STUDY OF TOTAL PRODUCTIVE MAINTENANCE AND IMPROVING THE PRODUCTION

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Abstract The purpose of this research is to investigate the contributions of successful total productive maintenance (TPM) initiatives to competitive manufacturing. It also seeks to critically examine the implications of strategic TPM implementation initiatives in an Indian manufacturing organisation. Total Productive Maintenance (TPM) is a maintenance program which involves a newly defined concept for maintaining plants and equipment. This research is focusing in implementing Keikaku-Hozen (KH) Pillar activities for solving the breakdown problem in an industrial sector. The study is carried out in a Manufacturing industry which is now facing problem in establishing processing certain machining in their Plant, and also maintaining it to reduce downtime due to maintenance issue. The approach is directed in the direction for finding the root cause of the problem due to which maintenance problem rise in a manufacturing sector in Indian industries. The work includes solving the maintenance issue by doing root cause analysis (RCA) of the problem due to which downtime increases. Customization of TPM principles to project based industry is an important part of this research. The study highlights the contributions of strategic TPM initiatives to organisational performance and also the need for the successful management of TPM programmes for establishing sustained maintenance improvement initiatives. By applying TPM and doing root cause analysis the maintenance issue is reduced by 50%.

Keywords -Total Productive Maintenance(TPM), Keikaku-Hozen (KH), Root Cause Analysis (RCA), organisational performance.

I. Introduction

Total productive maintenance (TPM), a resource-emphasized approach moves the paradigm of maintenance by putting emphasis on total employee involvement in the maintenance activities. Operators and all employees should be actively involved in a maintenance programmed that enable to avoid any disruptions, breakdowns, stoppages, failures, and so forth in order to improve manufacturing performance. Therefore, in the highly competitive manufacturing industries, the ability and reliability of equipment that well-maintained is very important in order to achieve desired manufacturing performance namely cost reduction, high quality products, on-time delivery, and flexibility. Furthermore, several studies in the literature argue that further research is required in the area of maintenance and operations management. In order to address this need, the study investigates the extent of TPM practices in the Patel Industrial works (Maharashtra) to investigate the relationship between TPM practices and manufacturing performance and to investigate the moderating effect of the level of technical complexity in the production process in the TPM practices and manufacturing performance relationships.

II. LITERATURE REVIEW

Total Productive Maintenance Undeniably, new technologies and advanced equipment need more attention from manufacturing companies especially when there are strong demands and pressure from customers. Therefore, manufacturing companies need to respond quickly to ensure smooth daily operations and manage adjustments to uncertainties in the market place. The ability to produce products through lean production, for instance, requires an extraordinary workforce who is capable of dealing with various challenges. Through proper and suitable maintenance programs, major losses due to breakdowns and defects can be avoided. Even though these maintenance program will cost money, but the lack of maintenance will cost even more [1]. The goal of the any TPM program is to improve productivity and quality along with increased employee morale and job satisfaction. [2]. TPM has become more popular not only due to its ability to improve performance but also due to the emphasis it places on human capital resources. There are many recent worldwide studies (in the form of case studies and surveys) related to TPM.

III. Methodology

We have surveyed manufacturing company e.g. Patel Industries supplier of ASBAH professional beauty product using scientific approach. The sampling frame was taken from the various manufacturing techniques of parts. The measures of this study were from various sources after thorough reviewed of articles. The sample selection was chosen systematically. The main objective of the study was to analyze the moderating effect of the level of technical complexity in the production process in the relationship between TPM practices and manufacturing performance. Then, the research hypothesis was tested using hierarchical regression analysis accordingly.

IV. RESULTS AND ANALYSIS

There were 5 steps where we improve the design methodology and also the preventive measures in which the total productive maintenance we applied. All independent parts design which took 10-15 % more time as well as the 20-25 % more material are redesigned and the proper fixture were implemented. We received some of constraints which are liable with manufacturing types. All independent variables loadings were recorded more than 0.66 and Eigenvalues were more than 1.4. table shows the

DESCRIPTIVE ANALYSIS

variable	Mean Time (min)	Std. Deviation
Time for loading	10	0.76
Cutting and embossing	5	0.68
unloading	2	0.71
Fixturing	6	0.62

The perceived reduction of manufacturing costs included production costs, manpower costs, overhead costs, material costs and unit costs. In order to examine the hypotheses of this study, 3-Step hierarchical regression was utilised. Various authors recommend using Hierarchical Regression in research concerned with moderator variable detection [19]-[21]. In addition, [22] suggest that moderating effect can be tested using multiple regressions. In step 1, the 4 independent variables were regressed with the dependent variable.

In step 2, the moderator was included; technical complexity on production process was regressed with the dependent variable. Lastly, the independent variables, moderator and interaction of moderator, technical complexity on production process and independent variables were regressed with the dependent variable. However, before further analysis could proceed, multiple regression assumptions were tested accordingly. Multiple regressions rely on four main assumptions to be fulfilled. Normality, linearity, independence of residuals and homoscedasticity [23] and these were tested consequently. The hierarchical regression showed TPM strategy.

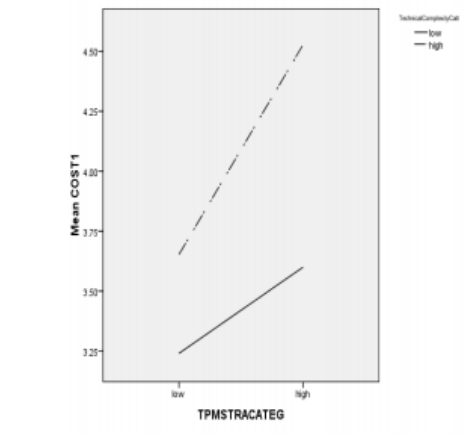

Fig. 1. The moderating effect of technical complexity in the relationship between Total Productive Maintenance (TPM) strategy and cost.

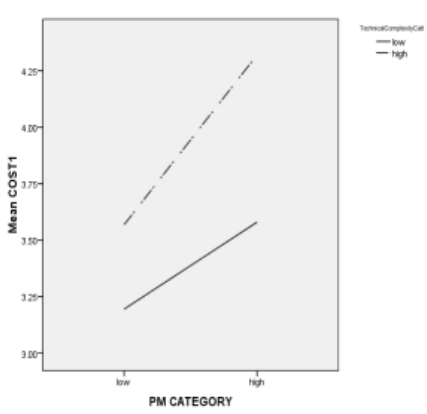

Fig. 2. The moderating effect of technical complexity in the relationship between Planned Maintenance and Cost.

V. CONCLUSION AND RECOMMENDATION

TPM tries to ensure equipment related losses are minimized and more effort is made to reduce equipment-related losses or defects. TPM could essentially help to minimize the deterioration of equipment, hence improving performance as highlighted by various researchers, for instance, [4], [5], [24], [25], and [26]. Meanwhile TPM team usage in the plant being low as shown by the standardized beta value of -0.05 for cost. Furthermore, the vicariate analysis showed a moderate positive low correlation between TPM team and manufacturing performance, r=0.34, for cost. This relationship may not be strong enough to have held up in the multivariate analysis. As noted by [27] based on their case study, work habits and communication especially for production lines and different shifts could affect the morale of TPM team development. The possible assumptions to be drawn from this study are that the communication and leadership of TPM team are not clearly perceived by those at operator level and other departments. The TPM team has been perceived as unable to formulate actions that can effectively help to reduce costs. TPM strategy which focuses on overall equipment effectiveness (OEE) tries to demonstrate that using all related information and the production line status, operators and maintenance staff can work closely to ensure more improvement suggestions and to ensure well-functioning equipment, performance efficiency and availability of equipment. An overall OEE of 85% is considered as world class performance [28]. In order to achieve an OEE of 85%, therefore, performance efficiency must achieve 95%, availability must achieve 95% and quality must achieve 99%. The results indicated that TPM strategy and planned maintenance found to be related to cost. Future research can be expanded further by analyzing other factors contributed to manufacturing performance. For instance, product characteristics, vertical integration, model mix, automation level and market requirements might possibly affect manufacturing performance [29]

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