**Transmission Lines Parameters**

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| --- | --- | --- |
| Transmission line resistance | Transmission line Inductor | Transmission line capacitor |

**Overhead transmission system**

1. Underground AC transmission would present a solution to some at environmental and aesthetic problem in overhead transmission lines, there are a technical and economic reason that make the use at underground ac transmission not preferable.
2. The overhead transmission system is mostly used at high voltage level mainly because it is much cheaper compared to underground system.
3. The selection of an economical voltage level for the T.L is based on the amount of power and the distance at transmission.

The economic voltage between lines in 3$ϕ$ is given by;

$$v=5.5\sqrt{0.62L+\frac{p}{100}}$$

where

* V = line voltage in KV
* L = length at T.L in KM
* P = peak real power in KW
1. Standard transmission voltage is established
2. HV (30- 230) KV.
3. EHV (230-765) kV.
4. UHV (765- 1500) KV.

 Conducting material

Types of overhead line conductor: is based on

 Strength

1. The material to be chosen for conduction at power should be such that it has the lowest resistance. This would be reducing the transmission losses.

**Note: The weight the aluminum conduction having the same resistance as that at coppers roughly 60% less at copper.**

1. The transmission of electric power conductors where usually copper but aluminum conductors have completely replaced copper for overhead lines because at the much lower cost and lighter weight at aluminum conductor compared with a copper conductor at the same resistance.
2. The most commonly used conductor for high voltage transmission lines are:
* AAC - ALL-Aluminum Conductor
* AAAC – ALL- Aluminum- Alloy Conductor
* ACSR - Aluminum Conductor Steel- Reinforced
* ACAR – Aluminum Conductor- Alloy – Reinforced
* Expanded ACSR
1. **Aluminum -alloy conductors** have higher tensile strength than the ordinaryaluminum
2. **ACSR** consists of a central core at higher- strength aluminum surrounded by larger of aluminum.
3. **ACAR** has a central core at higher- strength aluminum surrounded by layer at aluminum.
4. **Expanded** ACSR has a filler such as (paper fiber) separating the inner steel strands from the outer aluminum strands. The filler gives a larger diameter (and hence, lower corona) for a given conductivity and tensile strength. Expanded ACSR is used for some extra-high voltage lines.

**Stranded Conductors**

1. To increase the area stranded conductors are used. This increase the flexibility and the ability at the wire or cable to be bent.
2. Generally, the circular conductors at the same size are used for spiraling
3. Each layer at strands is spiraled in the opposite direction at its adjacent layer. This spiraling holds the strand in place

**Stranded conductor**

|  |  |
| --- | --- |
| Easier Manufacturing | handling much more flexiblebetter mech strength as well as well as |

**Stranded Conductors**

Line Resistance: The dc resistance at a solid round conduct at a specific temperature the equation is: $R\_{ⅆC}=\frac{ρ^{T}L}{A}Ω$.

1. Temperature: Resistivity at conductor metals varies linearly

The equation is: $ρ^{T\_{2}}=\left.ρ^{T}\right|=\left(\frac{T\_{2}+\dot{T}}{T1+T}\right)$

The equation of the conductor resistance is: $R\_{2}=R\_{1}\left(\frac{T\_{2}+T}{T1^{+T}}\right)$

1. Spiraling: The stranded conductor is spiraled each strand is lower than the finished conductor. this result is slightly higher resistance than the value calculated.

Note: the spiraling increases the resistivity at the conductor extended about 2% for the first layer and 4% for a second layer and so on.

1. Frequency “skin effect”: the current distribution is not uniform over the conductor cross- sectional area and the current density is greatest at the surface at the conductor.

This case the AC resistance is greater than DC resistance. This behavior is known a skin effect.

At (50-60) the AC resistance is higher than DC resistance about 2%.

The ac resistance or effective resistance at a conductor is:

$$R\_{ac}=\frac{P\_{Loss}}{I^{2}}$$

**Note: A circular mill is a unit of area**