

Comprehensive Multilevel Practical Condition Monitoring Guidelines for Power Cables in Industries: Case Study of Mobarakeh Steel Company in Iran

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Abstract : Condition Monitoring (CM) of electrical equipment has gained remarkable importance during the recent years; due to huge production losses, substantial imposed costs and increases in vulnerability, risk and uncertainty levels. Power cables feed numerous electrical equipment such as transformers, motors, and electric furnaces; thus their condition assessment is of a very great importance. This paper investigates electrical, structural and environmental failure sources, all of which influence cables' performances and limit their uptimes; and provides a comprehensive framework entailing practical CM guidelines for maintenance of cables in industries. The multilevel CM framework presented in this study covers performance indicative features of power cables; with a focus on both online and offline diagnosis and test scenarios, and covers short-term and long-term threats to the operation and longevity of power cables. The study, after concisely overviewing the concept of CM, thoroughly investigates five major areas of power quality, Insulation Quality features of partial discharges, tan delta and voltage withstand capabilities, together with sheath faults, shield currents and environmental features of temperature and humidity; and elaborates interconnections and mutual impacts between those areas; using mathematical formulation and practical guidelines. Detection, location, and severity identification methods for every threat or fault source are also elaborated. Finally, the comprehensive, practical guidelines presented in the study are presented for the specific case of Electric Arc Furnace (EAF) feeder MV power cables in Mobarakeh Steel Company (MSC), the largest steel company in MENA region, in Iran. Specific technical and industrial characteristics and limitations of a harsh industrial environment like MSC EAF feeder cable tunnels are imposed on the presented framework; making the suggested package more practical and tangible.

Keywords : condition monitoring, diagnostics, insulation, maintenance, partial discharge, power cables, power quality

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