



## Original

# Discussion on key successful factors of TPM in enterprises

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## Abstract

It generally takes 2.5 to 3 years for an enterprise to implement TPM in a full swing; however, the actual duration depends on each company's corporate status. Generally speaking, for a company with big staff, it even takes 3 to 5 years, but the major consideration should depend on whether the actual benefit is remarkable or not. This research aims to find out whether total productive maintenance (TPM) was carried out by enterprises, to inspect the enterprises' current performance, and to make comparison with those enterprises that have successfully carried out TPM. Through the findings, we hope to provide reference for enterprise owners when they carry out TPM, so as to reduce the cost for fumble.

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**Keywords:** TPM; Total productive maintenance; Competitiveness

## 1. Introduction

Silver and Fiechter (1995) emphasized that it was not possible to immediately carry out the eight supporting activities of total productive maintenance (TPM) when an enterprise

decided to import TPM. He pointed out that it's better to comply with the twelve steps of TPM implementation and push forward steadily, and this was called mastering the key to success. The twelve steps of TPM can be divided into four stages (Table 1).

Table 1  
The twelve steps of TPM implementation.

Stages	Steps	Key Point
Preparatory stage of importing TPM	1. Determination manifesto of importing TPM among operation stratum	Make manifestos at the internal TPM seminar, and publish in enterprise restricted publication
	2. Education and advocating of importing TPM	Cadres: accommodation, research and study for leader level cadres General: slide show
	3. TPM promoting organization and establish career structure demonstration	Committee, special departmental committee, affairs bureau structure demonstration
	4. Basic Policy and Target Setting of TPM	Forecast of reference value and target effectiveness
	5. Design the main plan of carrying out TPM	From preparatory stage of importing TPM to acceptance of examination
Commencement of importing TPM	6. The implementation of TPM (the Kick-Off Meeting)	Entertainment of stock manufacturers, affiliated companies, and third-party companies
Implementation stage of importing TPM	7. Establish efficiency system for production department	Pursue the maximum efficiency of production department
	8. Establish initial management system for new products and new equipments	Development of easily-made products and easily-used equipments
	9. Establish quality maintenance system	Will not occur undesirable condition setting and its maintenance management
	10. Establish efficiency system for management and indirect departments	Support the efficiency of production, department, and equipments
	11. Establish management system of safety, health and environment	Establish zero disaster and zero public hazard system
Realization stage	12. Full implementation and level upgrading of TPM	Accept examination of TPM, and challenge for higher goals

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Table 2  
Summary of key successful factors.

Scholars	Key Successful Factors
Wu and Seddon (1994)	<ol style="list-style-type: none"> <li>1. Long-term commitment to TPM by senior managers</li> <li>2. Continuous and obvious concentration and support to TPM by senior managers</li> <li>3. Participation of the Union</li> <li>4. Have a complete TPM aide and organization on line</li> <li>5. Carry out effective feasibility studies</li> <li>6. Develop effective lead-in plan</li> <li>7. Develop a strategy which is suitable for company's environment, equipments and products</li> <li>8. Acquire the support from employees within the company</li> <li>9. Reach cognition on TPM and strengthen continuously</li> </ol>
Patterson et al. (1995)	<ol style="list-style-type: none"> <li>1. The support and commitment from senior managers</li> <li>2. Promote and establish some kind of team culture</li> <li>3. Full empowerment to the employees</li> <li>4. Overall employee involvements</li> <li>5. High involvement willingness of the operators to the maintenance works</li> <li>6. Acquire the consensus of all employees within the company</li> <li>7. Technical trainings to the operators</li> <li>8. Cognition and support to TPM activities by maintainers</li> <li>9. Make the best of equipment maintenance records, and seize the opportunities of improvement</li> <li>10. High value on long-term benefits by senior manage</li> </ol>
Windle (1993)	<ol style="list-style-type: none"> <li>1. Measurable policies, targets and effectiveness</li> <li>2. Clear management plans and implementation of factory management</li> <li>3. Carry out high-quality, high-effective educational trainings</li> <li>4. TPM director who can solve problems, supervise the implementation of plans, and take accountability</li> <li>5. Make all employees understand the meanings of TPM promptly</li> </ol>
Williamson (1997)	<ol style="list-style-type: none"> <li>1. The steps of TPM implementation were carried out thoroughly</li> <li>2. The support and resolution of senior managers</li> <li>3. The consensus of all employees within the company</li> <li>4. Establish specific department to carry out TPM activities</li> <li>5. The operating department must take out more inspections to related industries, and attend workshops</li> <li>6. Establish the consensus of all employees within the company</li> <li>7. Leaders and directors of all level should attend more seminars or educational trainings</li> <li>8. Integration of personnel and equipment, and reasonable improvement</li> </ol>
Kristy et al. (2001)	<ol style="list-style-type: none"> <li>1. Commitment from senior managers</li> <li>2. Recruit talented people, and establish reliable promoting department</li> <li>3. Motivate employees to devote themselves to TPM</li> <li>4. Draw up educational training plans carefully</li> <li>5. Re-examine the most optimum organization and system</li> </ol>
Chand and Shirvani (2000)	<ol style="list-style-type: none"> <li>1. Establish project team with combination of the current system</li> <li>2. Establish overall and long-term targets</li> <li>3. Set awards for challenges</li> <li>4. Carry out educational trainings</li> <li>5. Guidance from professionals</li> </ol>
Rodrigues and Hatakeyama (2006)	<ol style="list-style-type: none"> <li>1. Launch the 5S movement and carry out complete implementation</li> <li>2. Organizational operation of small groups during self-maintenance</li> <li>3. Continuous educational trainings, and cooperate with the carrying out of TPM</li> <li>4. Support and participation of all directors</li> </ol>
Katila (2000)	<ol style="list-style-type: none"> <li>1. Education and training on TPM</li> <li>2. Establishment of maintenance system</li> <li>3. Real supervision of senior directors</li> <li>4. Lead-in education on TPM</li> <li>5. Plan the promotional organization of TPM properly</li> <li>6. Establish thoughtful preventive maintenance policies</li> <li>7. Good maintenance data record or maintenance status</li> <li>8. Upgrade in maintenance management technologies</li> </ol>
Khanlari et al. (2007)	<ol style="list-style-type: none"> <li>1. Sufficient understanding and support of TPM by senior managers</li> <li>2. Proper candidate of affairs bureau for promoting TPM</li> <li>3. Start with cadre demonstration (career demonstration), and activate enthusiastic participation of employees</li> <li>4. Get full understanding on the basic conditions that equipment should possess</li> <li>5. Equipment specialized department should possess sufficient professional knowledge, and have effective supportive live activities</li> <li>6. There should be seed personnel promoting teachers within factories</li> </ol>

## 2. Total Productive Maintenance

TPM is composed by the first English letters of T (Total) PM (Productive Maintenance). Its definition was as follows:

1. Target to achieve the maximum equipment efficiency (overall efficiency).
2. Establish TPM system which targets at equipment life of maintenance prevention, preventive maintenance and corrective maintenance.
3. All related persons should participate jointly, e.g. equipment planner (Planning Department), equipment user (Manufacturing Department), and maintenance person (Maintenance Department), etc.
4. Promote TPM by independent small group activities.

In order to carry out in full swing throughout the company, Okogbaa et al. (1992) put forward a new definition, i.e. TPM throughout company. The definition is as follows (Pintelonm & Wassenhove, 1990):

1. Pursue the maximum efficiency of manufacturing system (overall efficiency), aiming at improving enterprises' quality.
2. Under the framework at scene and with material, and targeted at the entire life circle, pursue zero disaster, zero defectiveness, zero breakdown and prevent all losses in advance.
3. Except manufacturing department, all departments (developing department, sales department, management department) are also involved.
4. Overall employee involvement, up from the operational strata, and under to the front-line.
5. Achieve the goal of zero losses through repeated small group activities.

In addition, some other scholars gave definition to TPM as follows: a collaborative approach for continuous improvement on product quality, operational effectiveness, grasp of productivity and safety between organization functions, especially between productivity and maintenance, also emphasize that the "Total" in "TPM" means overall employee involvement in enterprises, i.e. continuous improvement on overall efficiency and active employee involvement. Roup (1999) considered that there were three components of TPM:

1. Emphasize on continuous improvement of equipment.
2. Jointly share the responsibility of equipment maintenance.
3. Emphasize on autonomous work teams on equipment.

While MacAdam and Duffner (1996) considered that TPM was not only a problem on technology and machinery, or 5S, OEE, TPM is exactly a change in management method. This research plans to adopt Yamashina's definition to TPM which is relatively complete; moreover, other scholars' definitions are all covered in his definition (Yamashina, 2000).

## 3. Discussion on Key Successful Factors of TPM

Lixin et al. (2011) pointed out that in aspects of domestic cases developed TPM gradually and steadily in three stages. Through comparison between literature discussion, and the researches and perspectives of key successful factors of TPM by many scholars and experts, we get the summary listed in the attached Table 2. The core factors proposed by foreign scholars and experts are exactly consistent when being compared. Most of these factors emphasized on the commitment and involvement of management, the promotional organization and overall involvement.

## 4. Conclusions

Through comparison between literatures and actual cases, this research aims to understand the successful factors of implementation of TPM. And through comparison with those enterprises that have successfully carried out TPM, this research helps to understand the steps of carrying out TPM.

## References

- Chand, G., & Shirvani, B. (2000). Implementation of in cellular manufacture. *Journal of Materials Processing Technology*, 149-154.
- Cua, K.O., McInerney, K.E., Roger, G., & Schroeder, A. (2001). Relationships between implementation of TQ, IT, and TPM and manufacturing performance. *Journal of Operation Management*, 675-694.
- Katila, P. (2000). *Applying total productive maintenance-TPM principles in the flexible manufacturing systems* (p. 23). Technical Report. Lulea Tekniska University.
- Lixin, M., Shicheng, D., Yunqi, G., & Guiwen, Y. (2011). Study on application of TPM in small and medium-sized enterprises. In: *2011 International Conference on Management Science and Industrial Engineering (MSIE)* (pp. 678-681). IEEE.
- McAdam, R., & Duffner, A.M. (1996). Implementation of total productive maintenance in support of an established total quality programme. *Total Quality Management*, 7, 613-630.
- Okogbaa, G., Huang, J., & Shell, R.L. (1992). Database design for predictive preventive maintenance system of automated manufacturing system. *Computers and Industrial Engineering*, 23, 7-10.
- Pintelonm, L., & Wassenhove, L.V. (1990). A Maintenance Management Tool. *OMEGA*, 18, 59-70.
- Rodrigues, M., & Hatakeyama, K. (2006). Analysis of the fall of TPM in companies. *Materials Processing Technology*, 276-279.
- Roup, J. (1999). Moving beyond TPM to total plant reliability: Redefining the concept to optimize benefits. *Plant Engineering*, 53, 32-5.
- Silver, E.A., & Fiechter, C.N. (1995). Preventive maintenance with limited historical data. *European Journal of Operational Research*, 82, 125-144.
- Wayne, P.J., Kennedy, W.J., & Fredendall, F.D. (1995). Total Productive Maintenance Is Not for This Company. *Production and Inventory Management Journal*, Second Quarter, 61-63.
- Williamson (1997). Improve Organization Performance with Total Productive Maintenance. *Plant Engineering*, 46, 110-114.
- Windle, W.M. (1993). TPM: more alphabet soup or a useful plant improvement concept? *Plant Engineering-Chicago*, 47, 62-62.
- Wu, B., & Seddon, J.J. (1994). An anthropocentric approach to knowledge-based preventive maintenance. *Journal of Intelligent Manufacturing*, 5, 389-397.
- Yamashina, H. (2000). Challenge to world-class manufacturing. *International Journal of Quality & Reliability Management*, 17, 132-143.