Design for Reliability and Maintainability using FMECA: Case Studies of Mobile Underground Mining Equipment

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Abstract

Underground mining equipment must be designed to survive very demanding, and often unpredictable, operating conditions – hence reliability of equipment designs is crucial. Conversely, the underground mining environment imposes severe logistical constraints on equipment maintenance and repair – hence maintainability is also a significant design goal. This paper presents the outcomes of case studies related to the Design for Reliability and Design for Maintainability of mobile underground mining equipment. Failure Modes, Effects, and Criticality Analysis (FMECA), a well established tool for both reliability and maintainability analysis, is employed. The case studies deal with a Load-haul-Dump (LHD) vehicle and an underground truck. The specifics of the analysis methodology adopted, levels of effort, outcomes, and practical lessons learnt are discussed. The relationship between such FMECA analysis and the wider issues and implications of adoption of Related Centred Maintenance (RCM) by both mining equipment manufacturers and mining companies is also explored.