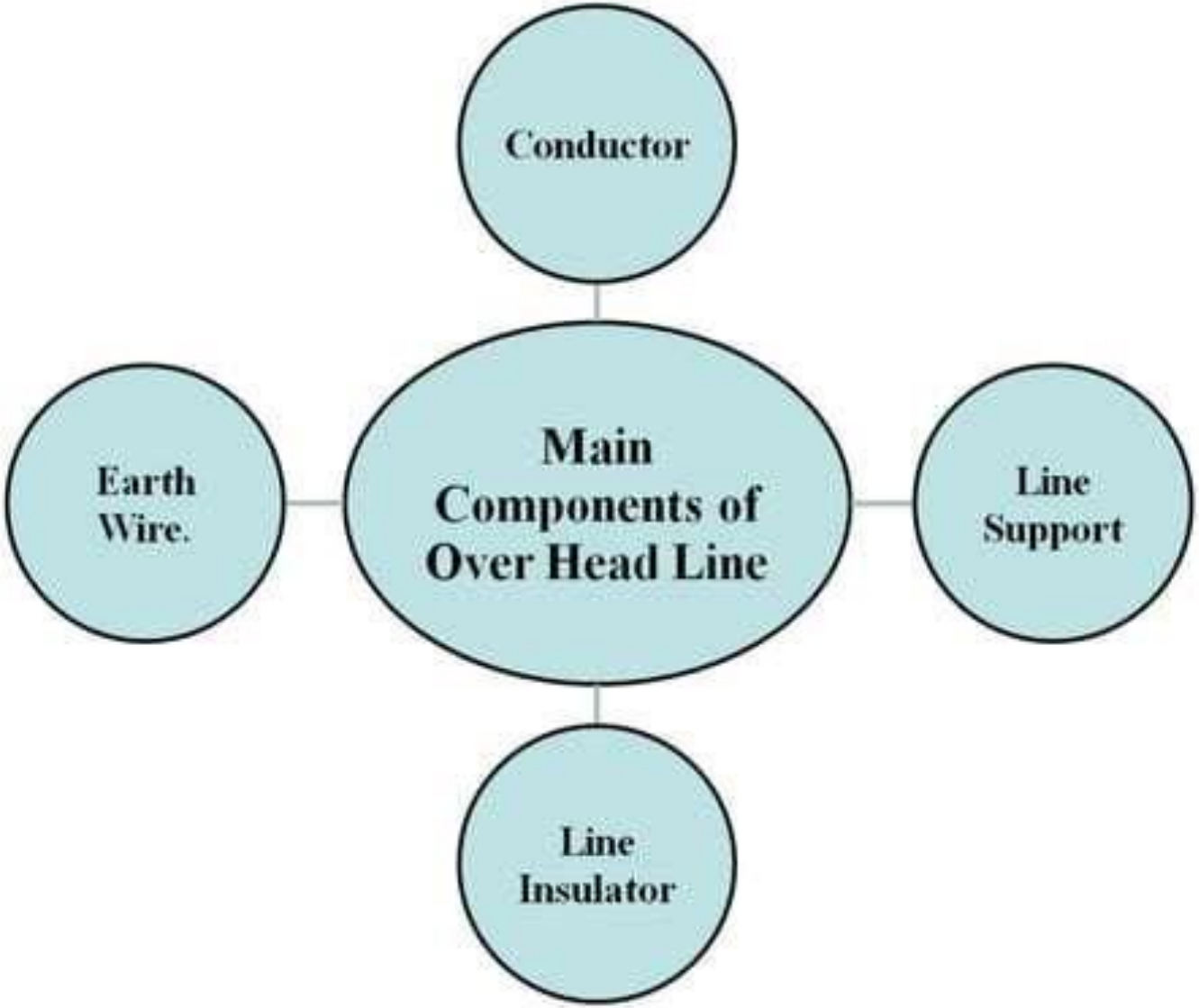
Electricity is transmitted over long distances through cables attached to pylons using isolators known as overhead transmission line. Overhead electricity transmission networks are one of the main links in modern power systems.



Classification of Over Head Transmission Line



Main Components of Over Head Line



• Conductors

Types of Conductors in Overhead Transmission Lines

- ❖ Copper Conductors
- ❖ Steel Conductors
- ❖ Aluminum Conductors
- ❖ Steel-Reinforced Aluminum Conductors

Copper Conductors

Steel Conductors

Aluminum Conductors

Steel-Reinforced Aluminum Conductors

Characteristics of Conducting Materials

The conducting material used for over head line of electric power should have the flowing properties:

- High electrical conductivity.
- High tensile strength.
- Low cost.
- Low specific gravity.
- Should not be brittle.

• Line Supports

Line supports made by

- ❖Tubular steel pole
- ❖Lattice steel pole
- ❖Concrete pole
- ❖Aluminum towers
- ❖Wooden pole

Tubular
Steel pole

A reinforced
concrete pole

Aluminum
towers

Wooden
pole

Characteristics of Support Materials

The supporting materials used for over head line of electric power should have the flowing properties:

- High mechanical strength.
- Low cost.
- Light in weight.
- Longer working life.
- Easy accessibility.

• Insulators

Types of Insulators in Transmission Lines

- Pin Type Insulators
- Suspension Type Insulators
- Strain Type Insulators
- Shackle Type Insulators
- Stay Insulators

Pin Type Insulators

Suspension Type Insulators

Strain Type Insulators

Shackle Type Insulators

Stay Insulators

Glass Insulators

Application of Insulators

TYPES	APPLICATIONS
Pine type	L.T., H.T. distribution, Not above 66 kv
Suspension type	O.H. transmission, More than 33 kv
Strain type	At the end or sharp curve
Shackle type	As strain insulator on L.T. distribution

Characteristics of Insulating Materials

The insulating materials used for over head line of electric power should have the flowing properties:

- High electrical resistance.
- High relative permittivity.
- Should not be prosper.
- High tensile strength.
- High ratio of puncture strength.
- High mechanical strength.

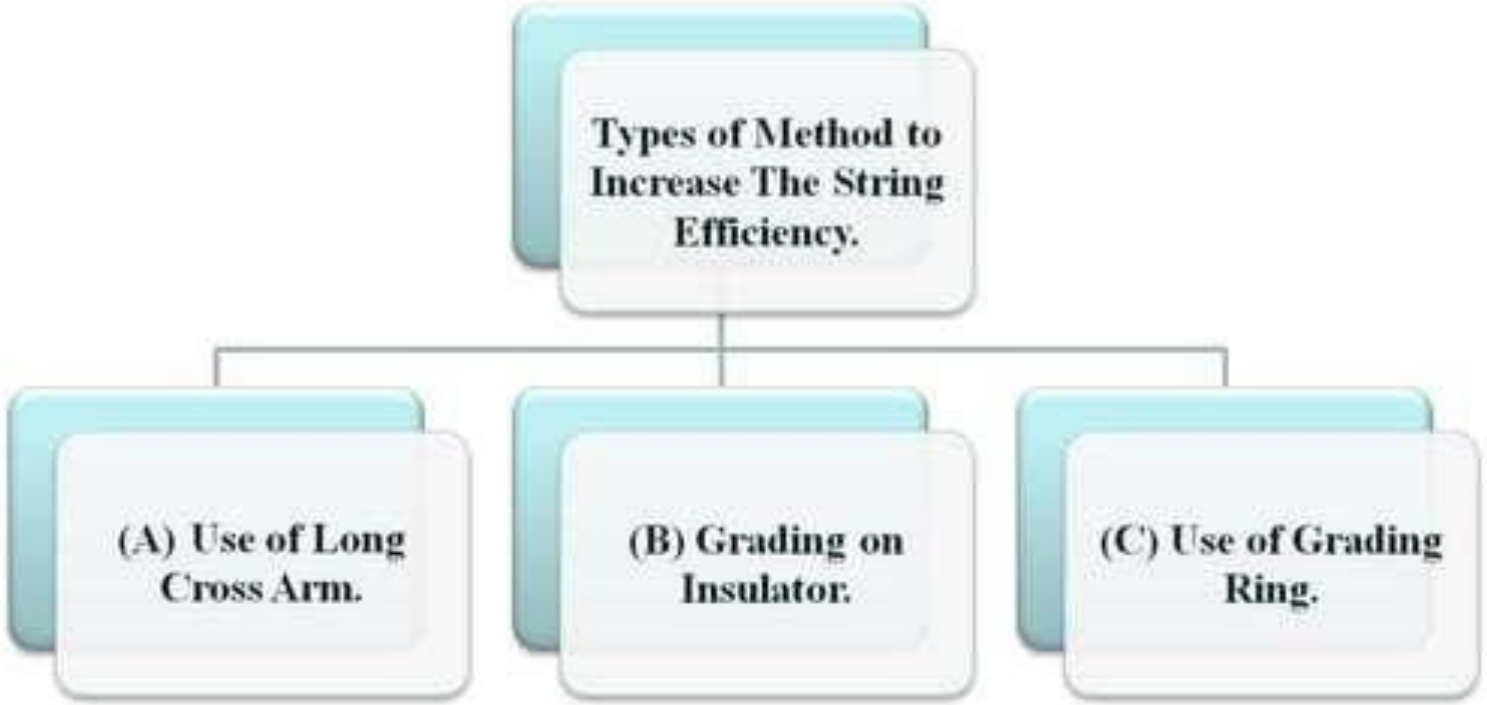
Some Important Effects (Mechanical) of Overhead Line

- String Efficiency
- Corona Discharge Effect
- Sag in Over Head Line

String Efficiency

The ratio of voltage across the whole string to the product of number of discs and the voltage across the disc nearest to the conductor is known as string efficiency i.e.,

String efficiency = {Voltage across String}/{n Voltage across disc nearest to conductor}*
where n = number of discs in the string.



Corona Effect

Corona discharge effect in the overhead transmission line is a phenomenon in which ionization of the surrounding air of power conductors takes place at voltage, greater than critical break down voltage. When the potential voltage between the power conductors of transmission line in a extra high voltage (EHV) system goes on increases hissing noise, flowed by the violet glow and finally electrical voltage breakdown and flash over is observed all this constitute the Corona Discharge Effect Phenomenon.

Finally we can say, the phenomenon of violet glow, hissing noise and production of ozone gas is an over head transmission line is known as corona discharge effect.

Some Important Effects (Electrical) of Overhead Line

➡ Skin Effect

The tendency of an alternating electric current (AC) to concentrate near the surface of a conductor is known as skin effect.

➡ Flux linkages

The inductance of a circuit is defined as flux linkages per unit current. Therefore in order to find the inductance of a circuit, the determination of flux linkages is primary importance.

Conclusion

An overhead power line is an electric power transmission line suspended by towers or utility poles. Since most of the insulation is provided by air, overhead power lines are generally the lowest-cost method of transmission for large quantities of electric energy. A major goal of overhead power line design is to maintain adequate clearance between energized conductors and the ground so as to prevent dangerous contact with the line.

Thanks to All