Abstract

Breakdowns in construction machinery are inevitable despite scheduled preventive maintenance practices. Unattended preventive maintenance schedules, extreme climatic conditions, dynamically varying working environment, machine mix of old and new in the same fleet, differences in operator competence levels and over utilization of components and systems result in breakdowns. Breakdowns results in loss of morale, developmental losses apart from costs involved.

This study focuses on breakdown maintenance of construction machinery in United Arab Emirates, the need for which has been reestablished with a survey in the region, indications from literature review, unavoidable mechanization and fast growth rates of construction industry.

ETA ASCON is chosen as a representative of several construction majors in the region and breakdown/failure data of FIVE years analyzed to identify machinery on which further studies could be carried out, but replicable for other machinery in the fleet.

TWO earth moving machinery are identified through cost impacts, breakdown ratios and breakdown percentages. Reliability studies with calculation of Mean Time Between Failures (MTBF) and Mean Time To Repair (MTTR) on the identified machinery further focuses the study on a few systems in the whole machinery.

Coding is a simpler method of understanding and analyzing maintenance data and is an accepted practice in maintenance management. FOUR levels of codes called Breakdown Main Codes (BMC), Breakdown Sub Codes (BSC), Breakdown Symptom Codes (BSyC) and Breakdown Reason Codes (BRC) are developed on the identified systems to enable easy identification of the route cause for the failures using Cause Effect Analysis (CEA), Pareto Analysis, Failure Mode Effect Analysis (FMEA) and Fault Tree Analysis (FTA). After finding the exact reason for the failure/breakdown, a swift and methodical approach to repair and restore the machine is possible with the help of protocols.

This study has also resulted in the development of Breakdown Maintenance Protocols (BMP) apart from development of a handheld tool called the BMP Ruler, which aides in the process of arriving at the right reason identification for the breakdown and the corresponding protocol to be followed.

To study the impact of this new approach, a Breakdown Maintenance Management (BMM) Model is proposed, which not only encompasses the methodical approach to identify the protocols but also compare the breakdown maintenance before and after the implementation of this approach. The study proves with case studies the impact of BMM Model on the overall time reduction in the restoration of breakdowns.

BMM Model in the present form is suitable for construction industry, but may be adapted for other similar industries with modifications in the inputs related to breakdown data, machinery and the corresponding systems.

Key words: Breakdown Maintenance, Construction Machinery, Codes, Protocols