Skin

The tendency of alternating current to concentrate near the surface of a conductor due to greater inductance of the inner parts is called the skin effect. The apparent or de ohmic resistance of the conductor is increased due to concentration of current on the surface or skin of the conductor. Skin effect depends on the following factors

i) Nature of material
ii) Diameter of wire (Increases with diameter)
iii) Frequency (Increases with increase of frequency)
iv) Shape of wire (less for stranded conductor than solid conductor)

Skin effect is low for low supply frequency (< 50 Hz) & conductor diameter is small.

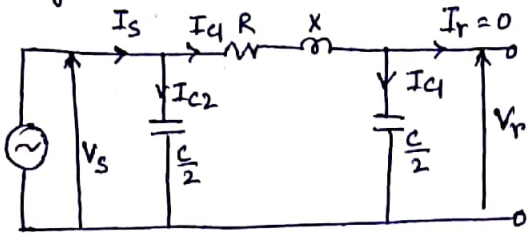
Proximity effect

This is an electromagnetic effect which also results in increase of the apparent resistance of the conductor due to the presence of other conductors carrying current in its vicinity. When two or more conductors are in proximity their electromagnetic fields interact with each other with the result that the current in each of them is redistributed such that greater current density is concentrated in that part of the strand most remote from the interfering conductor. In each case a reduced current rating results from the apparent increase of resistance.

The above two effects assume importance only for conductor sizes greater 125 mm^2.

Ferranti effect

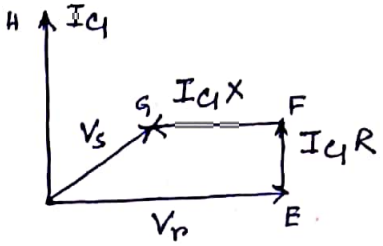
A long transmission line has a large capacitance. If such a line is open circuited or very lightly loaded at the receiving end, the magnitude of the voltage at the receiving end becomes higher than the voltage at the sending end. This phenomenon is called Ferranti effect. Ferranti effect is due to charging current of the line. (The value of current at the sending end at no load and normal operating voltage applied at the sending end is called charging current)



$I_r = R \cdot E$ current

$I_S = S \cdot E$ "

Nominal π model



Phasor diagram

Transposition

When 3ϕ line conductors are not equidistant from each other ie unsymmetrical spacing of conductors, the flux linkages and inductance of each phase are not the same. A different inductance in each phase results in unequal voltage drops in the three phases even if the currents in the conductors are balanced. Therefore the voltage at the receiving end will not be the same for all phases. To make the voltage drops equal in all conductors the positions of the conductors are interchanged at regular intervals along the line, so that each conductor occupies the original position of every other conductor over an equal distance. Such an exchange of position is known as transposition. The effect of transposition is that each conductor has the same average inductance. In practice the line conductors should be so transposed that each of the three possible arrangements of conductors exist for 1/3rd of the total length of line.