

Cable Lore

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MOISTURE RESISTANCE

Describing insulations as resistant to moisture or water implies that they may be expected to retain their original physical and stable electrical properties without undue dimensional change, decomposition, or disintegration when immersed in water for indefinite periods. Moisture absorption is a critical property in high quality insulations. The electrical stability of an insulation is intimately tied in with this characteristic. Generally speaking, the lower the milligrams moisture absorption of an insulation, the greater the electrical stability.

Moisture absorption in insulations is controlled by discriminate selection of polymers, fillers and curing systems. Care is taken to choose materials that have practically no affinity for water or when involved in chemical reactions during vulcanization form no water soluble chemical compounds.

The degree of moisture absorbed by an insulation is measured by two methods — one gravimetric; the other electrical.

In the gravimetric or weight increase procedure standard insulation samples are immersed in distilled water under prescribed time and temperature conditions — usually seven days at 70 C. The increase in weight per unit area of surface exposed is noted. Insulations absorbing 20 milligrams per square inch or less of water meet requirements for RHW or moisture-resistant insulation. U/L Type USE cables are a good example in this category. High quality medium-voltage compounds exhibit less than 10 milligrams per square inch moisture absorption. In general gravimetric methods are excellent short-time screening tests yielding comparative data in an area backed by much experience.

Electrical moisture absorption (or EMA) tests are long-term sensitive tests that utilize electrical measurements as criteria. Insulated conductors are used as test specimens. These are coiled and immersed in a water bath with test ends exposed under carefully controlled temperature conditions. Temperatures are usually 70 C or 90 C depending on the type of insulation under test. A significant factor in EMA testing is the application of voltage for the duration of the test. Some insulations perform satisfactorily when no voltage stress is applied but poorly under voltage stress. Performance IN EMA testing is evaluated by measuring PF, SIC and IR at regular intervals — usually after 1 day, 1 week, 28 days, and monthly thereafter for the duration of the test. A record of these values is plotted on a graph. The slope of the line for each characteristic determines the stability of the insulation in water. The percentage increase

in power factor and SIC from 1 to 14 days and from 7 to 14 days is also used as criteria. In general, a flat curve or a very slight increase in percentage between intervals indicates stability or low moisture absorption. If the PF and SIC continues to increase without leveling off or the IR continues to decrease without leveling off, this is an indication of poor electrical stability and an unsatisfactory insulation.

Gravimetric and EMA tests are performed on all insulations where moisture-resistance is specified. Complete testing for 600-volt insulations requires up to six months. Medium-voltage insulations require up to two years. The results of this rigid investigation are cables like Uniblend XLP and Uniblend EP. Each has gravimetric moisture absorption values of less than 5 milligrams per square inch and EMA stability at 90 C.

Steve Bunish