Advances in Automobile Engineering

Extended Abstract

Reliability Analysis of Gas Turbine Power Plant Based on Failure Data

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Abstract

To predict the reliability of a product or a system, life data from a representative sample of the system performance is fitted to the suitable statistical distribution. Reliability analysis techniques have been accepted as standard tools for the planning, design, operation, and maintenance of thermal power plants. Therefore, the parameterized distribution can be used to estimate important life characteristics such as reliability, or probability of failure at a given time, mean life, and failure rate.In today's competitive environment reliability analysis is the most important requirement of almost all types of systems, subsystems, and complex systems; whether they are mechanical, electrical, or electronic devices. To alleviate failures and improve the performance and increase the operational life of these components and systems, key performance indicators such as: Failure Rate, Reliability, Availability, and Maintainabilityare investigated.Weibull++/ALTA is used to fit the available data set concerning three sets of gas turbines (GT) operating in a power plant to estimate the probability density function (PDF), plant reliability, and failure rate of each set and for the whole plant. In this study data of a gas turbines (GT) power plant (three groups of GTs) is used. Two methods for parameter estimation are applied in the data fitting stage: Maximum Likelihood (MLE) and Rank Regression Analysis X –axis (RRX). Using Mean Time Between Failure (MTBF) data, the results show that the system overall reliability is 97% at 413 hr while using Down Time (DT) data the system reaches the same reliability at 289 hr. Also at 800 hr, the reliability of Group-1 is 74% while the reliability of Group-2 and Group-3 is 83% and 45% respectively. Downtime losses and cost of maintenance of the power plant can be minimized by implementing a proper mix of maintenance and repair approaches on system reliability failure rate.

Reliability life data analysis refers to the analysis and modeling of observed data over the product life to estimate important features such as system (or component) reliability, failure rate, or mean time to failure (MTTF). Several studies for reliability assessment were; and still are, conducted. Mechanical equipment reliability evaluation is highly important in condition-based maintenance to lower costs and increase equipment efficiency;which is the reason, that it an important research field for reliability analysis of mechanical equipment and life prediction.

Nowadays, the usage of transportation, especially automotive have become an important part of daily life. However, the rapid development of the vehicle industry and increasing their numbers, so that drive to more traffic accidents, that lead to death or serious injuries. Globally, the reliable availability of electricity is seen as an effective and indispensable mechanism for the rapid industrial and economic growth of any nation. Types of PV modules failure such as hot spot, diode failure and glass breakage are highly dependent on the PV module design technology and the installation site environmental conditions used realistic operation and maintenance data to estimate the failure rates, grouped by components and the relative effect of failures on the PV plant's energy balance. Results showed that the impact of failures in all evaluated PV plants energy losses are small, reaching a maximum value of 0.96 percent of net energy yield

Index Term: Reliability, Gas Turbine, MeanTime between Failures, Failure Rate, Mean Time to Repair, WeibullDistribution

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