

The Importance of Tracking Resistance

What is Tracking

"Tracking" in electrical terminology refers to the formation of a conducting carbon path on the surface of a normally insulating surface.

How are tracks formed.

These carbon "tracks" are formed under the influence of a voltage stress gradient that is tangential to the insulating surface. Under the influence of this voltage gradient, leakage currents begin to flow over the surface. The heating effect of the leakage current can cause the insulation to deteriorate by "burning". This "burning" is visible as sparks or scintillation in more severe case, while in less severe cases it may be invisible but can be detected as "static" on a radio receiver or by Partial Discharge measurements. Depending on the nature of the insulating material, two possible failure modes can arise. In case of ceramic or porcelain insulators, the common result is "erosion" of the surface glaze. In case of polymeric materials, the material can "burn" to leave a carbon residue. As the electrical stresses concentrate around the carbon a conducting track forms along the surface. With the passage of time, the conducting track extends all the way from high voltage to ground and the insulation "fails".

Tracking failure in termination :

Cable terminations are like line insulators in one respect. At the lug end is the line voltage, while at the crutch there is ground potential. If a continuous conducting carbon track forms along the length of the termination from the lug to the ground point, it will no longer be able to sustain the system voltage. The increase in leakage current can cause the system to trip, or if the protection fails, it can lead to fire.

Improving Tracking Resistance

It is evident that longer "creepage" path over the termination will improve resistance to tracking. A termination with a longer creepage length will be better than one with a shorter creepage path. In case of wet conditions, the protected creepage plays a specially important role. The more the number of skirts and larger the diameter of skirts, the better will be the tracking resistance. This is similar to providing more and deeper discs on insulators in more polluted areas.

Voltage distribution over the length of a termination is not linear. The voltage gradient, and more specifically, the steepest voltage gradient plays a key role in initiating tracking. The stress control element in the termination, (be it a stress cone, stress relief pad or heat shrink stress control sleeve) drops most of the potential across its length. The balance length is more important for ease of connection. Hence a longer stress control element also assists in improving tracking resistance.

Tracking Resistance is much talked about in relation to terminations.

What is tracking?

How can tracking resistance be improved.

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