The 18th IERE General Meeting and Japan Forum
May 21-24, 2018, Kyoto, Japan

Research and Trial Application of Mobile Sensing and Interactive Diagnostic Technology for Power Cable Lines

Ouyang Benhong
Director, Power Cable Technology Division, China Electric Power Research Institute
Wuhan, China

Wang Yuli
R&D Engineer, Power Cable Technology Division, China Electric Power Research Institute
Wuhan, China

Keywords: *Transmission and distribution cables, Mobile sensing, Interactive diagnosis, Assistant decision, intelligent operation and maintenance*

Abstract

State Grid Corporation of China (SGCC) constructs and operates nearly 600,000 km power cable lines. The comprehensive construction of intelligent operation and maintenance system which is combined with the modern information technology, intelligent technology and the traditional technique is an urgent demand. The mobile sensing and interactive diagnostic technology for power cable lines integrates technique of conventional statue detecting, on-line monitoring, tunnel monitoring and patrol robot, supported by the internet of things technology and combined with RFID technology, individual mobile terminal technology, multiple states sensing technology, patrol robot technology, the distributed diagnosis technology and data interactive technology. The patrol robot or staff targets power cable devices by sensing electronic tags and achieve comprehensive characteristics such as load current, partial discharge, grounding current, operation temperature, mechanical vibration, dielectric loss of power cable lines and environmental temperature/humidity, concentration of harmful gases, water stage in cable channels automatically. The distributed multiple states sensing unit is devote to analyze and storage these state data to achieve preliminary conclusion and upload data to mobile terminal or patrol robot, or push early warning information and abnormal data to platform immediately. The complement and synergism of artificial inspection and patrol robot as data relay terminal optimize data stream and communication networks form sensors to platform. The multi-source heterogeneous database of cable lines built in the control center platform is applied to variable influence analysis of state parameters, case study, state diagnosis and risk assessment, implement horizontal and vertical contrast with the similar cable lines and tunnels by association analysis of abnormal characteristics data and fault case. By means of threshold analysis, trend analysis, spectrogram comparison of power cables lines and tunnels status, abnormal tendency is presented in sequence diagram and maintenance strategy is suggested. That information could be transmitted to the mobile terminal of operation staff to realize seamless link of equipment identification, state awareness, data interaction and intelligent diagnosis and maintenance recommendation. To conclude, the whole system makes operation staffs conveniently acquire operation indicators and preliminary analysis of power cables lines and tunnels in the process of patrol and maintenance, master and update real-time operational information of power

cables lines and tunnels, such as operating state, fault prediction, risk level and maintenance recommendation by communicating with control center platform. Further application of the technology will innovate maintenance mode and promote intelligent level, efficiency and effects of operating management and maintenance of power cable lines comprehensively.