Lifecycle Maintenance by Utilizing Proactive Method

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Abstract

For power receiving and distributing facilities, good economics are called for. This includes the costs for stable operation, maintenance, and renovations. In order to secure these factors, maintenance for facilities is carried out under maintenance plan including facility operation and renovations. Power equipment and facilities are installed in a variety of environments and operating conditions, and their deterioration speeds are diverse. Accordingly, optimal maintenance can be realized by determining major causes of deterioration in each equipment and facilities. Such an approach can be considered a maintenance approach by implementing a proactive method. This method refers to the act of anticipating or preventing failure or shutdown before it occurs.

We provide maintenance services by using appropriate proactive methods for each facility and provide a proposal to our customers on how to effectively maintain and inspect their facilities, improve system reliability, and the economics in running facilities.

1 Preface

The rate of deterioration in power receiving and distributing facilities is greatly influenced by environmental conditions and operating conditions at the installation site. The occurrence rate of failures differs from one site to another. As a method to ensure stable management of equipment until the end of its useful life (design product life) expected by manufacturers, maintenance technologies by utilizing the proactive methods are proposed[(1)]. In most cases, the conventional formerly adopted live-line diagnostic method was solely to observe the phenomena of deterioration. With our services, the rate of deterioration progress in electrical facilities is predicted by observing the negative factors occurring in the upper stream of the deterioration process. We measure potential influences at the power receiving and distribution facilities: on-site environmental situations, the operating conditions, and impact level of the unplanned shutdown. Based on such data, we conduct the proper facility improvements and work to reduce the rate of failure. This is our comprehensive evaluation maintenance plan.

As common maintenance approaches, there are: Time Based Maintenance (TBM) where the rate of deterioration progress is not taken into account and Condition Based Maintenance (CBM) where the initial state of a failure is observed. In our process, a proactive method is adopted. This method is based on “anticipating” or “preventing” by removing or reducing real factors for deterioration. We always consider the negative impact of an unplanned shutdown of a facility. With this proactive method, we can realize more advanced maintenance. As a result, the speed of deterioration progress slows and the rate of failure occurrence is reduced. As such, we can expect longer stable operation and useful life of the facilities. **Fig. 1** shows the image graphs of failure rates and deterioration progress in electrical facilities.

We have been working on our maintenance service business based on the proactive method. This paper introduces an outline of typical and major technologies that support the proactive method.

2 Comprehensive Diagnostic Evaluation Method for Power Receiving and Distributing Facilities

Electrical facilities must be renovated otherwise the end of the useful life will come. As a method

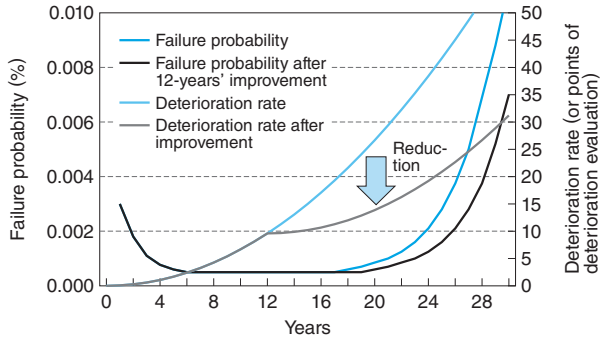

Fig. 1 Image Graphs of Failure Rates and Deterioration Progress in Electrical Facilities

Even in a stable period of time, deterioration in equipment occurs and progresses. By slowing down the rate of deterioration, the failure probability or fault generation rate is reduced.

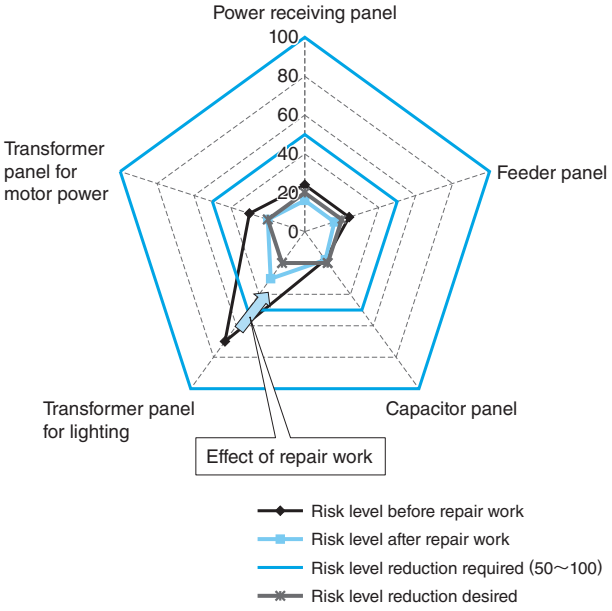

Fig. 2 Image Graphs of Comprehensive Evaluation Method

Necessary cost to lower the risk level is also proposed. (Cost-effectiveness can be found at a glance.)

of determining the expected life of a facility, the deterioration evaluation method is proposed in the maintenance service industry. This evaluation method can show the rate of deterioration by points based on predetermined criteria; however, it does not factor each facility level importance. In addition, it does not factor economic impact by the unplanned shutdown of the facility. To solve such issues, we calculate the level of importance of each facility and the negative impacts by unplanned shutdown of each power receiving and distributing facility. These metrics are added up to the total evaluation. Further, after the completion of the aforementioned primary evaluation, approximate cost of critical parts to be repaired is calculated and the benefit of repairing work is simulated for re-evaluation. We provide the economic impact from the proposed repair work to our customer to enable them to make decisions regarding the benefits. In this, we propose to our customers which is more beneficial: to prolong the useful life by partial renovation or total renewal. **Fig. 2** shows the image graphs of the comprehensive evaluation method.

In the case of this evaluation method, the facility level of importance and the negative impact of the unplanned shutdown by each facility are already added to the evaluation points, whereby making it easy to make comparisons of all facilities. For more details, please refer to our relevant brochure, titled “Comprehensive Diagnostic Evaluation Method for Power Receiving Substation Facilities and Various Live-Line State Diagnostic Technologies” (see p.05.)

3 Environmental Diagnosis

The rate of deterioration in electrical facilities is mostly affected by the operating environment, that is, operating conditions and the on-site installation environment.

If the relationship between such environmental changes and the rate of deterioration is clarified, we can predict the useful life of an electrical facility. It is, however, not easy to make a uniform quantification because environmental conditions for electrical facilities are continually changing.

In the case of outdoor cubicles, for example, they face different environmental conditions: long-time exposure to direct sunlight, shade, vulnerable to direct sea breeze, moist wind, dust and dirt impact, or stagnant moist air. Regarding the operating conditions, there are various possible operating conditions: constant loading case, case of heavy-loading for brief period or repeating ON-OFF cycles in a short time. We can grasp comprehensive environmental conditions where the electrical facilities are installed by monitoring operating conditions. In so doing, we can slow down the rate of deterioration and help our customers reduce the rate of failure. We provide appropriate proposals to our customers for the stable supply of electrical power through diagnostic analysis by constant or “as-needed”

monitoring of environmental conditions. For more details, please refer to our relevant paper here titled “Comprehensive Diagnostic Evaluation Method for Power Receiving Substation Facilities and Various Live-Line State Diagnostic Technologies” (see p.05.)

4 Postscript

Going forward, we will continue to offer various proposals with highly added values to our customers by applying this proactive method. In so doing, we aim to realize stress-free stable operation of the customer’s electrical facilities.