"Empirical Analysis on Total Productive Maintenance (TPM) Implementation in Selected Automobile Industry at Mysore"

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Abstract

Total Productive Maintenance is the equipment and process improvement strategy that links many of the elements of a good maintenance program to achieve higher levels of equipment effectiveness. Therefore the current study focused on detailed analysis of the concept of TPM and issues, challenges and also major barriers of TPM implementation process in TVS Motors Company. The main objectives of this study is to highlight the demographic profile of the employees in TVS Motors Company and analysis major barriers for TPM implementation in the organization and also examined major issues and challenges faced by the employees for TPM implementation in the organization. The current study has been collected from primary data was collected by on the basis issue of questionnaire, the population or sample size for study was only 50 employees of TVS Motors Company. For the purpose of analysis of data applied for Mann – Whitney U test, chi square test and Kruskal –Wallies Z-Test etc. Finally this study concludes. majority of the employees opined that, lack of top management commitment, scarcity knowledge in TPM implementation, lack of proper working organizational equipment, TPM implementation requires lack of financial commitment, lack of adequate technology to faster TPM process and changing organization culture these are mentioned major issues and challenges were by the employees of TVS Motors Company.

Key Words:. ***Barriers in TPM, Training of TPM, 5S and TPM Implementation.***

INTRODUCTION

Total Productive Maintenance (TPM) has been developed in japan in 1971. This came in response to the problems of maintenance, which prevailed at that time in most Japanese companies and factories. TPM implementation is not yet comprehensive enough to increase the productivity and reduce the losses and thus, benefit the organization as a whole. Most important reasons cited by researchers regarding partial implementation of TPM program in such countries is the lack of safety regulations, which encourages machine operators to take on maintenance work on their own and secondly, lack of top management's ability to provide conducive environment for proper implementation of the TPM program. Mainly due to problems highlighted organizations

adopt techniques such as 5S to overcome problems and help in successful implementation of the TPM program ***(Admin, 2010; Ahuja and Khamba,*2008).**

Total Productive Maintenance (TPM) is a unique Japanese philosophy, which has been developed based on the productive maintenance concepts and methodologies. This concept was first introduced by M/s Nippon Denro Co. Ltd. of Japan in the year 1971. Total productive maintenance is an innovative approach to maintenance that optimizes equipment effectiveness, eliminates breakdowns and promotes autonomous maintenance by operators through day-to-day activities involving total workforce..TPM is a maintenance based technique, which involves a newly process for maintaining plant machines & equipment. The goal of the TPM program is to optimize the maintenance activities throughout the plant while, at the same time, increase production, increasing employees job satisfaction.TPM is team: based approach to improve overall equipment effectiveness (OEE). OEE is characterized by three components which are availability, quality rate and performance rate.

The current study focused on TPM implementation practices in TVS Motors Mysore.TVS was established by Thiruvengudi Sundaram Iyengar. He began with Delhi's first bus service in 1911 and founded T.V. Sundaram Iyengar and Sons Limited, a company in the transportation business with a large fleet of trucks and buses under the name of Southern Roadways Limited. When he died in 1955, his sons took the company ahead with several forays in the automobile sector, including finance, insurance, two-wheelers/ three wheelers, tyres and components, housing, aviation, logistics etc.

The TVS group has operated 97 companies that account for a combined turnover of nearly US$6 billion. In 2017,TVS launched their most-awaited motorcycle, the Apache RR 310 in an event at Chennai. The 310cc motorcycle with an engine which was co-developed with BMW features first ever full fairing on a TVS bike, dual-channel ABS, EFI, KYB suspension kits, etc. It is expected to rival bikes like KTM RC 390, Kawasaki Ninja 250SL, Bajaj Pulsar and Dominar and Honda CBR 250R after hitting the market and the TVS has successfully follows the procedures of TPM implementation in the organization to reduce the maintaince and production costs and currently TVS launches the Apache RR 310 is designed and released entirely in India

REVIEW OF LITERATURE:

Ahmed Hama (2015), conducted a study on role of ethical factors 5S and TPM implementation: Study of Kurdish cement industry, IRAQ.In this paper he mentioned many of these organizations especially in developing countries face problems in effective and successful implementation of these techniques 5S and TPM. This is mainly due to lack of employee related factors that are not considered when organizations adopt these techniques. Finally he come out with results reveal that manager-subordinate relationship (empowerment) is having insignificant influence on the implementation of 5S.

Egwuagu (2016), focused a study on benefits and challenges of total productivity maintenance implementation. He try to analyzes in this study major challenges of TPM which must be overcome for enhanced

benefits include inadequate knowledge of TPM, lack of leadership and management support, organizational culture, excess inventory, and inadequate trainings. The paper concluded by stating that the six major losses of faulty equipment and operation could be addressed by the introduction of Overall Equipment Effectiveness (OEE) model and involvement of top management and employees in the organization.

Venkateswaran (2018) conducted a study on "Total Productive Maintenance (TPM) Practices Adopted at Manufacturing Unit: An Analysis". This study includes the overall equipment effectiveness (OEE) to analyze maintenance performance of machine and to understand the quality standards and customer expectations over the products manufactured. The Research design taken for this study is Analytical research. Finally he give suggestion to the management from this research is Cleaning and Inspection time and machine setting change over time to be reduced to utilize the machine as much as possible to meet the production target and to increase the OEE in organization.

Saureng Kumar(2019) undertaken a study on total productive maintenance & it's implementation approach in steel manufacturing industry: A case study of equipment wise breakdown analysis. The purpose of this paper is implementation of total productive maintenance by performing machine wise breakdown analysis. He mainly focused on section wise breakdown analysis, breakdown types wise and equipment wise breakdown analysis to avoid delay in manufacturing process. finally he conclude that equipment wise ie; Stacker, Cooling bed, Cold saw-2 having maximum breakdown occur.

RESEARCH METHODOLOGY:

The primary data was collected on the basis of issuing questionnaire. The study employed survey based and empirical and cross sectional survey in nature. The total population size for study was only 50 respondents, which is considered optimum for the study. The questioner issued for employees of TVS Motors Company, situated in Kadakola Mysore. In the context of secondary data was gathered from different sources such as, Internet, website, Professional Magazines, refereed journals and peered journals related on TPM implementation in manufacturing as well as automobile industries. For the purposes of analysis of data shows, ***mean, standard deviation, Mann – Whitney U test , chi square test and Kruskal–Wallies Z-Test*** etc

Objectives of the Study:

1. To highlight the demographic profile of the employees in TVS Motors Company;
2. To analysis major barriers for TPM implementation in the organization:
3. To examined major issues and challenges faced by the employees for TPM implementation in the organization.

HYPOTHESES:

The study is based on the following hypotheses:

1. **H1:** There is a significant variation in demographic profile of the employees.
2. **H2:** There is no significant association between major barriers for TPM implementation in the organization.
3. **H3:** There is a significant relationship between issues and challenges faced by the employees for TPM implementation

RESULTS AND DISCUSSIONS

1. Demographic Profile of the Respondents:

Table No.1 shows the demographic profile of employees of TVS Motors Company, Mysore. The overall respondents were numbering, 50 employees out of that 38 respondents are belongs to male category and 12 respondents are belongs female category this shows male employees were more compared to the female employees. In the context of age pattern, majority of the respondents numbering, 28 and 15 employees were belongs to age group of between 25 to 35 years and between 35 to 45 years respectively. Further the educational background of the respondents majority numbering, 20 and 15 respondents were found mechanical engineering and industrial engineering respectively. In the context of occupation, majority numbering, 20 and 15 respondents were belongs to machine operators and production executives respectively.

Table No. 1 showing the demographic profile of the Employees of TVS Motors Company (Descriptive statistics)

SI. No	*Factors*	*Classification*	*Frequency*	*Chi-Square Results*
1.	**Gender**	Male	38	***χ²=3.992 P=0.000 (H0 Significant)***
		Female	12	
2.	**Age Pattern**	Between 25-35Years	15	***χ²=2.841 P=0.004 (H0 Significant)***
		Between 35-45Years	28	
		Above 45 years	07	
3	**Educational Background**	Electronic Engineering	08	***χ²=2.014 P=0.051 (H0 In Significant)***
		Industrial engineering	15	
		Mechanical engineering	20	
		Diploma in Engineering	07	
4	**Occupation**	Production Executives	15	***χ²=3.174 P=0.001 (H0 Significant)***
		Machine operators	20	
		Maintenance Engineers	05	
		Process Engineers	10	

Sources: Primary data
Note: Significant Level 0.05

To calculate, chi –square test for data of gender, age pattern and occupation of the respondents the table value of $\chi 2$ for degrees of freedom at 5% level of significance, The calculated P value is 0.000, 0.004, and 0.001 which is less than the Alpha Value of 0.05 it was found to be significant. Therefore the results indicate that the stated null hypothesis to be rejected and alternative hypothesis is accepted. In the other part to calculate, chi – square test for data of educational background of respondents, the table value of $\chi 2$ for degrees of freedom at 5% level of significance, the calculated P value is 0.051, which is more than the Alpha Value of 0.05. it was found to be Not significant. Therefore the results indicate that the stated null hypothesis to be accepted and alternative hypothesis is rejected.

2. Major Barriers for TPM implementation in the organization:

Table No.2 highlights the major barriers for TPM implementation in TVS Motors Company Mysore. Majority of the respondents or the employees has been agreed and they were faced some of the barriers faced for TPM implementation in the organization. According to The mann-whitney U-test it's a category of nonparametric test it is describe to test the significant difference between major barriers for TPM implementation in organization. The highest mean and standard deviation were found unawareness towards quality and productivity process was recorded the value of 28.55 and 8.01 respectively. As against the lowest mean and standard deviation were found poor repair driven maintenance in plant layout, was recorded the value of 18.92 and 2.56 respectively.

Table No.2

Major barriers for TPM implementation in the organization.

Statements	Mean	S.D	*Whitney U-Test*	(Sig 2-tailed) P-value	Hypothesis (H0)
High man power cost	20.63	3.22	3.151	0.001	*Significant*
Poor repair driven maintenance in plant layout	18.92	2.56	3.714	0.053	*Not Significant*
Problem of Holding large inventory	25.47	7.02	2.413	0.064	*Not Significant*
Many employees consider TPM activities as additional work	22.23	5.26	3.741	0.072	*Not Significant*
Improper understanding by employs of TPM methodology	24.01	6.81	3.174	0.002	*Significant*
Longer time taken to implement TPM	26.77	7.78	3.206	0.005	*Significant*
Employees' Resistance to Change In System	23.42	5.88	3.851	0.000	*Significant*
Lack of co-ordination between different departments	22.21	6.08	2.001	0.078	*Not Significant*
Unawareness towards quality and productivity process	28.55	8.01	4.011	0.001	*Significant*
There is no benchmarking and performance analysis for TPM implementation.	27.07	7.31	2.782	0.004	*Significant*

Sources: Primary data

Note: Significant Level 0.05

To be summarized that, high man power cost, improper understanding by employs of TPM methodology, longer time taken to implement TPM Employees, 'resistance to change in system unawareness towards quality and productivity process and there is no benchmarking and performance analysis for TPM implementation category results, the P value (Sig 2-tailed) is which is indicates less than the Alpha value of 0.05, it was found to be significant. Therefore the results indicate that the stated null hypothesis to be rejected and alternative hypothesis is accepted. In the context of poor repair driven maintenance in plant layout, problem of holding large inventory, many employees consider TPM activities as additional work and lack of co-ordination between different departments category results, the P value (Sig 2-tailed) is which is indicates more than the Alpha value of 0.05, it was found to be not significant. Therefore the results indicate that the stated null hypothesis is accepted.

3.Issues and challenges for TPM implementation in the organization:

Table No.3 shows the issues and challenges for TPM implementation in the organization. Majority of the respondents or the employees has been strongly agreed that they were faceing lots of issues and challenges while implementation of TPM. According to the Kruskal–Wallies Z-Test, it's a category of nonparametric test it is describe to test the significant difference between issues and challenges for TPM implementation in the organization. The highest mean and standard deviation were found lack of proper working organizational equipment was recorded the value of 28.22 and 8.14 respectively. As against the lowest mean and standard deviation were found lack of knowledge of TPM category was recorded the value of 16.58 and 3.87 respectively.

Table NO.4
Issues and challenges for TPM implementation.

Statements	Mean	S.D	Kruskal–Wallies Z-Test	(Sig 2-tailed) P-value	Hypothesis (H0)
Lack of top management commitment	23.00	6.41	2.18	0.002	***H0*** *Accepted*
Lack of strategies to achieve overall objectives	18.60	3.87	2.73	0.071	***H0*** *Rejected*
Lack of knowledge of TPM	16.58	2.51	3.87	0.000	***H0*** *Accepted*
Lack of a suitable reward mechanism	19.60	3.89	2.57	0.061	***H0*** *Rejected*
Lack of proper working organizational equipment	28.22	8.14	2.07	0.001	***H0*** *Accepted*
Issues in design modification (OEM)	26.80	7.79	3.09	0.057	***H0*** *Rejected*
Lack of Standard Operating Procedures	27.15	7.07	3.04	0.072	***H0*** *Rejected*
TPM implementation requires lack of financial commitment	15.40	3.57	2.06	0.004	***H0*** *Accepted*

Lack of adequate technology to faster TPM process	18.23	4.02	4.27	0.003	***H0*** *Accepted*
Lack of right skills and educational background to implement TPM	24.22	6.88	3.01	0.062	***H0*** *Rejected*
Changing organization culture	20.74	4.02	3.11	0.005	***H0*** *Accepted*

Sources: Primary data
Note: Significant Level 0.05

To be conclude that, lack of top management commitment, lack of knowledge of TPM, lack of proper working organizational equipment, TPM implementation requires lack of financial commitment, lack of adequate technology to faster TPM process and changing organization culture category results, the P value (Sig 2-tailed) is which is indicates less than the Alpha value of 0.05, it was found to be significant. Therefore the results indicate that the stated null hypothesis to be rejected and alternative hypothesis is accepted. In the context of lack of strategies to achieve overall objectives, lack of a suitable reward mechanism, issues in design modification (OEM), lack of standard operating procedures and lack of right skills and educational background to implement TPM category results, the P value (Sig 2-tailed) is which is indicates more than the Alpha value of 0.05, it was found to be not significant. Therefore the results indicate that the stated null hypothesis is accepted.

SUGGESTIONS FOR THE STUDY:

- Δ Top management support helps to successful implementation of TPM. For successful implementation of TPM organization should provide adequate funds, separate TPM office, trained employees and positive attitude of man-power to implement TPM.
- Δ Setting change over time to be reduced in future, so that OEE can be increased Proper filtration and checking for the leakage at various joints to be done for oil in order to reduce the cost.
- Δ To proper implementation of OEE Electrical and Electronics items, and various mechanical systems in a machine to be serviced at scheduled period in order to avoid the machine breakdown in company.
- Δ TPM training to be given maximum to all shop floor employees in order to have zero breakdowns and zero accident.
- Δ This study suggests that organization should establish separate TPM office to reduce repetitive work and to reduce inventory levels.

- Effective implementation of TPM should work as a tool to develop employee's personal integrity, morale, passion and enjoyment at work.
- Evaluation of TPM should not be every time on the basis of monetary benefits. Evaluation of criteria should be competitiveness, morale, reliability of the machine.

CONCLUSION

The contemporary study depicts that major barriers, issues and challenges faced by the employees while TPM implementation in TVS Motors Mysore. This paper shows that one the major difficulties organization encounter in attempting to longer time taken to implementation of TPM, resistance to change in system, unawareness towards quality and productivity process this are some of the barriers they will faced with in the workstation therefore finally this study results strategies to achieve overall objectives, lack of a suitable reward mechanism, issues in design modification (OEM), lack of standard operating procedures and lack of right skills and educational background to implement TPM category results, the P value (Sig 2-tailed) is which is indicates more than the Alpha value of 0.05, it was found to be not significant. Therefore the results indicate that the stated null hypothesis is accepted and also this study make out TVS Motors Company had follow better and rational operating procedure for TPM implementation in the organization.

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