National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: HAZARD IDENTIFICATION BY USING ANALYTICAL TECHNIQUES
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Venue	: Seminar Hall
Date and Time	: 08 Jan 2025 (5:00 PM)
Abstract	: Mechanization in metal mines has increased keeping in pace with India's growing raw material demand. The deployment of heavy machineries like dumpers, excavators, tankers with higher capacities for operations has greatly attributed towards the cause. Consequently, growing hazards associated with machinery in metal mines continues to be the area of concern. Machinery related accidents obtained from DGMS reports for non-coal mines in 2018 and 2019 indicate a decline in number of accidents. However, the improvement was not satisfactory. For hazard identification and risk assessment safety theories like Fault tree analysis (FTA) , Event tree analysis (ETA) , Failure mode effect analysis (FMEA), Hazard and operability analysis (HAZOP) have been proposed . The accident models are found inadequate to deal with hydro-mechanically operated system, software glitches and complex human-machine interactions. Similarly, the proactive safety management system (SMP) designed and introduced in Indian mines in accordance with Directorate General of Mine safety (DGMS), India, guidelines, and Hazard and Operability Analysis (HAZOP) was found to be consequence based and analyzed accidents as distinct events. This thesis aims to introduce in the mining industry a hazard analysis framework System-Theoretic Process Analysis (STPA) based on systems theory. The models shift emphasis from failure prevention to identification and enforcement of constraints on system behavior and component interactions. The theory includes accidents occurring due to components interaction, software faults, complex human decision making and organizational and social factors. But STPA being a qualitative method produce a large number of hazards and also cannot quantify the hazards based on their severity or likelihood. Hence a new approach has been introduced for screening, prioritization and evaluation of hazards arising out of HEMM operation systems based on combination of system-theoretic approach (STPA) and Failure Mode effect analysis (FMEA). This proposed method will help in optimal utilization of available resources and time towards mine safety. Keywords: Heavy Earth Moving Machinery, Metal Mines, System Theoretic Process Analysis , Failure Mode effect Analysis