# Study on reliability engineering system and its evaluation .

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This research paper deals about the basic concept of reliability engineering system evaluation and optimization on any system. The paper also briefs about the possibility to create a set of global standards and specification indices along with geographical and technological boundaries across the system. This review paper also shows that the investigation related to reliability applies to any branch of engineering by utilizing the mathematical tools and careful analysis.

 Keywords: Reliability, Evaluation, Failure, Mathematical model, Modern engineering, Optimization 1. Introduction Reliability engineering is the technology of prediction, control, measurement, reporting and analysis of failure phenomena and failure rates. It has played a critical role in a vast spectrum of industrial and technological applications by addressing the various issues relating to a given component or system. This technology provides the information about the probability of the component or system working successfully over a specified interval of time. It also balances the achievable performance with other desirable system qualities in a given context in order to achieve optimum performance levels. It also helps to examine the inherent part strength against the expected stress. The organizational planning and implementation required to achieve a specified performance level and recommending the operating conditions under which the part or system may be deployed. It also helps in studying the procedures needed to achieve volumetric production of reliable parts and systems. 2. Modern Reliability Technique The reliability is an important system parameter as lethality, resolution and other more prominent performance measurement [1-3]. Modem reliability engineering is a technique to provide a set of numerical indices for performance evaluation in order to understand all the sophisticated issues starting from equipment manufacture to the product deployment or implement. This technique addresses the issues such as how to design for performance, how and why a system may fail, the consequences of

failure, how to best manage failure and specification of ideal operating conditions for best system utilization. Due to this technique, it is possible to create a set of global standards and specification indices that are consistent in meaning and measure across geographical and technological boundaries. It was studied by “Ministry of Defence - United Kingdom” that life cycle with 60% to 80% costs occur in the operation and support of equipment, emphasizing the importance of this ability to provide strategic information to engineers and managers that links the quality *Corresponding Author: P. Singh, E-mail: singhpankaj76@rediffmail.com Singh, Yadav and Srivastava / Turkish Journal of Engineering, Science and Technology 03 (2013) p53-55 54 of the product with economical interests and capital investment [4-5]. Whereas reliability evaluation techniques have traditionally been associated with the aerospace and military industries, modem concepts of reliability engineering have proven to be invaluable in almost every part of the scientific and industrial world. 3. Basic considerations for Reliability The basic considerations in the area of equipment manufacture and deployment have necessitated the introduction of concepts such as unpredictable behaviour even in fairly well-understood processes. Failure of mature electronic equipment [6] is one such process that is stochastic in nature, i.e., it varies randomly with time. All the basic as well as practical considerations has to be carefully studied and should be in a procedure; in such a way that it combines contextual engineering knowledge with traditional reliability techniques [1] to assist engineers in estimating the long term reliability of large electronic systems. Many researchers and various authors have described the reliability predictions into qualitative, quantitative and statistical. Out of which, the Qualitative prediction as per Gupta et al [7] has been the major source of reliability achievement in the past, primarily from the subjective and qualitative experience of design and operating engineers. The assessing the reliability of a system, although a significant contribution, suffered with a lot of deficiencies. The results varied with personal experience, educational level and expertise, and suffered from a wide variance in meaning and interpretation. As the discipline progressed and the complexity of technologies grew, the need for a quantitative measure of reliability under universal standards began to be felt. In the modem world, the importance and limitations of both qualitative and quantitative techniques has given rise to a strategic breed of scientists that are investigating the advantages of both approaches. The

investigations have led to a highly specialized branch of engineering that utilizes mathematical tools of analysis and at the same time emphasizes the consideration of the unique engineering factors that arise and interact in the operational life of the equipment in order to make any predictions about its reliability. 4. Mathematical Models for Reliability Engineering As now a day, all the technologies are becoming more and more complex, with advancements being made on a global level, it becomes impossible to perform a useful reliability analysis [8-12] without employing a standardized approach. Reliability prediction using probability theory, mathematical models and engineering techniques allows the formulation of a quantitative measure of the expected system performance while taking into account important qualitative factors. This allows a standardized methodology of consistently comparing the reliability of competing parts and designs. Any reliability study essentially remains an academic exercise unless due consideration is given to economic factors and organizational feasibility. For the practical considerations, it is the ability to achieve incremental improvement in system reliability through careful analysis with the help of mathematical model and that is more important than maximum reliability [10-12]. 5. Conclusions The paper concludes that there is a requirement to develop reliability models with a thinking to help designers to predict reliability at the design stage. This review paper shows that the investigations related to reliability applies to any specialized branch of engineering that utilizes mathematical tools of analysis and at the same time emphasizes the consideration of the unique engineering factors that arise and interact in the operational life of the equipment in order to make any predictions about its reliability perfect and to implement. Acknowledgement The first author is very thankful to Dr.(Prof) Manoj Kumar Pandey, Director, SRM University, Modinagar who always encourages to publish the research and innovative papers. Thanks are also due to some of the faculties of SRM University, Modinagar for their important and invaluable suggestions for this research topic. References [1] Osaki, S.,"Stochastic Models in Reliability and Maintenance", Springer Publication, 2002. [2] Billinton, R., and Allan, R., “Reliability Evaluation of Engineering Systems: Concepts and Techniques", Springer Publication, 1992. [3] Degarmo, E., Black, J.T., and Ronald, A., “Materials and Processes in Manufacturing”, Prentice Hall of India, 1997. [4] Lindsey, J.K., “Statistical Analysis of Stochastic Processes in Time”, Cambridge University Press, 2004. [5] Kuo, W; Prasad, V.R.; Tillman, F.A. and Hwang, C.L:

"Fundamental and Applications of Reliability Optimization", Cambridge University Press, Cambridge, 2000. [6] Calabro, S.R., "Reliability Principles and Practices", McGraw Hill Book Company, Inc. New York, 1962. [7] Gupta, P.P., Kumar, A., and Mittal, S.K., "Stochastic Behaviour of Three-State Complex Repairable System with Three Types of Failures", Microelectronic Reliability, 1985, Vol. 25, pp 853-858, Singh, Yadav and Srivastava / Turkish Journal of Engineering, Science and Technology 03 (2013) p53-55 55 [8] Agrafotis, G.S.; Tsoukalas, M. Z.: "Reliability Analysis and Optimization Applications of a Two Unit Standby Redundant System with Spare Units", Microelectronic Reliability, 1994, Vol. 34 (5), pp 1469 – 1476. [9] Agnihotri, R.R., and Satsangi, S. K.: "Two Non-identical Unit System with Priority Based Repair and Inspection", Microelectronic Reliability, 1996, Vol. 36 (2) , pp 279 – 282. [10] Cassady, C.R., Lyoob, I.M., Schneider, K., and Pohi, E. A., "A Generic Model of Equipment Availability under Imperfect Maintenance", IEEE Transactions on Reliability, 2005,Vol. 54, issue - 4, pp 564 – 571. [11] Chung, W. K.: "A k-out -of n: G Redundant System with the Presence of Chance with Multiple Critical Errors", Microelectronic Reliability, 1993, Vol. 33, pp 334-338. [12] Cluzeau, T., Keller, J., and Schneeweiss, W., "An Efficient Algorithm for Computing the Reliability of Consecutive-k-outof-n: F Systems", IEEE Transactions on Reliability, 2008, Vol.57 (1), pp 84-