ANACONDA

Cable Lore

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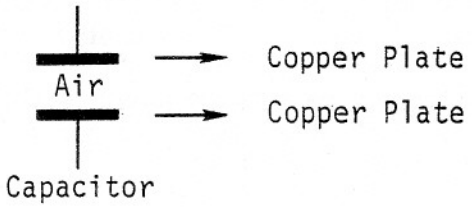
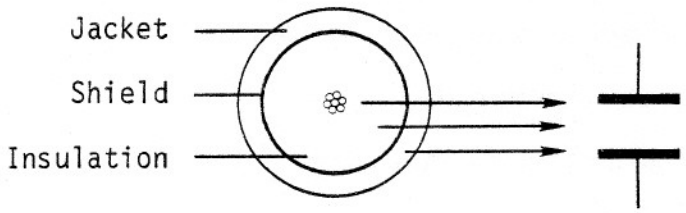
A CABLE IS A CAPACITOR

A capacitor is an electrical device consisting essentially of two conducting surfaces separated by an insulating material (dielectric) such as air, paper, oil, glass, or rubber.



A close look at a cross-section of a shielded cable reveals a striking resemblance to the description of a capacitor. The copper strand is one conducting surfaces, the cable insulation is the dielectric, and the shield the second conducting surface.



The fact that a cable behaves like a capacitor must be taken into consideration during cable design and application. The following characteristics of a capacitor as related to cable require special attention:

(1) A Capacitor Stores Electrical Energy: The property of an insulation which determines how much electrostatic energy can be stored per unit volume when unit voltage is applied is called S.I.C. (specific inductive capacity). In effect, the S.I.C. of an insulation is the ratio of the amount of energy that a given capacitor can store when it has the insulation between its plates to the amount of energy that the same capacitor can store when it has air (actually a vacuum) between its plates. For example, if a certain air capacitor has a measured capacitance of one MF (microfarad), but when the air is replaced with an insulation and the measured capacitance is 3 MF, then that insulating material has an S.I.C. of about 3. S.I.C. is also referred to as dielectric constant and permittivity. For a capacitor, whose purpose is to store electrical energy, a high S.I.C. is desirable; but for a cable to transport energy, a low S.I.C. is best. If the S.I.C. of the dielectric is too high, energy is stored in the insulation and the cable will not be an efficient conductor of electricity. Generally for 600-volt cables, the S.I.C. is kept below 7. For 15Kv cables below 4 and cables above 15Kv the S.I.C. value is kept as low as it is possible to obtain in any given insulation.

(2) A Capacitor Permits the Flow of Alternating Current to a Degree Dependent on the Capacitance and Frequency: Applying this characteristic of capacitors to cables one could say there is no such thing as a perfect insulation - A-C current appears to flow through any insulation. The amount or degree is dependent on the S.I.C. of the insulation and the frequency (60-cycle, etc.) of the current.

The fact that a capacitor permits the flow of A-C current carries considerable weight in cable design and application. Some feel for its importance can be grasped when it is a major influence in situations such as:

(a) Should a cable be shielded or nonshielded?

(b) A cable shield should always be grounded.

(c) Cause for external corona in an installation.

(d) Significant factor in choice of cable size.

(e) Geometry in cable design.

(f) Spacing of conductors during installation.

(g) Shielding in data-log cables.

A more comprehensive study of capacitors and their relationship to cables would be most informative and develop a deeper appreciation for safe and efficient application.

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