

论文

基于雷达图法的矿用高压电缆安全预警模型

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摘要:

为了全面在线评估矿用高压电缆的安全工作状态, 确保矿井安全生产, 提出了矿用高压电缆安全预警体系的新理念。在借鉴目前电缆老化研究成果的基础上, 建立了基于绝缘参量表征高压电缆安全状态的指标集, 并通过层次分析法确定了各项指标的权重; 定义了完好度的概念, 并对指标数据进行了归一化处理, 使各项指标在时间和空间维度上具有可比性; 提出了基于雷达图表示的图形化预警方法, 并在定量计算中引入了反映优劣程度的参考样本和多源信息互补的均衡度因子, 定量并直观地表示了电缆不同时刻的预警等级, 实现了监测过程和预警结果的直观显示。最后通过10 kV矿用高压电缆的安全预警设计验证了雷达图法将多维数据图文并茂进行安全预警的优越性。

关键词: 矿用高压电缆; 安全预警; 雷达图; 绝缘参量; 完好度; 层次分析法

Early safety warning model for mining HV cable based on radar chart method

Abstract:

To fully access online safety condition of mining high voltage (HV) cable and ensure the safety operation of the mine, a new notion of safety early warning system for mining HV cable was developed. Based on the research about cable aging, a set of index characterizing the insulation parameters was proposed and the weight of each index was determined with analytic hierarchy process (AHP). To compare each index from perspective of time and space, "perfection degree" was introduced to deal with the data in the same measuring scale. Then an improved radar chart method with eigenvalue calculating algorithm was applied to the safety early warning system, in the process of which the reference samples characterizing the impairment of cable and equilibrium factor reflecting the multisource information fusion are adopted, and the result is concise, clear and intuitive. Finally, the system is tested by monitoring the 10 kV mining HV cable, the state of the cable is effectively represented by multi-dimensional data and picture, and with more superiority than other method.

Keywords: safety early warning

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