

EMPIRICAL DETERMINATION OF RELIABILITY OF DRAGLINE SYSTEM BY APPLICATION OF NHP MODEL

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Abstract

Dragline system in Open Cast Mines is used to extract coal by removing overburden. Performance of a dragline system depends on reliability, availability & maintainability characteristic of the system & its six sub-systems namely Drag, Hoist, Swing, Power Drive, Propel & others. It is essential that all the subsystems remain in operating state for maximum possible time duration for efficient working of the dragline system. A typical dragline can move about 30 crore cubic metres of overburden a year and equates to generate approximately 1 crore revenue per day. i.e. down time cost of 1 hr is 5 lacs (approx.). Hence reliability modelling of dragline system plays significant role. This paper outlines the reliability modelling of two subsystems of dragline namely drag and hoist. Failure Data Analysis act as a very important tool for Reliability Modelling of Dragline System. Failure data collected from the field is fitted for suitable conventional type of distribution namely Normal distribution, lognormal distribution, Exponential distribution and Weibull distribution. For subsystems Drag and Hoist, Mean Time To Failure (MTTF) is greater than Median and approximately not equal to standard deviation(σ). Therefore lognormal distribution & weibull distribution will provide better fit. After carrying out entire analysis, index of fit (r) for drag by Weibull distribution is 0.1674 and by lognormal distribution is 0.00013. Similarly index of fit for hoist by Weibull distribution is 0.2191 and by lognormal distribution is 0.0108. Since values of index of fit are not in the desired range of 0.6 – 0.8, they are not considered as the distribution fitting to the failure times. The Operating Time Before Failure (OTBF) are not homogenous. Therefore Non-Homogenous Poisson(NHP) process is considered as a model befitting to the Situation. The reliability of the drag is found to be 0.4742 (47.42%) and the reliability of the hoist is found to be 0.5931 (59.31 %) by the application of this methodology.

Keywords : Dragline , Index of Fit, Reliability, MTTF