Cable Lore

ow Long Will Your Cables Last?

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ANACONDA

Epilogue

The life expectancy of a cable is generally longer than most cable users realize.

If we were to randomly select a building or a manufacturing plant that was built 30-40 years ago, we would probably find that the original insulated wire is performing its intended function. Some of the wire might have been retired to gain added ampacity, but a very small percentage, if any, would have been retired because it had reached the end of its useful life.

How long will today's cables last? The best estimates of cable survival are made when a conscientious effort is made to identify the stresses to which a cable will be exposed. After identifying the stresses, the various materials and cable designs are exposed in the laboratory to simulations of these stresses and combination of esses; a material and cable design is then selected to insure optimum cable reliability.

The basic stresses (electrical, thermal, mechanical, and chemical) to which power cables have traditionally been exposed remain the same. But the magnitude of several of these stresses has increased with time. For example:

Electrical Stress: Thirty years ago, 15 kV cables were insulated with 297 mils of material. Today only 175 mils are used. Electrical stresses are therefore much higher. In addition, the type of electrical load has changed. There are more motors, automatic controllers, transformers and discharge-type lighting fixtures which subject cable systems to a much greater probability of both transient and steady state overvoltage conditions.

Thermal Stress: Early cables were rated at 60° C, while today's cables are rated at 90° C. Today's materials are more resistant to thermal stresses than the early materials and their lives should be the same at 90° as the others were at 60°.

Mechanical Stress: As generating stations and industrial plants increase in size, their cable runs become more complex with more bends and longer pulls, which increase mechanical stresses on cables. Direct buried cables, of course, must withstand severe mechanical stresses.

Chemical Stress: The increases in number and size of oil refining plants, and the growing demand for nuclear generation of power, require materials and designs more resistant to chemical environments.

A Combination of Water and Electrical Stresses: The susceptibility of polyethylene insulated cables to failures related to the formation of water trees was a surprise to those who evaluated such cables in water alone, or under electrical stress alone, but not to those who studied the effect of a combination of two stresses together. The multifactor approach discussed in *Cable Lore* #66 is necessary to obtain worthwhile evaluation in the laboratory of cables and cable materials. The test programs or methods must simulate and accelerate the actual stresses to which a cable is exposed in a given environment. Such test data, and statistically planned and interpreted life-test data, provide a basis for estimations of cable survival.

Unpredictables Affect Predictions

Cables are not indestructible. They are designed with a generous safety margin in essential properties. But unpredicted catastrophic events that exceed these safety margins will assuredly destroy a cable.

It is not a lack of confidence in the product that makes cable engineers reluctant to predict cable life. It's simply that they have no control over any number of catastrophic events, including mechanical damage in transportation and installation procedures; electrical system aberrations; and a lack of cable maintenance that could seriously damage a cable.

If a power cable is properly installed and operated, and we were told that the cable is still in operation after even four decades of use, our reaction would be "what else is new."

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