

Implications of TPM in Domestic Based Ready Made Garments Industry in Bangladesh during Corona Pandemic: A Case Study

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Abstract

Corona pandemic situation has vandalized the industrial environment of all the manufacturing industries especially ready-made garments in Bangladesh. The primary purpose of the paper is to illustrate how successful implementation of TPM can be conducted in RMG sector to regain and improve industrial scenario during the pandemic time. The case study aims to describe a procedure to improve overall equipment efficiency, productivity, quality of products, and ensure a healthier and secured working condition. The methodology mainly focused on the policy and activities taken by the industry for establishing all the pillars of TPM with an aim of conducting a successful TPM journey. Though the TPM journey was an arduous task to carry on, the industry succeeded in it through ensuring unity, cooperation and support among all level of people. The findings show that the industry witnessed a huge success in improving all the concerned areas through a successful implementation.

Keywords

Corona, TPM, Garments, Pillars, Implementation

1.0 Introduction

Many domestic based middle sized RMG industries in Bangladesh, at the present time, are facing low productivity and high product cost because of running less than their full capacity. In RMG sector, stoppage of machines or equipment can harm both production rate and quality of products. To ensure better quality products and high productivity, RMG sectors always look for downtime reduction and maintain smooth continuity in production line. In the eve of corona pandemic situation, most of the industries especially RMG industries in Bangladesh were facing numerous hurdles in maintaining production rate, product quality and safe environment. Learning the problems in RMG industry this case study was conducted in a domestic based RMG industry during the pandemic situation by following all government rules and regulations. Mainly present economic condition in domestic based RMG industry motivated us to perform the case study to mitigate their difficulties in a great extent.

1.1 Objectives

The aim of this survey based paper is to show how successful TPM implementation in industry during pandemic situation can save an industry from being extinct by maintaining products quality, improving production rate and providing safer work environment. This survey can be useful for all other moderate sized RMG industries in the pandemic situation.

2.0 Literature Review

Domestic based RMG sectors in our country usually can not make proper profit because of lower productivity and higher cost which result from utilizing less that volume. During the corona pandemic situation, this phenomenon becomes more acute in Bangladesh. Most probable and vital reason for running with less capacity and low

productivity is imperfect maintenance of production line activities, machines and equipment. Total Productive Maintenance (TPM) is considered to be the most artistic technique and strategy for promoting enhanced maintenance performance to succeed in the highly demanding market area (Nakajima 1988; Ahuja and khamba2008c). TPM acts as bridge between maintenance and production activities in the industries to enhance productivity, product quality and at the same time to reduce waste and manufacturing cost (Rhyne 1990). Another researcher described TPM as an aggressive strategy which urges on the actual improvement of the function and design of the production equipment (Swanson, 2001).

Maintenance activities in the industrial environment have been given priority for so many long time. According to the report by Mobley (1990), on an average of 28%, within the range of 15% to 40%, of the total production cost is allocated for maintenance activity. Such a huge portion of budget is allocated in maintenance activity to preserve the function of the system of an industry in an accurate manner so that the system can continue in its designed function. The aim to allocate such a considerable amount of operating budget of manufacturing industries in maintenance activity is to improve and enhance availability, product quality, safety requirement as well as increase plant cost-effectiveness level (Al-Najjar and Alsyof, 2003).

Many researchers, in many case studies, have worked on the implementation of TPM in plants, industries etc. and showed a clear view on the successful improvement in the industrial activities through TPM (Hartmann, 1992; Suzuki, 1992; Tjiri and Gotoh, 1992; Shimbun, 1995). In one research article Ireland and Dale (2001), based on a case study in three companies, gave an explanation on TPM implementation process, TPM goals, TPM journey and the responsibility of the company's TPM coordinators. Another researcher Thailander (1992) carried out his research on the benefits of TPM in various organization aspects. Tsang and Chan (2000) through a case study introduced TPM implementation in a highly precise environment of a machining factory in mainland china. Another successful implementation of TPM was carried out by Bohoris et al. (1995) in Land-Rover-Transmissions where the advantages of the computerized maintenance management were originated to lend a helping hand for the successful introduction of TPM.

The success of TPM implementation in industry has been documented in many research articles. In one research article, Carter (1999) initiated TPM implementation in the US shipbuilding where he was able to achieve higher quality and eliminate costly delays. Also, another successful TPM implementation was carried out in MRC Bearing where they came out as successful in reducing their breakdown losses almost 540 percent (Aerospace, 1999). Many other researchers narrated the successful implementation of TPM in their research article (Vasilash, 1999; McAdam and McGeough, 2000; Ferrari et al., 2002).

This research paper aims to delineate a case study, conducting in the pandemic situation in a domestic based middle sized garments industry, about the TPM journey, implementation of TPM, TPM processes and goals.

Total Productive Maintenance (TPM) was first introduced through developing the approach of preventive maintenance (PM) in Japan. A research conducted by Nakajima (1986) described how the Japan Institute of Plant Engineers (JIPE) was established in 1969 from the initiative of 20 Japanese companies. This JIPE institute, in late 1969, focused on carrying routine maintenance which was the beginning of TPM. Though, at the beginning, TPM challenge was not welcomed widely by maximum industries of Japan (Tajiri and Gotah, 1992), adaptation of TPM was speeded up in the early 1970s during the situation of economic crisis (Nakajima, 1989). TPM is considered as a combination of eight pillars which are autonomous maintenance, planned maintenance, quality maintenance, continuous improvement, early equipment management, education & training, TPM in office as well as health, safety & environment (Ahuja and khamba 2008).

3.0 Case Study

This case study was solely based on a domestic based RMG garments industry which was established in 2008 and gained popularity all over the country through satisfying customers by their product quality and price. This factory has almost 300 machines and equipment and 900 foreman (3 person for each machine) work in the production floor. The management administration consist of 100 people. The factory achieved annual sale of \$65 million last year in 2019 and revenue was almost \$20 million. The situation completely changed when the corona pandemic hit in Bangladesh. The strict lockdown and reluctance of people in doing work badly affected the early situation of the factory.

Though the factory was satisfied with an overall OEE (overall equipment efficiency) of 57% in 2019, the factory became more worried in January 2020 when their OEE dropped to 16% due to less availability, performance efficiency and quality rate. Also, in the eve of the corona pandemic situation in January 2020, manufacturing cost and customer complaints increased dramatically due to less productivity and more unavailability as well as more

accidents in the production floor. To overcome these issues the factory decided to implement TPM with an aim of improving factory scenario to get ride from getting extinct.

Table 1 has been drawn to demonstrate and compare the factory scenario of 2019 (December) and 2020 (January).

Table 1: Factory scenario comparison between 2019 (December) and 2020 (January):

Factory Scenario	2019 (December)	2020 (January)
Availability (%)	75	25
Performance efficiency (%)	90	80
Quality rate (%)	85	80
OEE (%) (OEE=Availability* Performance efficiency* Quality rate) (Tsarouhas, 2007)	57	16
Workers number	1000 person	700 person
Breakdowns/Accident number	3/ month	12/month
Customer complaints	2%	30%

4.0 Factory's Goals for TPM Implementation:

After facing adequate number of problems in January2020, at the eve of corona pandemic, the factory decided to implement TPM for the improvement of factory scenario. The main goals of the factory behind TPM implementation are listed below:

- Increase OEE and productivity keeping in mind the pandemic situation
- Satisfy Customer needs & Minimize Customer complaints
- Reduce accidents
- Increase confidence & employee participation
- Build multi skilled employees to back up the paucity of workers.

5.0 Methodology:

5.1 TPM Journey of the Industry:

The surveyed industry started their TPM journey in February 2020. The industry, on the basis of the opinion of the top level management, decided to conduct the whole TPM journey in three major stages. The major stages were:

- Preparatory stage of TPM
- Introduction stage of TPM
- Implementation stage of TPM

5.2 Activities & Policy of Preparatory Stage of TPM:

To get success in the TPM journey, the industry started the preparatory stage with great attention and care. The activities carried out in this stage are given below:

- Making sure that the top management of the industry is fully determined & devoted to the implementation of TPM policy
- Facilitating awareness programs for the top management for engaging them actively in the TPM policy.
- Making an announcement of the TPM policy in each and every area of the industry through online meeting, notice board and face to face talk.
- Facilitating awareness programs for the people who have basic knowledge about TPM policy and basic training programs for the people who lack the knowledge of TPM policy.
- Setting up TPM departmental committees by including all the people of the industry from top management (administration level) to lower management (Foreman level).
- Setting up a standard working system so that each area of the industry can be included under the TPM policy.

5.3 Introduction Stage of TPM:

In this stage, the industry made sure that the preparatory stage has been carried out successfully. Also, in this stage, the industry decided to inform all the suppliers and buyers who are associated with their products about their new policy.

5.4 Implementation of TPM:

5.4.1 Formation of new structure of the industry:

Previously, in 2019 December, the industry consisted of 1000 people in which 50 person were at the top management, 50 in the middle management and 900 people as foreman on the production floor (lower management). Figure 1 was drawn to present the previous structure of the industry.

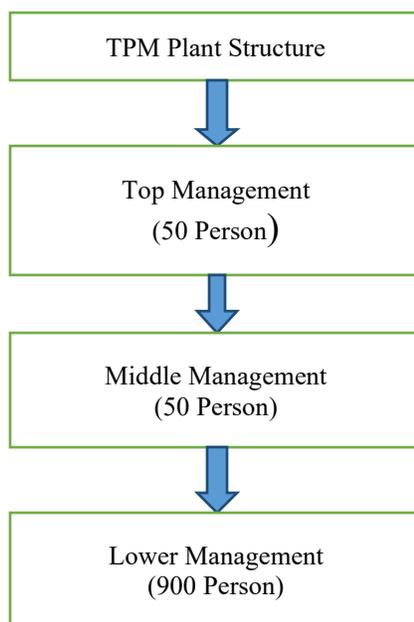


Figure 1: Previous Industry structure

Due to the pandemic attack, the industry faced paucity of workers as 300 foreman left the job which resulted in 700 people remaining in the industry. Among those remaining 700 people, 50 were from top management, 50 from middle management and 600 foreman in the production floor. By following the previous plant structure, the industry was facing numerous drawbacks which persuaded them to rebuild the structure while implementing TPM. The industry decided to form 50 TPM group to conduct the TPM journey. The new formed TPM groups were built in the following manner:

- Total 50 TPM team in the industry
- Each team consisting of 14 members where 2 belonging from top & middle management and 12 belonging from foreman level.
- Each TPM group was given the responsibility to conduct 6 machine works.
- In each TPM group, 2 persons belonging from top & middle management were in the charge of guiding and supporting the whole activities of 6 machines whereas 12 foreman actively conducted the production works.
- Besides working as the charge of TPM team, all 50 person of the top management were also engaged in the activities of overall industry management.

5.4.2 Policy & Activities Taken for Autonomous Maintenance:

The industry conducted numerous policy and activities to ensure and improve autonomous maintenance in the production area which are given below.

- Ensure regular cleaning & inspection of machines
- Ensure uninterrupted operations of machines
- Try to find out defects and eliminate those through active engagement
- Try to set up JISHU HOZEN standards
- Increase the use of flexible operators for operation and maintenance
- Ensure autonomous management and counter action for every problem.

5.4.3 Policy & Activities Taken for Planned Maintenance:

Policy and activities carried out in this stage are given below.

- Ensure regular evaluation of machines, accessories etc. and create an information management system
- Try to improve weakness and ensure reinstating decay
- Try to increase availability of machines through predictive maintenance
- Try to boost maintainability of machines

5.4.4 Policy & Activities Taken for Continuous Improvement:

Policy and activities carried out in this stage are given below.

- Try to find each and every loss occurring in the workplace and practice zero loss concept in every area
- Try to reduce cost in every step and find better cost effective way for every operation
- Perform the why Analysis concept in every area
- Ensure easy handling activities of operators

5.4.5 Policy & Activities Taken for Quality Maintenance:

Policy and activities carried out in this stage are given below.

- List major complaints of customers regarding quality issues
- Try to find out all defects occurring in the products and identify location, magnitude, severity and occurrence frequency of the defects.
- Perform root-cause analysis of the defects
- Try to prevent defects at source

5.4.6 Policy & Activities Taken for Early Equipment Management:

In this step, the industry mainly focused on two activities which are given below.

- Try to improve maintenance system everyday
- Focus on improving skills everyday

5.4.7 Policy & Activities Taken for Education and Training:

This step was a crucial task as through this step the industry aimed to build multi skilled workers and manage the paucity of workers. The main activities done in this step are given below.

- Top management provided numerous TPM online practical course which were available free in different online platform at that moment for middle & lower management people
- Top management asked for knowledge & experience from other relevant industries who had experience in TPM implementation and shared those knowledge with all other employees
- Top & middle management persons of each TPM group actively helped foreman level to improve their TPM knowledge and required skills
- Each TPM group created a learning environment where everyone enjoyed sharing their knowledge and experience in the relevant field
- Each TPM group tried to create a training environment for self-learning
- Each TPM group prepared a training calendar to conduct training activities
- Each TPM group focused on the evaluation and up gradation of skills and activities

5.4.8 Policy & Activities Taken for Health, Safety and Environment:

The industry focused strongly on this step as the whole country, at that moment, was suffering greatly from corona pandemic. The activities taken on this step are given below.

- Ensure required personal protective equipment for all people
- Ensure the availability of hand sanitizer in different locations
- Check body temperature of everyone before entering into the workplace
- Ensure self-quarantine if anyone found to have corona virus
- Ensure zero accident and health damages in the workplace

5.4.9 Policy & Activities Taken for TPM in Office:

In this stage, the industry focused more on the overall achievement of the TPM implementation. The activities carried out on this stage are given below.

- Ensure the involvement of all people in TPM implementation
- Try to utilize the workplace area
- Try to reduce repetitive works, extra inventory cost, overhead cost, extra purchasing cost, customer complaints etc.
- Ensure cooperative and supportive environment among each TPM group
- Ensure pleasant working environment

5.5 Budgeting for TPM:

Though TPM implementation has so many benefits, it needs a considerable amount of money. The industry arranged the budget for the TPM plan from government support which was provided during pandemic situation to the industries as well as from a portion of the revenue fund earned in the previous year.

6.0 Results and Discussion

Though successful implementation of TPM in any industrial area is a challenging task, the industry, mentioned in the case study, tried their best to conduct the journey. According to the collected survey data, the industry, in one year from January 2020 to December 2020, has improved their result in every sector in which they were concerned on the eve of corona pandemic situation. Table 2 was drawn to show and compare the industrial environment scenario of before and after TPM implementation.

Table 2: Factory scenario comparison between December 2020 (after TPM journey) and January 2020 (before TPM journey):

Factory scenario	2020 (December)	2020 (January)
Availability (%)	60	25
Performance efficiency (%)	90	80
Quality rate (%)	84	80
OEE (%) ($OEE = \text{Availability} * \text{Performance efficiency} * \text{Quality rate}$)	45	16
Workers number	700 person	700 person
Breakdowns/Accident number	4/ month	12/month
Customer complaints	5%	30%

From the above table, it can be easily anticipated that the industry has improved all the concerned areas including availability, performance efficiency, quality rate, OEE, breakdowns/ accidents, customer complaints etc. through conducting the TPM journey. Also, more and more managers and workers are currently showing their interests to get recruited in the industry, which is now considered as a positive sign for the future.

Based on the data of table 1 and table 2, figure 2 was drawn to illustrate and compare a clear view of the outcome of TPM journey where three different period of the industry was presented.

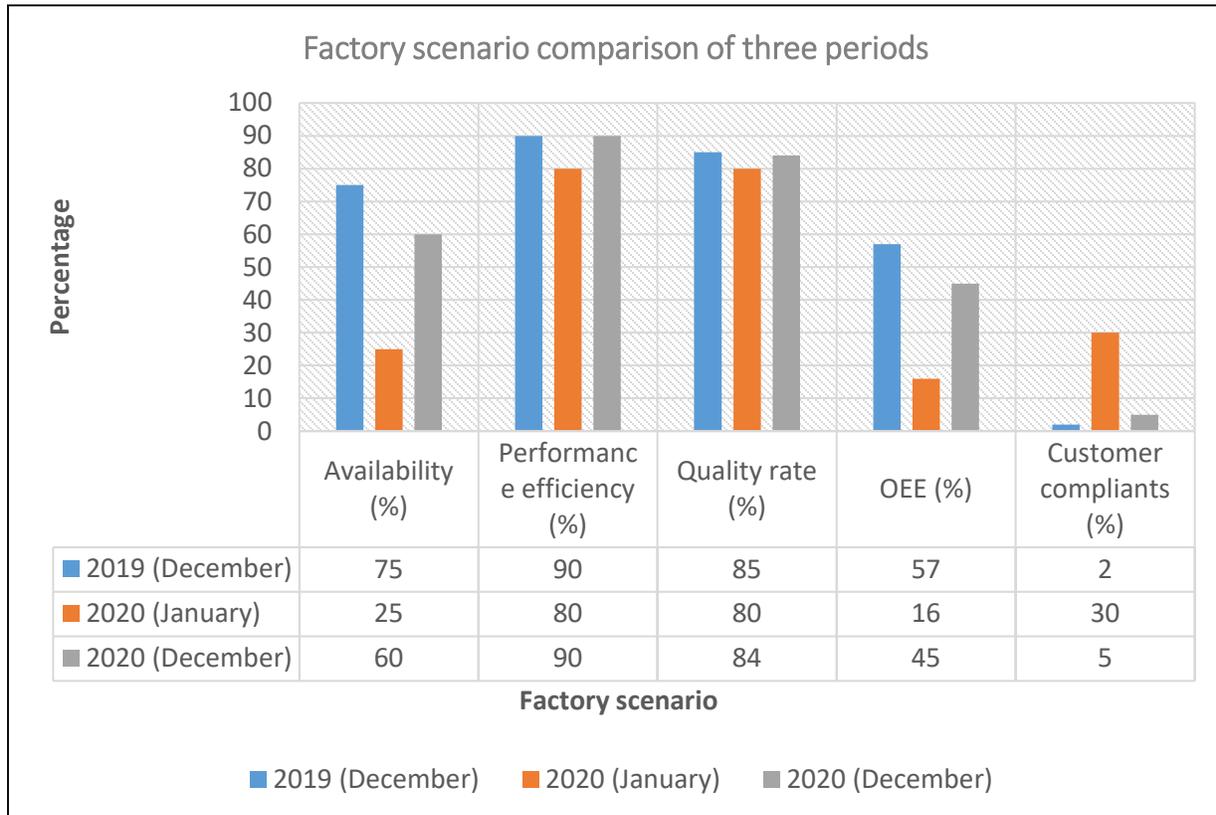


Figure 2: Factory scenario comparison of different period

From the above figure, it can be stated that the company, before corona pandemic situation in December 2019, was in a satisfactory position in respect of availability, performance efficiency, quality rate, OEE and customer complaints. Unfortunately, with the attack of pandemic situation in January 2020, the factory faced a rapid fall of 50% in availability, 10 % in performance efficiency, 5% in quality rate and 41% in OEE while at the same time customer complaints increased by 28% from December 2019 to January 2020. At that time the factory was actually fighting for their existence in the garments market. Figure 2 clearly illustrates that after introducing the TPM journey, as per the data of December 2020, the factory witnessed a sharp rise of 35% in availability, 10% in performance efficiency, 4% in quality rate and 29% in OEE to reach a final outcome of 60%, 90%, 84% and 45% respectively. Also, in December 2020, customer complaints reduced to 5% from 30%. The above figure clearly represented that the successful TPM journey is now leading the factory towards the previous satisfied scenario. The industry believes that their unity, hard working and dedication towards the TPM implementation activities make it possible to improve the industrial scenario of the industry during the existing pandemic situation. The industry is planning to conduct the TPM journey in the future and they believe the industrial scenario in the future would improve even more than their past records.

7.0 Conclusion

The reason behind implementing TPM by the industry was to overcome numerous difficulties they were facing at that time like less availability, lack of performance efficiency, dearth of quality rate, increasing amount of damage/accident, considerable amount of complaints etc. A research conducted by Steinbacher and Steinbacher (1993) presented that dissatisfaction on things may lead to the need for change. Another research done by Maggard and Rhyne (1992) stated that urgency for change can shorten TPM implementation time. The industry of the case study focused on the practical implementation of the pillars of TPM through reorganizing their plant structure. As the industry, on the eve of corona pandemic situation, were suffering from dearth of employees and working hour, they tried to find out a way by which they can utilize their existing human resource and improve productivity within

limited working hour. TPM deemed as a turning approach for the industry at that time. Though TPM journey was a difficult one to conduct, the industry succeeded to carry on the journey through ensuring unity, cooperation and support among themselves. After implementing TPM journey for 1 year, the industry got ride from getting closed and witnessed a huge success. They believe there TPM journey is not over yet. That is the reason, the industry hopes to continue this journey in the future and wants to improve more and more.

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