Amnad Kwansawaitham 2006: Analysis of Distribution Failure Rate of Components in Distribution System of Provincial Electricity Authority, Thailand. Master of Engineering (Electrical Engineering), Major Field: Electrical Engineering, Department of Electrical Engineering. Thesis Advisor: Associate Professor Jamnarn Hokierti, Ph.D. 278 pages.
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Failure rate computations of components in power distribution systems of the Provincial Electricity Authority (PEA) have depended on historical forced outage records. The life time of the components extracted from the records is usually assumed to follow the exponential distribution. The hypothesis of the exponential distribution results in simple computations with fewer parameters to be computed by comparison with other kinds of distributions. With limited capabilities, however, some life time data cannot be characterized by the exponential distribution, and significant errors are normally found when this distribution is assumed.

In this thesis, forced outage records of the PEA distribution systems from the year 2001 to 2005 are studied and analyzed to determine the mean time to failure (MTTF) of the installed components based on an appropriate type of statistical distributions. The above components are divided into 6 groups including Overhead Lines (OH), Underground Lines (UG), Protective Equipments (PE), Power Transformers (PT), Distribution Transformers (DT), and Capacitors (CA). The group of Overhead Lines (OH) is mainly focused because it is a majority of the components of the distribution systems, and there are a plenty number of life-time records for the hypothesis test of interested theoretical distributions.

From the test results, the life time of the OH components is best characterized by the Weibull distribution, while the test on the other groups of components cannot be concluded because of insufficient number of records. By comparison, the obtained Weibull parameters and exponential parameters are later used to calculate the failure rate and MTTF of the OH components. According to Anderson-Darling test (AD) with Minitab, the MTTF of all distribution feeders resulting from the Weibull parameters can pass the test more than 65.07%, whereas those resulting from the exponential parameters pass only 22.86%. The above results show that the Weibull distribution is a better alternative to characterize the life time of power distribution components, and it can be later applied for reliability index calculations and future maintenance planning.

Amnad Kwansawaitham
Student's signature

Thesis Advisor's signature

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