Condition monitoring of electrical cables using LIne Resonance Analysis (LIRA).

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There is a continued interest worldwide in the safety aspects of electrical cable system degradation. Degradation of a cable system can result in loss of critical functions of the equipment energized by the system, or in loss of critical information relevant to the decision making process and operator actions. In either situation, unanticipated or premature aging of a cable can lead to unavailability of equipment important to safety and compromise public health and safety.

Current techniques to evaluate aging properties of electric cables include electric properties tests.

While known to be difficult, advancements in detection systems and computerized data analysis techniques may allow ultimate use of electrical testing to predict future behavior and residual life of cables. The following describes the current results and development of a system (LIRA) and its progress in being able to determine the degree of cable degradation through electrical testing. LIRA has gone through extensive tests since 2005 with low, medium and high voltage cables, both in laboratory tests and in-situ experiments and it has been used in service assignments since 2007.

The LIRA (Line Resonance Analysis) Technology is a cable condition assessment, cable fault location and cable aging management system that works in frequency domain through advanced proprietary algorithms. LIRA is based on the transmission line theory, and calculates and analyse the complex line impedance as a function of the applied signal for a wide frequency band. It detects and locates changes in the cable impedance and makes it possible to perform fault location and cable condition monitoring on I&C, low, medium, and high voltage cables even in inaccessible challenging environments. The applied frequency band is a 5V signal, and is harmless to the cable.

LIRA will detect and locate local degradations in the cable, which is specific to certain sections of the cable and caused by mechanical stress and damages, or by heat-induced oxidation and radiation. It will also detect global degradation in the cable, which is applicable for the entire cable, and is caused by general aging, influenced by external and internal environmental conditions.

This paper presents the current technology at the base of this system, together with some interesting results on installed cables.