

STUDY OF SYNCHRONIZATION IN THE AREAS OF TPM IMPLEMENTATION

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ABSTRACT

It is normal to find industries, which implemented the TPM (Total Productive Maintenance) as a factory management system the challenge of understanding, practicing, and transferring knowledge to the new members of the team according to the turnover. The synchronization among management, maintenance, and production when defective results in serious damages on a strategically level. This paper aims to analyze the biggest difficulties when synchronizing the areas as well as verifying if the problems start top-down or bottom-up. A survey has been used as a research method in order to evaluate the level of understanding and acknowledgment by the involved and it has been found that, in this specific team, the impacts (the positive as well as the negative ones) start in a bottom-up manner.

Keywords: 5S; TPM; top-down; bottom-up; turnover.

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1. INTRODUCTION

The TPM (Total Productive Maintenance) activities should be encouraged, not imposed, once the mandatory constitutes an opposition to the willpower inherent of each individual. The wish that the employees should believe in TPM, when the leadership itself is still skeptical, prevents its accomplishment (Nakajima, 1989). The High dome has a great role in implementing the TPM, the top-down decisions impact significantly on the autonomous team (operators and production assistants).

Besides the management, the production and maintenance are high importance areas in the TPM system, each one with its own contribution, but both essential. The Autonomous Maintenance activities are part of the main features in TPM, the operators get involved in the routine maintenance and in improvement activities that avoid the accelerated deterioration, control the contamination, and help to improve the equipment conditions (Suzuki, 1994).

Moreover, these three areas there is also the support areas, such as HR, Quality, Safety, Environment, among others that support and are essential for the TPM system.

This paper is organized as follow. The Section 2 starts with the definitions of 5S what is considered as the base of TPM. The Section 3 explain the TPM concept and turnover and it challenges. In the Section 4 is discussed the top-down versus bottom-up concepts. The Section 5 shows the types of decisions related with the TPM implantation. Section 6 present the results of the survey that was applied in a Brazilian food industrial of chocolate and discuss in the Section 7 are the conclusion of the survey study.

2. 5S

The 5S is a program that, as well as the TPM, was created in Japan and it is currently practiced for many organizations from all segments. The term 5S means: Seiri, Seiton, Seisou, Seiketsu, and Shitsuke and it is translated to English as Sort, Systematize, Shine, Standardize, and Sustain. According to Rebello (2005), the 5S methodology is the determination to organize the workplace. Sort, systematize, and shine refers to the people's activities; standardize refers to the completion of the

previous systematically; Sustain refers to the maintenance of the new established order. The TPM basis is the 5S methodology, and it depends 100% on the commitment of everybody involved, as it is showed in the next topic.

3. TPM

The TPM is a methodology developed in Japan and originally published by the JIPM (Japan Institute of Plant Maintenance). According to Tavares (1996): T = Total, in the sense of global efficiency, the equipment and the production systems full cycle of life, and the total scope of this philosophy, reaching all organizational levels. P = Productive, meaning the continuous search for maximum efficiency in the organization as a whole, reaching zero loss. M = Maintenance, keeping the equipment preservation and productive process objectives reached, maintaining the productive systems in ideal conditions. Eight pillars sustain the TPM, but the basis is the commitment of everybody involved, as showed in Figure 1:

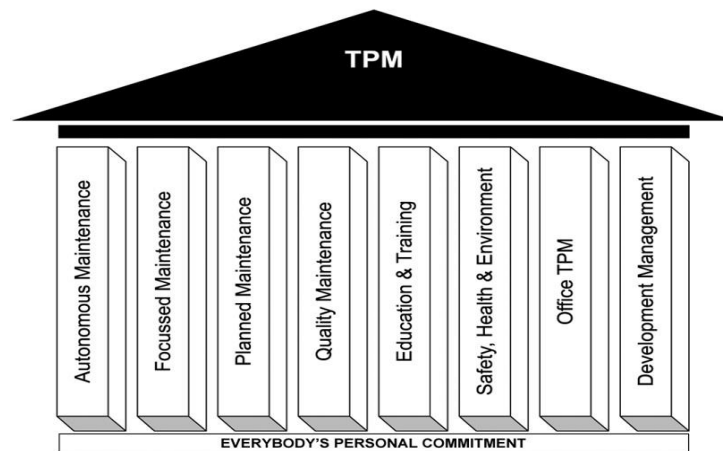


Figure 1: The Eight Pillars of TPM (Suzuki, 1994)

Each pillar is responsible for the development of activities that control and keep the TPM's expected results. Nakajima (1989) defined the each pillar individually: Autonomous Maintenance: It's based on practical and theoretical training received by the workers and the work ethic in order to continuously improve the production and maintenance routines. The autonomous identify from anomalies to improvement opportunities that could result in specific improvement projects involving the previous pillar.

Focused Maintenance: The concept of Corrective Maintenance is used here in order to act on the chronic loss related to the equipment. This pillar is responsible by the liberation of the losing tree, what serves as support for the improvement identification; it also charges as well as supports existent projects.

Planned Maintenance: It refers to the preventive maintenance routines based on time or equipment conditions, seeking continuous improvement in availability and reliability as well as the cost reduction with maintenance. It is in the planned maintenance that the most part of the anomalies and improvement opportunities are put into practice. **Quality Maintenance:** It is about the interaction of equipment reliability and product quality and the capacity of attendance on demand.

Education & Training: It refers to the application of leadership technical and behavioral training, the edibility and autonomy of the teams. The Education & Training pillar has a fundamental role in supporting, as its own name says, the training of the employees when necessary, no matter if it is a recycling training or a new one, objectifying the knowledge and team integration.

Safety, Health & Environment: Dependent on the action of the other pillars, this pillar has the focus on the continuous improvement in the work conditions, and the reduction of environmental and safety risks.

Office TPM: It uses the concepts of organization and waste elimination in the administrative routines, which in some way interfere in the equipment and productive process efficiency.

Development Management: It uses the concepts of Preventive Maintenance, where every history of previous equipment or similar is used since the project in order to build equipment with proper reliability and maintainability. For short, it can be said that, TPM success is directly connected to its pillars commitment and synchronization, and the employees from the support areas and production compose those. However, if there is a place or specific pillar that can be considered fail, stopping the company to accomplish the desired result.

4. TOP-DOWN X BOTTOM-UP

Two important aspects about TPM is the impact of the decisions analysis, and the behavior of the individuals to the common objective. According to de Oliveira (2006)

the top-down analysis make sure that decisions regarding the course of certain public police are taken by authorities that have control over the process and can decide what and how this policies will be implemented. The bottom-up aspect is somehow opposite to the previous one, it emphasizes the importance of those who found themselves closer to the resulting actions in the public policies. In the industrial case, the top-down definition is about the high dome and the bottom-up is about the common workers.

5. RESEARCH

5.1. Research methodology

In order to elaborate this article, it was adopted as strategy an explanatory research to analyze the TPM implementing in a large food company from the industrial hub of Extrema-MG, Brazil. It was made a survey with 24 qualitative questions (Appendix) for the collection and quantification of data from the answers.

The survey was applied during the daily TPM meeting in all plants in implementation process. People answered the survey from production (autonomous), maintenance, and leadership. Summing of 28 people from the production, 3 from maintenance and 7 from leadership have answered. The question one is about position on the organogram.

Considering the total sample response:

- 65.7% of the people know the concept of TPM very well,
- 34.2% know little about it; 31.6% consider it an easy methodology to be followed,
- 50% think it is reasonable,
- 15.8% believe it is a little complicated,
- 2.6% consider it as being very complicated.

About understanding the methodology:

- 31.6% believe it is very easy,
- 57.9% say it is reasonable,
- 10.5% say it is complicated to understand.

About the individual contribution for the TPM development:

- 65.8 % claim they can contribute a lot,

- 34.2% believe they can contribute a little.

The answer closest to unanimity was the one where the TPM contributes for the increase of productivity and availability in the company, where:

- 84.2% of the people answered that it contributes a lot,
- 15.8% believe it contributes a little;
- 81.6% believe that the autonomous can contribute a lot for the methodology success,
- 18.8% believe a little on that.

Regarding the leadership support:

- 78.8% think it is very important,
- 21.1% believe it is not very important;
- 73.7% claim that the leadership involvement in the company is very good, because it always supports the autonomous in the TPM, encouraging improvement,
- 26.3% say that there is only a small participation, interaction and support from the leadership;

Regarding the integration between areas:

- 60.5% know all the members from the maintenance work group,
- 31.6% know a lot of the members,
- 7.9% know a little of them.

About the knowledge of the production staff:

- 57.9% know all the members of the group in their plant,
- 31.6% know several members,
- 5.3% claimed to know only a little,
- 5.2% of the surveyed know about every day that there are meetings from the autonomous staff in their plant,

About the group meetings:

- 27.5% know about some days.
- 39.5% participate frequently in their group meetings,
- 55.3% have good participation, and 5.3% participate a little.

About their teams, being invited for other groups meetings:

- 10.5% claim that are always invited,
- 26.3% say they are frequently invited,

- 44.7% are almost never invited,
- 18.4% have never been invited.

Regarding the TPM practice,

- 47.4% aim to help always so that a problem does not happen again,
- 36.8% help almost always,
- 15.8% help a little.

When asked if the production staff considered their opinions:

- 42.1% say that all their opinions are considered,
- 36.8% say that a few of them,
- 5.3% say they do not consider,
- 5.3% do not give opinions in meetings.

In the maintenance staff:

- 18.4% of the opinions are always considered,
- 60.5% are rarely considered,
- 2.6% are not considered at all,
- 7.9% do not give opinions.

On the specific questions:

- 81.6% believe that production and maintenance together have the greatest influence on the good TPM implementation, so the decisions taken by them have greater impact on the implementing,
- 5.3% say that the production has the greatest influence,
- 13.2% say that the leadership has the bigger influence.

On the second question, not very difference from the previous:

- 73.7% say that production and maintenance together are the responsible for the impact on the TPM implementation, so the non-developed activities can bring great consequences,
- 7.9% say that the production is the main responsible,
- 13.2% say it is the maintenance,
- 5.2% say it is the leadership.

The Table 1 has the complete survey results with the percentage from each question.

Table 1: Survey results

Question	A	B	C	D
2	65,8%	34,2%	0,0%	0,0%
3	31,6%	50,0%	15,8%	2,6%
4	31,6%	57,9%	10,5%	0,0%
5	65,8%	34,2%	0,0%	0,0%
6	84,2%	15,8%	0,0%	0,0%
7	81,6%	18,4%	0,0%	0,0%
8	78,9%	21,1%	0,0%	0,0%
9	73,7%	26,3%	0,0%	0,0%
10	60,5%	31,6%	7,9%	0,0%
11	57,9%	36,8%	5,3%	0,0%
12	28,9%	23,7%	44,7%	2,6%
13	23,7%	34,2%	39,5%	2,6%
14	76,3%	23,7%	0,0%	0,0%
15	39,5%	55,3%	5,3%	0,0%
16	10,5%	26,3%	44,7%	18,4%
17	47,4%	36,8%	15,8%	0,0%
18	42,1%	47,4%	5,3%	5,3%
19	28,9%	60,5%	2,6%	7,9%
20	42,1%	44,7%	2,6%	10,5%
21	18,4%	60,5%	0,0%	21,1%
22	34,2%	42,1%	21,1%	2,6%
23	81,6%	5,3%	0,0%	13,2%
24	73,7%	7,9%	13,2%	5,3%

6. RESULT ANALYSIS

The key questions in the analysis are number 23 and 24 (presented as 'specific questions' on the survey), from them it was possible to analyze which vision from the areas (production, maintenance, and leadership) related to the work groups (autonomous and maintenance). In this company, people believe that the union between production and maintenance have greater influence on the good implementation of the methodology while the activities developed by them have great impact, showed by the majority that the systematic is from the bottom-up kind. Analyzing these questions apart, we have the graphics below: Question 23. Which

area do you believe has the greatest influence in a good TPM implementation, in other words, the decisions taken by them have the greatest impact on the implementation?

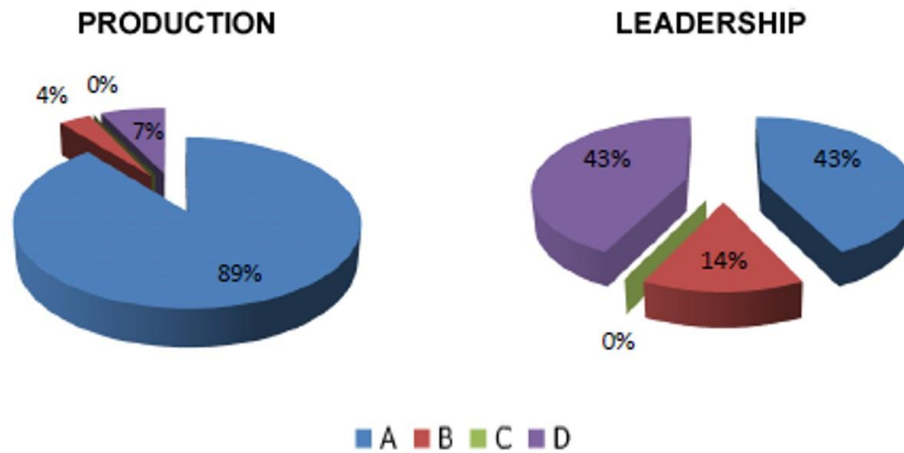


Figure 2: Question 23

All the maintenance team answered the alternative A, saying that production and maintenance together are the main responsible by influencing the TPM good implementation and 89% of the autonomous also agree. Although for the leadership 43% agree with the other areas answer, and other 43% believe that the leadership is the area with more influence.

Question 24. Which area do you believe has the greatest impact in the TPM implementation, in other words, the non-developed activities bring big consequences?

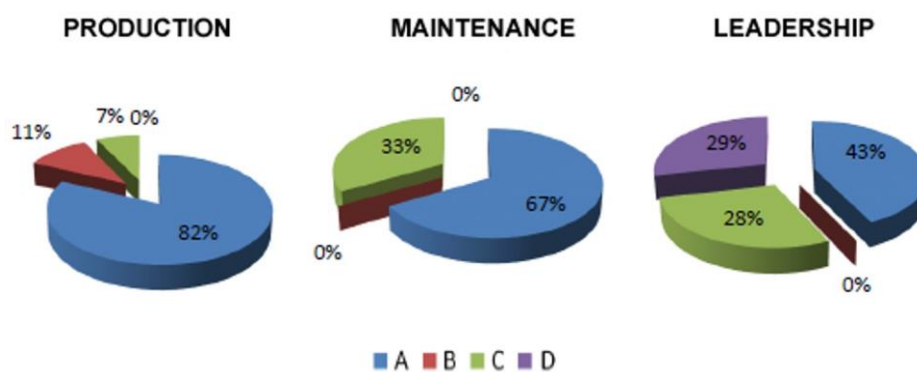


Figure 3: Question 24

Most of the three areas answered the alternative 'A', they believed that the activities developed by production and maintenance together are the ones with the greatest impacts for the company.

7. CONCLUSION

There is a good integration among the areas on the company object of research, but there are also opportunities for improvement, mainly about the participation in other groups. Many people believe that the TPM increases significantly the availability and productivity of the company; in the meantime, they do not believe they can contribute individually for such results. As seen, the turnover disturbs the implementation, what can be explained on the answers about not knowing all the members from the staff and the schedule for the meetings. According to the TPM methodology and its application on this industry, it can be said that the leadership team supports the development of the staff, but at the same time, there is a great bet that production and maintenance together are the strongest areas on the implementation, both in decision making and in the practical aspect. With a better support from the leadership, it is clear that the other areas will have better results and consequently better returns for the company.

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Appendix: Survey

TPM Routine and Activities Survey

1. What is your position in the company?

() Production

() Maintenance

() Leadership (coordinators, commissioner, manager, etc.)

General survey:

2. Do you know what TPM stands for?

A. Yes, plenty

B. A little

C. I heard about, but do not remember

D. I know nothing about TPM

3. Do you consider the TPM an easy-to-follow methodology?

A. Yes, very easy

B. Yes, reasonably

C. No, a little complicated

D. No, very complicated

4. Do you consider the TPM a methodology easy to be understood?

A. Yes, very easy

B. Yes, reasonably

C. No, a little complicated

D. No, very complicated

5. How could you contribute for the TPM development?

A. A lot

B. A little

C. Almost nothing

D. Nothing

6. Does the TPM contributes to the productivity and availability increase in your company?

- A. A lot
- B. A little
- C. Almost nothing
- D. Nothing

7. How can the team participation contribute for the TPM's success?

- A. A lot
- B. A little
- C. Almost nothing
- D. Nothing

8. Do you think the leadership support is important?

- A. A lot
- B. A little
- C. Almost nothing
- D. Nothing

9. How is the participation and involvement from the coordinators in the TPM?

- A. Very good (Always supporting the team in the TPM activities and encouraging improvement)
- B. Small (Small participation, interaction and support)
- C. Almost nothing (Rare participation, interaction and support)
- D. Nothing (Non-existent participation, support or incentive)

10. Do you know the members of the TPM maintenance group?

- A. I know everybody
- B. I know many of them
- C. I know some of them
- D. I do not know any of them

11. Do you know the members of the TPM production group?

- A. I know everybody
- B. I know many of them
- C. I know some of them
- D. I do not know any of them

12. Do you know the members of the Autonomous?

Maintenance pillar?

- A. I know everybody
- B. I know many of them
- C. I know some of them
- D. I do not know any of them

13. Do you know the members of the Planned Maintenance pillar?

- A. I know everybody
- B. I know many of them
- C. I know some of them
- D. I do not know any of them

14. Do you know when the TPM workers' meetings take place?

- A. I know all of them
- B. I know some of them
- C. I heard about it, but I do not remember
- D. I never heard about it

15. Do you participate in your group's meetings?

- A. All of them
- B. A lot
- C. A few
- D. None

16. Are you invited for other groups' meetings?

- A. Always
- B. Frequently
- C. Occasionally
- D. Never

17. Have you ever helped preventing some problem of happening again in your plant?

- A. Always
- B. Frequently
- C. Occasionally
- D. Never

18. Are your opinions considered by the production workgroup?

- A. Yes, all of them
- B. A little
- C. They are not considered
- D. I do not give opinions

19. Are your opinions considered by the maintenance workgroup?

- A. Yes, all of them
- B. A little
- C. They are not considered
- D. I do not give opinions

20. Are your opinions considered by Autonomous Maintenance pillar?

- A. Yes, all of them
- B. A little
- C. They are not considered
- D. I do not give opinions

21. Are your opinions considered by Planned Maintenance pillar?

- A. Yes, all of them
- B. A little
- C. They are not considered
- D. I do not give opinions

22. Do you know the other TPM pillars?

- A. All of them
- B. Some of them
- C. I heard about it, but I do not remember
- D. I never heard about it

Specific questions:

23. Which area do you believe has the greatest influence in a good TPM implementation, in other words, the decisions taken by them have the greatest impact on the implementation?

- A. Production and maintenance together
- B. Production
- C. Maintenance
- D. Leadership

24. Which area do you believe has the greatest impact in the TPM implementation, in other words, the non-developed activities bring big consequences?

- A. Production and maintenance together
 - B. Production
 - C. Maintenance
 - D. Leadership
-