

Implementation and fall of TPM in Micro Manufacturing Industries Using SWOT Analysis-A Review

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Abstract— *The relationship existing between maintenance and production has been a perplexing aspect in the tiny manufacturing industries. Understanding the global prevalence and the possibility of productivity enhancement through maintenance, the Micro Industries (MI) may opt for the most used methodology called “TPM” for their maintenance needs. The tailor made pillars of the TPM will guide the tiny enterprises to establish the said tool. As far as the TPM implementations in MIs are concerned, it is still viewed as an alien to them. Even if implemented there is no structured working methodology for sustenance. This review is about this sort of MIs where a structured TPM methodology may be designed and after the implementation, the chances for fall or dereliction from the structure proposed. For the purpose, SWOT analysis is carried out to support the implementation as well as exploring the possibilities for a fall.*

Index Terms— TPM, Micro Industries, Maintenance, SWOT Analysis.

I. INTRODUCTION

Several research works are being carried out worldwide on TPM. Researchers like Curtis A Richardson [8], Ireland-Dale [9] Gajdzick [4], have conducted studies on the implementation and its impacts on a variety of industries worldwide. The above started with an optimistic note on selecting a particular industry and continued their study on how it was being implemented and never worried about the pessimistic side of it and in particular there has been no study on a Micro Industry (MI). Where, the introduction or implementation is even harder to push through. Mishra RP, Anand G and Rambabu Kodali [1]

On the other hand have carried out a SWOT (strength, weakness, opportunities and threat) analysis, which will channelize towards the usage of “S & O” for the introduction and implementation aspects and “W & T” will guide the work to avoid the fall of TPM, as analyzed by Marcelo-Kazuo [2]. For the observation a MI Chennai, India, was approached, which is a Plastic Molding Industry, supplying components to the companies and has a workforce strength of 50 and the annual turnover is of range Rs.50 lakhs to 1 crore. The organization is in the process of implementing ‘5S. A preliminary feasibility study is right now undertaken for the details discussed in this review.

II. TPM

Before talking about the tiny enterprises it is supposed that a brief introduction to the TPM is a must. TPM is a program which originated way back in the 1950’s and after a series of evolutions it is in the present status without losing its relevance and instead becoming more relevant day by day as it is widely practiced in almost all of the modern industries with a variety of variants, suitable for a particular industry. It is a series of techniques to ensure that the machinery or assets are always capable of performing the functions it is intended to do, so that the productivity is never brought down, but there exists a steady improvement of it. It has companywide prevalence, involving A-Z activities, as well as top to the bottom personnel involvement. TPM ensures the minimization of down time and maximization of the facility utilization. It metamorphoses the maintenance into a profitable activity. Its core aim is to negate the emergency maintenance and minimizing the unscheduled maintenance. It improves the output so that it becomes uniform and predictable. It involves the continuous clean up of the facility (machinery or otherwise) with the autonomous coordination of the operators/maintainers/keepers, etc; and visually identifying the maintenance requirements and ensuring the compliance. Thereby improving and sustaining the overall equipment effectiveness (OEE), viz. the index, which can be calculated as a product of Availability, Efficiency rate and Quality rate. This is possible by means of teams, which review, analyze, improve and track the progress on maintenance and overall operation effectiveness. The TPM philosophy also works well along with the other quality policies like, Six sigma, Lean, TQM as studied by AJ THomaset.al [6], RenukaT et.al[7], Curtis [8], etc., As an

SWOT ANALYSIS



Fig.1 SWOT Analysis

outcome, more reliable facility with a predictable output, competitive in all respects. involved employers and near elimination of unexpected downtime are achieved.

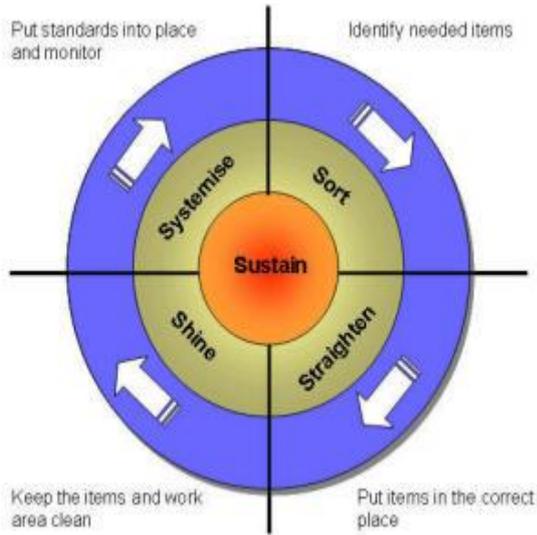


Fig.2 5S

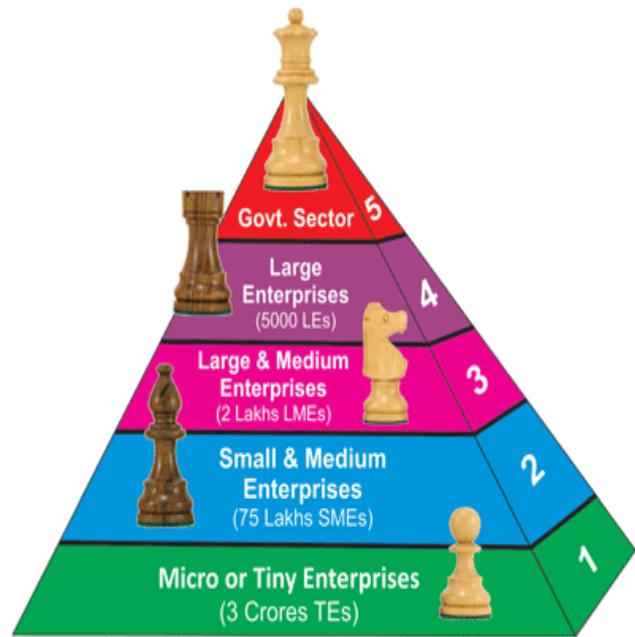


Fig.3 Micro Industry

III. MPORTANCE AND RELEVANCE OF TPM IN TINY ENTERPRISES

Most of the small, medium, and large enterprises (SMLE) rely on many tiny industries for most of their smaller components, which may be functioning as individual units or may be ancillary units of the main units. Whatever may be the case tiny enterprises have a noticeable impact on the whole. Our consideration is the tiny units run individually, where the annual transaction is limited and varies with the country. There are many tiny units functioning in a conventional manner without the knowledge of or not considering the modern trends. On the other hand they struggle a lot for a survival and to withstand the competition. Of course to be competitive they need to update themselves. But they are afraid of the increase in the expenses as well as lack of personnel to guide them. Moreover the complications in the understanding of the core concept of any modern tools, aids, techniques etc., impair such implementation of it, even in small, medium and large industries themselves it is difficult, due to non involvement of the top management as well as the personnel up to the lowest rung. Cynicism is always there considering TPM also as one of the 3 or 4 letter acronym of the month. Since the outcome as well as the benefits of TPM could be perceived only after a long term proper implementation without any lacuna. But there is a clear evidence of positive outcomes and noticeable benefits as found by Mishra RP[1], Gadjick[4], Thomas AJ [6]. Considering the tiny enterprises, to taste the benefits they are not ready to spend time, money, personnel etc., and they still prefer short term benefits. This makes the introduction of TPM in such industries become more and more difficult. Finding an apt tiny industry and convincing the management remains a Himalayan task. Despite all the stumbling blocks TPM remains a relevant and important technique to be

IV. INVOKING SWOT ANALYSIS FOR THE IMPLEMENTATION

As discussed by Mishra RP et.al [1] there exists a number of frame works designed by or adopted by a variety of industries/organizations, selecting a suitable frame work for a tiny manufacturing facility is a difficult job. So conducting a SWOT analysis is a right choice. The common elements of almost all the frame works are

- Kobetzu Kaizen (continuous improvement)
- Jishu Hozen (autonomous maintenance)
- Education and Training
- Early Maintenance Management
- Quality Management
- Administrative (Office)TPM
- Safety, Health and Environmental consideration
- Planned Maintenance



Fig.4 TPM Pillars

Which are termed as the Pillars of TPM as mentioned by Fore S et.al [3] Initially a model may be designed which concentrates on the economic efficiency, which plans and controls the maintenance expenses , to gain confidence of the top management, of course a tiny enterprises is mostly run by

a single owner. Convincing him using economic efficiency of the model may be attractive, of course zero accident, zero defect and zero failure are underlying agenda of the model. Coming to the workers participation, the tiny units normally have only temporary workers or workers' turnover would be more, this should be changed. Though the work force is of small strength it should be properly paid, educated and trained so that understanding and involvement would be there from their part, which in turn results in staff retention.

V. STRENGTHS

The first step towards the introduction of TPM is introducing "5S", as mentioned by Gadjick [4], which makes the house in order. Certainly this needs a lot of cultural change among the workers and this is normally a slow process. A well maintained in house of an industry itself will reveal the spots need maintenance. Secondly the ownership pride of the workers upon the facility they are working with should be well promoted, as told by Fore S et.al [3]. The normal situation in a tiny enterprise is, as and when there is maintenance need, they call upon the maintenance crew externally to get the job done, as they don't have a team as part of their staff.



Fig.5 Productivity Influence

This is slowly and partially replaced by the existing staff themselves as they may be educated and trained on the simple maintenance activities in addition to the running of the facility, to make this possible, incentives may be announced based on the nature of the maintenance needs, which is normally going to be less expensive. This slowly starts attacking the major losses [12] as observed by Fore S et.al[3], which results in reduced variation, increased

flexibility, increased labor productivity, reduced replacement cost, reduced energy cost, reduced downtime etc.,

VI. OPPORTUNITIES

Thus the TPM introduction may be directly establishing a link between TPM and business goals, as referred to Pinjala SK et.al [11]. An opportunity may be created to invoke continuous improvement in all the sections. The industry gradually starts responding quickly to the market changes. As a result minimization of inventory takes place. Innovative maintenance suggestions by the workers are increased and it should be well heeded. Thereby availability and better services to the customers is possible. Improved safety and reduced accidents add to the productivity. Capital requirements for buying new equipment are reduced due to the better condition of the existing equipment, as termed by RenukaT et.al [7]. Operators become multi-skilled as an added advantage. Both the management as well as the operators reach a win-win situation. All these opportunities are waiting to be grabbed.



Fig.6 Safety Map

VII. WEAKNESS AND THREATS

Despite of all the above, several factors are there strongly affecting the TPM implementation if not nurtured well as observed by Marcelo- Kazuo [2], Mishra RP [1] and Fore L Zuze [3]. As part of the SWOT analysis, several weakening aspects threaten the sustenance. As studied by Marcelo-Kazuo [2] the following may impair the success: the culture of the industry has a strong role in the dereliction. Changing their culture is not an easy task; likewise the shallow knowledge about TPM impedes the process. Another factor is improper training by the improper trainers. Sustained

management support against all this is a must, which normally could not be expected from a struggling management, as it may not consider TPM as full time job. The monotony of the job, lack of enough time for autonomous maintenance, single operator commanding more than one machine, omitting some of the consolidating steps of TPM, lack of follow-up and evaluation, investment cuts, constant changes in the schedule etc., are generally identified as reasons affecting TPM success. Coming to resources, it is another important aspect, it may be personnel, funding, etc., and a proper planning in these areas could nullify these weaknesses. Lack of or not recording the data may also affect the OEE calculation. Likewise over- simplification of the TPM process may too be a weakness to the organization. Excessive – cleaning, labeling, tagging, color coding etc., may not be suitable for tiny enterprises. If the TPM activities are not directly leading to cost reduction means it may dishearten the management and its consistent, unclear expectations. The reward and recognition system will also be a weakening factor, if not suitably amended. The threats could even be the complexities, labor-unions, lack of competency, focus, modernization, structure and the likes. Too much of autonomy to the operators, resistance to total discipline, focus only on output ignoring the quality, views on TPM as a program and not as a process, total copying of the TPM methodology applicable only to the SMLEs etc., may too come into play. Of course the weaknesses and threats are common to SMLE and Micro enterprises, the MIs are very much vulnerable to the above all, altogether may lead to a disastrous failure.



Fig.7 OEE Cycle

VIII. CONCLUSION

TPM for Micro enterprises (MIs) is an excellent idea but identification of a MI introduction and implementation is the most difficult part of it. If it could be accepted, SWOT analysis may be done, which is MI specific and based on strengths and opportunities listed out [13], the MI management may trigger the process and should be extremely cautious about the weaknesses and threats, which could be easily kept at abeyance, if the top-management has the conviction.

| Total Productive Maintenance... | |
|---|---|
| IS... | IS NOT... |
| A broad-based improvement strategy that involves changing everyone's daily work...and building and sustaining new leadership practices. | A maintenance improvement strategy for a select few, implemented by the maintenance department. |
| A cornerstone of lean management, and a prerequisite to achieving true flow. | An afterthought or add-on element to lean, six sigma, or other continuous improvement efforts. |
| For all types of manufacturing, service, and healthcare—that is, for any organization that has people and equipment. | Only for process manufacturing or other subsets of the manufacturing industry. |

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