B.10.1 Contrôle non-destructif appliqué aux câbles de centrales. Détermination des caractéristiques mécaniques résiduelles des câbles

BERTRAND Y., PINEL B., BRINCOURT T., EDF/DER, Moret/Loing, France

Résumé :

Les câbles de centrale sont soumis à des contraintes thermiques et radiatives. En conséquence ces matériels voient leurs propriétés évoluer au cours du temps. Afin de suivre sur site les caractéristiques physiques de ces câbles, nous avons évalué un appareil de mesure développé par l'E.P.R.I. « INDENTER ». Les tests ont été réalisés sur des câbles K1 en (EPR-CSPE) et PVC. Les résultats obtenus sont satisfaisants pour les câbles K1. En revanche des essais complémentaires doivent être réalisés sur les câbles PVC pour statuer de l'intérêt de cet outil. Nous avons observé une bonne corrélation entre les valeurs du module INDENTER avec celles des caractériques d'allongement à la rupture.

B.10.1 Non-destructive control applied on power station cables: Assessment of the residual mechanical properties of cables

BERTRAND Y., PINEL B., BRINCOURT T., EDF/DER, Moret/Loing, France

Abstract :

Cables in power plants are subjected to thermal and radiation stresses. As a result, these equipments have their electrical and mechanical properties modified versus time. In order to follow mechanical characteristics on site, we have tested a non destruvctive equipement named « INDENTER ». The experiments have been conducted on L.O.C.A. cables (EPR-CSPE) and PVC. Results obtained are satisfying for L.O.C.A. cables. For PVC cables, supplementary tests might be done in order to pronounce opinion in the interest of this equipment. We have observed a close relation between modulus INDENTER and classical mechanical data (absolute elongation at break).

I. Introduction

Cable in nuclear power plants must provide reliable service after decades in hostile environment, involving stresses as temperature and irradiation. Previous work allowed us to establish the correlation between the main degradations occured on cable and the mechanical properties. In order to follow these parameters on site, we have tested a non destructive equipment developped by E.P.R.I., named « INDENTER ». The physical characteristic measured is the compression modulus. This study have been conducted on EPR-CSPE and PVC cables. We first determined the test procedures to be done with NDENTER. Thermal aging have been carried out on cable in order to evaluate the evolution of the modulus at different temperature versus time. Some IDENTER tests have been done on site in different stations.

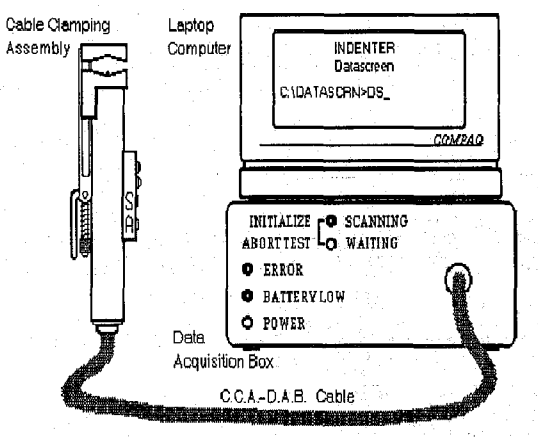

Figure 1 - Indenter (Polymer Aging Monitor)

A. Presentation of the Indenter

The Indenter was developed by the E.P.R.I. in the United States for the purpose of performing *in-situ* testing of electrical cables in power stations. Its main objective is to measure the condition of a cable while it is in service. This is a non-destructive testing method, which distinguishes it from the conventional testing methods.

As shown in Figure 1, the instrument is composed of a measuring clamp into which the cable is inserted (the cable clamping assembly). This clamp is fitted with a probe which moves at a fixed speed perpendicularly to the surface of the cable (Figure 2). The probe is connected to a force sensor which measures the reaction of the cable to the force applied to it by the probe. The clamp is connected to a data acquisition system, which is controlled by a portable microcomputer over a serial interface. This assembly is independent (battery powered), portable, and weighs about 13 kg.

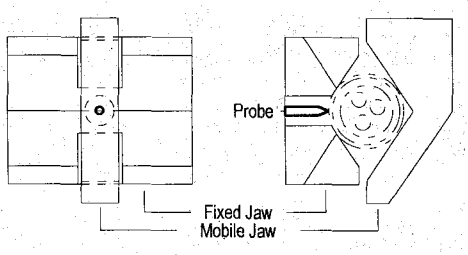

Figure 2 - End of the Clamp

The principle of the Indenter is based on measurement of what is call the **compression modulus**, which yields the ability of the material tested to cope with an applied load. Studies carried out by the E.P.R.I. [1] [2] appear to show quite a good correlation between the physical age of the cables, or their degradation, and the compression modulus calculated by the system.