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**APPLICABILITY OF RELIABILITY CENTERED
MAINTENANCE FOR DOZERS AND BACKHOE LOADERS**

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ABSTRACT

The Independent Workshop of the Engineer Regiment is primarily responsible for the maintenance, repair and overhaul tasks of the entire fleet of earth moving machinery in the Sri Lanka Army. Due to certain adverse implications observed with regard to the performance and productivity indices of this machinery fleet, it was identified that there are serious lapses in the role and tasks of Independent Workshop. This core factor provided the necessary background for the relevant academic research.

Out of all the maintenance strategies presently available for reference, Reliability Centred Maintenance (RCM) was chosen as the most appropriate system, since reliability is a mandatory requirement of any military hardware. RCM is a scheduled maintenance program designed to realize the inherent reliability potential of equipment. The objective of RCM is to develop a scheduled maintenance programme that ensures the equipment's maximum safety and reliability and meets this requirement at the lowest cost. RCM is based upon the premise that maintenance cannot improve upon the safety or reliability inherent in the design of the hardware but it can only preserve those characteristics.

The scope of research was narrowed down to the study of tracked dozers and backhoe loaders only, leaving aside other categories of earth moving machines. This can be justified by two reasons; first, the selected two categories of equipment form 68% of the total fleet and second, an annual average of 79.4% out of a Rs.60 million worth maintenance budget is spent exclusively for these two categories of earth moving machinery.

The objectives of the research were to analyse the serviceability status of the present fleet, to investigate the major causes for breakdowns/failures in earthmoving machines, to evaluate the effectiveness of the budget spent to maintain the fleet in operational condition, to study the reliability of tracked dozers and backhoe loaders, to explore a possible path for a gradual transition from the existing OEM specified system to an RCM based custom designed model and to propose a long term Human Resources Training & Development Plan to complement the Maintenance, Repair and Overhaul (MRO) tasks undertaken by the organization.

After deciding that tracked dozers and backhoe loaders should be selected as significant machine categories for the study, the research process then followed a sequential methodology. In this, the key functions and related performance standards of machinery were listed out as an *Operational Mode Summary*. This provided a baseline which the proposed maintenance programme should support. Prior to performing the RCM analysis, the individual components comprising the machine's system were identified by means of a *Work Breakdown Structure*. After the composition of system was established, a *Failure Mode, Effects and Criticality Analysis (FMECA)* was carried out to ascertain the key areas which demand attention. Thus *Critical Parts* of each sub-system were identified and *Mean Time Between Failures (MTBF) / Mean Time To Fail (MTTF)* data of such components were collected. Finally maintenance, repair and overhaul schedules were revised/defined using that information while adhering to the economical parameters as guiding factors.

Pre-research reliability of tracked dozers and backhoe loaders were found to be at 0.77 and 0.72 respectively. The proposed RCM based maintenance programme expects to raise overall reliability to a value of over 0.85 for both categories of machines.

The contribution of *liveware* to the new maintenance programme was considered crucial and with this in view, a *Human Resources Development Plan* was also worked out as a secondary objective. This plan encompasses on recruitment, training & development, career planning and organizational restructuring of human resources.

The discussion, conclusions and recommendations of the project focussed mainly on extending the study further into other categories of earth moving machinery, test running the new system to check its technical/economical viability, concurrent development of procurement/inventory control systems to supplement maintenance goals, incorporation of IT for data processing activities of the maintenance system for efficiency purposes and lastly, to re-engineer the organization with a more competent and capable human resource pool.