ANACONDA Cable Lore

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CORONA

Corona in a power cable can be defined as a type of electrical discharge occuring when the gas in a void is electrically stressed beyond a certain critical value. The location of these voids can generally be found: (1) At the interface of the strand shield and insulation, (2) Within the body of the insulation or (3) At the interface of the insulation surface and the shielding system.

Corona is highly undesirable in a power cable because it will initiate cable deterioration and ultimately cause cable failure. The speed of this reaction or time to failure follows very closely the laws of physics and chemistry for most chemical reactions, i.e. reaction time is dependent upon concentration, activity of chemicals involved, and temperature.

Corona and its side effects in an energized cable are interesting but complex phenomena. Once an electrical discharge bridges a void and keeps firing away, it's like turning on the switch in a chemical plant.

(1) Oxygen in the discharge field is converted into ozone.
(2) Electron bombardment will produce heat and also accelerate deterioration of crystalline type polymers.
(3) Nitrogen reacts with oxygen in an electrical field forming nitrogen oxides which in turn becomes the base for acids, etc.
(4) Ultra violet light is generated during the discharge.

Three approaches or combinations of these approaches can be taken to minimize the probability of corona occurrence or the side effects of corona.

(1) Choice of materials
(2) Cable construction or design
(3) Manufacturing techniques

Choice of Materials:

Insulation choice must be given top priority. The following characteristics are the most highly desired.

(1) Excellent ozone resistance over a wide range of concentration and temperature.
(2) An amorphous chemical structure or a highly crosslinked polymer.
(3) A chemically saturated back chain in the polymer.
(4) Excellent chemical resistance.
(5) Excellent heat resistance.
(6) Retain similar thermal expansion characteristics in all components.

(continued)

Cable Construction or Design

Keeping in mind that one of the fundamental reasons for insulating a cable is to save space.

(1) Control the voltage stress by judicious choice of conductor size and insulation thickness.
(2) Present a smooth round electrode for a conductor—intimate contact with insulation at interface.
(3) Shielding system must remain in intimate contact with surface of insulation even when cable is cycled—heated and cooled.

Manufacturing Technique

(1) Use contaminant-free, homogenous compound.
(2) Apply insulated or tubed components in a single pass for intimate contact and contamination-free surfaces at interface of extruded compounds.
(3) Control processes for reproducible and predictable characteristics within a narrow range.

Since no single contemporary material is corona proof, nor possesses total chemical resistance and ideal electrical and physical properties—the best choice is one that contains the best balance of properties and is capable of being enhanced by maximum use of cable engineering and advanced manufacturing technology.

EP and XLP insulations both exhibit an excellent balance of properties plus outstanding features peculiar to each insulation, i.e., XLP in electrical properties and EP in an amorphous chemical structure. Both are compatible with extruded strand shield constructions, contemporary specification wall thickness requirements, extruded insulation shield systems and advanced manufacturing techniques.

Maximum corona resistance in solid dielectric cable can be achieved with a uniblend core, judicious choice of materials and a technologically sound and properly applied shielding system. This will minimize the probability of voids within the total cable and aid in reducing corona occurrence.

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