

1.1: Forward:

The electric power in the past and still the main concern of this world, where it is the life blood and the fuel that runs the process of civilization, so the need has grown continuously, and it became a measure of the evolution of nations and advancement. Because there are some consumers who do not bear any interruption in the electricity so the energy should be insured in a high degree of reliability for these consumers.

The renewal process define as a counting process where the times between the count is a random variable and their distribution is identical, in the electricity generation machines there are spare parts replaced due to damage or expired and replacement process occur repeatedly whenever spare parts damaged or expired and the renewal process of here assume that times between replacements are independent random variables and it has identical probability distribution. The random malfunctions to electricity generating machines cause cut off electricity for the consumer and reflected negatively on economic development.

This research considered as scientific and practical addition through mathematical models building for the machines which helps more precisely in future expectations that occur on studied systems to help on conduct economic development plans.

1.2: The Research Problem :

The electricity generation machines need maintenance periodically to ensure the stability of the electricity supply and all the machines rotates two cases either fault or working and when the machine was fault it can be maintained then it gets back like new one.

The research basic problem is that there is no model explain the fault machines status , and when we apply the renewal process model on electrical obstetrics machine this leads to a significant improvement in the

level of machine and ensures that the electricity voltage stability by providing a database for decision makers.

1.3: The Importance of the Research :

The importance of this research lies in the importance of a renewal model of electricity generation machines upon which industrial and economic development depend and is that through the use of renewal model to predict faults for machines and determine the cost of spare parts, leading to electricity voltage stability and boost production.

1.4: Research Objectives :

This research seeks to achieve the following objectives:

- To build renewal process model on the machines, generating electricity in Sudan.
- predict the length of time required for the replacement process.
- To apply lifetime models on electricity generating machines in Sudan
- Study Reliability and failure model.
- Study of probability distributions which used in the lifetime and compare them in terms of preference.
- Number of faults per year, month and the number of replaced parts.
- Predict the number of renewals.
- Predict the remain age of running machines
- Database configuration of the machines in terms of number of faults per year, month and the number of replaced parts

1.5: Research Hypotheses :

- The generation of electricity and the process of replacing parts follow the Poisson regenerative process.
- The time of spare parts replacement follows Weibull distribution.

- Applications of lifetime model on machines have a positive impact on the electricity stability.
- The electricity generating machines have a high reliability.
- There is a relationship between the time of renewal and times of renewal distribution.

1.6: Research Methodology :

The research methodology consists of an analysis of the time failure data by using renewal process and lifetime model .In order to get precise results, the researcher used SPSS, Easyfit ,Excel and STATGRAPHIC packages for analysis of data .

1.7: Research Limits :

Spatial limits: electric power generation machines in Sudan.

Temporal limits: The renewal spare parts during the period 2011 -2015m.

1.8: Research Data :

The research is based on technical fault data, collected from the efficiency department in the station and it was (type of machine, time of stopping, time of return, failure time , times between failures and power loss) during the period (2011-2015).

1.9 :Researches and Previous Studies :

Here are some researches and studies used the renewal process for scientific research.

1. In (2009) Mr. Pradeep Ramchandani (University of Waterloo, Canada) conducted a research at (stochastic renewal process model for basic maintenance process – conditioned).The study concern at reliability and maintenance of structures exposed to sudden damage that occur randomly in a certain period of time. Rusting process has

been modeling as cumulative stochastic point, the study mentioned that the previous studies relied on the cost reduction criteria to maintain the optimal cost policies for maintenance, which ignored the factor's effects that result from reducing the cost of maintenance for the life cycle of the system. Therefore it provided a detailed analysis of the criteria of the expected cost which gives us the basics of more accurate (reliable) to obtain the optimum maintenance cost. It analyzed some examples of maintenance policies as well as primitive maintenance; also substitution process was analyzed based on age. Derivation general cases were discussed, including the level of maintenance protection of the damage; and some special cases were taken into consideration.

2. In (2007) J.A.M. Vander Weide and M.D. Pandey (University of Waterloo, Canada) conducted a research entitled with Conceptual interpretation for renewal theory with applications.

Worn Risk Management of Engineering Systems can get optimum performance through renovation and maintenance.

Renewal theory has been defined clearly also they derived all the important theories and those which related to renewal theory.

The main objective of this study is to provide an explanation of renewal theory and to derive theories related to it.

3. In (2007) (Bris Radim) (University of Ostrava Technical VSB, Canada) conducted a study entitled (Stochastic ageing models - extensions of the classic renewal theory).

In this paper they obtained models and its solutions that are used to solve the problem of maintenance in light of economic struggle and to obtain sufficient safety for maintenance process. Also they developed several models for renewal, considered different distributions related to age as a failure case of (Abel and Arlang, Loq

normal). Exchanged renewal models used natural All ograitham distribution of time with the presence of two types of failure.

1.10 :Structure of Research:

This research contains five chapters; the first chapter includes a general introduction, a problem, the importance, objectives, assumptions, limitations, data and the methodology of the research addition to previous studies and research.

The second chapter Renewal process, Renewal theory, Point Process, the Poisson Process, Distribution of the Number of Renewals, Random stopping times, Renewal Reward Processes Key Renewal Theorem, Blackwell's Theorem, Alternating Renewal Processes ,Delayed Renewal Processes, Expected number of renewals.

The third chapter contains the Lifetime Models and Distribution, Reliability, Homogenous Poisson, Non Homogenous Poisson, Test for time trend and repair effect, Repair Rate, Common Distribution Functions, Maximum Likelihood Estimation Method, Goodness of fit Techniques

The fourth chapter contains applied aspect, in which data of the study described and the model of renewal and reliability build.

The fifth chapter contains the results that have been findings and recommendations.

