Extreme Value Theory Applied in Reliability Analysis: Case Study of Diesel Generator Fans

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Abstract : Reliability analysis represents a very important task in different areas of work. In any industry, this is crucial for maintenance, efficiency, safety and monetary costs. There are ways to calculate reliability, unreliability, failure density and failure rate. In this paper, the results for the reliability of diesel generator fans were calculated through Extreme Value Theory. The Extreme Value Theory is not widely used in the engineering field. Its usage is well known in other areas such as hydrology, meteorology, finance. The significance of this theory is in the fact that unlike the other statistical methods it is focused on rare and extreme values, and not on average. It should be noted that this theory is not designed exclusively for extreme events, but for extreme values in any event. Therefore, this is a great opportunity to apply the theory and test if it could be applied in this situation. The significance of the work is the calculation of time to failure or reliability in a new way, using statistic. Another advantage of this calculation is that there is no need for technical details and it can be implemented in any part for which we need to know the time to fail in order to have appropriate maintenance, but also to maximize usage and minimize costs. In this case, calculations have been made on diesel generator fans but the same principle can be applied to any other part. The data for this paper came from a field engineering study of the time to failure of diesel generator fans. The ultimate goal was to decide whether or not to replace the working fans with a higher quality fan to prevent future failures. The results achieved in this method will show the approximation of time for which the fans will work as they should, and the percentage of probability of fans working more than certain estimated time. Extreme Value Theory can be applied not only for rare and extreme events, but for any event that has values which we can consider as extreme.

Keywords : extreme value theory, lifetime, reliability analysis, statistic, time to failure

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