# Cable Lore

## How Long Will Our Cables Last?

**An Eight-Part Series Examining Performance Characteristics of Cable**

Number 59

Date: November 17, 1978

by Power Cable Engineering and Research

ANACONDA

### Introduction

Every user of power cables expects the product to perform reliably and safely for a reasonable period of time. Although this period of "reasonable time" has not yet been defined for every application, experience tells us something about customer expectations.

For example, coal mine operators generally expect shuttle car cable to last at least three months; designers of nuclear power plants think more in terms of 40 years; and house wiring is installed with the expectation of lasting at least as long as the house itself.

In the past, cable engineers have answered customer inquiries about cable life in various intuitive and empirical ways, and users, for their part, generally were satisfied with the answers. In fact, our ability to provide satisfactory information of this type has been excellent.

### Complex Applications Require Firm Assurances

But today, cable users and regulatory bodies alike can no longer make decisions based on observation and intuition. They want, and rightly deserve, new and more sophisticated assurances that extruded dielectric power cables made with new materials or designs will provide a safe, reliable and reasonably priced transfer of power. The consequences of a cable failure have simply grown too great to allow for informal assurances.

Two groups of engineers are concerned with cable life. One group, which includes the utilities and industries, is primarily interested in maintaining uninterrupted circuit continuity through scheduled cable replacement. Above all, they want to prevent catastrophic failure or costly downtime.

The second group, while sharing the concerns of the first, is more interested in satisfying Nuclear Regulatory Commission rules governing the performance of cables installed at nuclear power stations.

### Five Key Elements in Predicting Cable Longevity

A forthcoming eight-part series of *Cable Lore* will examine major factors affecting cable life and provide a sound basis for discussing customers' concerns about its survival. The following five points, which are key to the discussions, are worth remembering.

**(1) Properties Govern Strength**—Like the individual links of a chain which contribute to its overall strength, a cable has a useful life only until one of its properties deteriorates to a level which would prevent the cable from performing its intended function. A cable will survive as long as each property is of a sufficient value, or level, to maintain continuity in the chain of properties required to resist or withstand the application environment.

**(2) Environmental Risks**—Cable recommendations are necessarily subject to uncertainties, because cable manufacturing and installation involve elements of chance.

**(3) Real-life Test Data**—The chances of accurately predicting cable survival are greatly increased if technical judgments are made on the basis of tests administered in accelerated conditions that simulate real-life conditions.



(Continued)

**(4) Premium Performance Record**—The service record for power cables during the past 100 years has been excellent. This outstanding record of past achievement supports our test methods, interpretation and engineering judgments.

**(5) Capability for Easy Repair**—A failure in a cable does not constitute the end of its useful life, just as a flat tire doesn't signal the end of an automobile's. Thorough investigations and analyses of cable faults indicates that it is physical or mechanical damage to isolated sections of cable, and not the deterioration of cable, that is usually responsible for cable faults. And most often, the cable can be easily repaired and put to additional years of good use.

Subsequent editions of this cable longevity series will include:

60 The Historical Basis for Judgment
61 The Track Record
62 Uncertainties in Predicting Cable Life
63 The Arrhenius Relationship
64 The 7th Power Law
65 Weibull Distribution explained by Weakest Link Theory
66 Laboratory Experimentation
67 Epilogue

**Steve Bunish**