State-of-the-art review on health monitoring of transmission line conductors

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This paper presents a critical review of literature on Structural Health Monitoring (SHM) of Overhead Transmission Line (OVTL) conductors. Different health monitoring techniques such as wave propagation mechanics and other significant methodologies used for remaining life prediction is discussed in detail. From the critical review of monitoring techniques, it has been observed that some of the methods have complex approach involving many parameters. In the present work, research papers on different topics e.g. study of wave propagation techniques, study on guided waves, damaged conductors are reviewed. Wave propagation analysis has been used extensively in Non-Destructive Testing (NDT) techniques. However, in the context of intelligent health monitoring tasks, there are several possibilities that such wave propagation analysis can be employed along with certain emphasis on efficient modelling and signal processing aspects. The widely used SHM technique based on guided wave approach have been explained. The main objective of this literature survey is to study the available techniques and to propose the required research work for the development of SHM of OVTL conductors using wave propagation techniques. Research in these areas is of paramount importance so that an automatic warning and alert system can be implemented.

KEYWORDS: Transmission line conductors; SHM; wave propagation; damage detection; NDT; guided wave.

As all living organisms, each substance and material in nature shows deterioration and degrades with time. Likewise structures also undergo constant chemical, mechanical or physical transformation that lead to detrimental alterations in one or more properties of a building material or component resulting in its decay as discussed in Table1. Therefore the civil infrastructures are vulnerable to this problem due to aging of materials. SHM is a process of conserving and preventing decay in structures or minimizing it from further deterioration. In order to achieve an ingenious method, an interdisciplinary approach should be taken towards the monitoring which requires effective confluence of science and engineering1. With this consortium a systematic approach or methodology should be outlined which can predict the service life of the structure and ensure its functionality and strength.

In recent years, large investments have been made in this area, leading to developments in inspection, non-destructive testing, monitoring and structural analysis. Nevertheless, understanding, analysing and repairing structural constructions remains one of the most significant challenges to the modern techniques. Safety coefficient of the structure can be identified and service life of the structure can be prolonged with inspections and structural monitoring with short/long term methods. SHM technologies have emerged, for the last ten to fifteen years, creating an exciting new field within various branches of engineering. Academic conferences and scientific journals have been established during this time that specifically focuses on SHM. These technologies are currently becoming increasingly common2-3.