

Total Productive Maintenance And ISO 9000

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INTRODUCTION

Emerging industrial environment shows an enormous acceleration of interest in and widening of the boundaries of quality. There is an upsurge of activity in the Indian industry due to liberalization of the Indian economy. Indian industries have recognized quality as de rigeur for long term survival and for entry into competitive global markets. We can not afford to set aside with global competition heating up. Corporate leaders must realize this and establish dynamic forward looking cultures within their companies to survive in the global village of the business world.

In pursuit of excellence, quality has taken a tangible form with the advent of ISO 9000 series of standards. They represent worldwide integration of standards, which will benefit all enterprises. Adherence to ISO 9000 provides an over all improved competitiveness as it ensures control, consistency, assurance of high standards, improved productivity, and most importantly improved quality. It is recognized internationally as a bench mark for measuring quality and providing a measure of an organization's ability to consistently deliver a product or service that meets the requirements of its customers.

The ISO 9000 has recognized maintenance as an important aspect of quality management system for efficient and effective use of machinery and equipment. Total Productive maintenance (TPM) is directed at using equipment and machinery to the fullest possible extent without dislocation in the production process for achieving the desired quality and efficiency in production. It aims at:

- (a) Maximization and improvement of overall effectiveness.
- (b) Establishing a total system of Productive Management covering the whole life cycle of equipment and machinery.
- (c) Involvement of all concerned functions such as equipment planning, equipment usage, maintenance.

(d) Participation of personnel from top management down to shop-floor workers.

(e) Promotion of productive maintenance through motivation management, that is, small group autonomous activities.

The TPM can dramatically revitalize the work place by providing the mechanism for achieving a 'zero loss' workplace with zero breakdowns, zero defects and zero accidents.

ORIGIN OF CONCEPT OF TPM

The World War II had devastating impact on economies of many countries and Japan was the worst sufferer. It's economy was totally shattered. But soon after the war concerted efforts were made for industrial reconstruction. To achieve this objective the Japanese companies took upon themselves the task of conservation of resources and the fullest utilization of industrial equipment. This led to development of the concept of Total Productive Management (TPM) in 1951. Japan was the first country to introduce preventive maintenance. The concepts and techniques of preventive maintenance acquired from the United States heralded the modernization of plant maintenance in Japan.

In the mid 1960's, automation of industrial production brought in automated manufacturing and assembly operations creating a new era of maintenance of automated equipment. It was found that the maintenance operators could not effectively maintain the greatly increased number of automated equipment. To meet such challenge, the managements of large companies introduced a practice of making the operators of automated equipment responsible for routine maintenance of the equipment. This was the origin of one of the important features of TPM, which is autonomous maintenance by production operators.

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In the pursuit of excellence in goods and services, Japanese adopted new concepts in the governance of enterprises. The concept of Quality Circle (QC) originated in 1962 as an effective tool for employee involvement, motivation and quality and productivity improvement. Simultaneously, a new movement called the zero defect (ZD) programme originated in the United States was introduced in Japan in 1965, and since quality circles were already active in some of the Japanese corporations by that time, the zero defect programme was combined with quality circles to give birth to voluntary small groups called the ZD groups. The activities of the ZD groups were primarily aimed at the assurance of the quality of products and production processes. Thus another feature of participation of employees through small group voluntary activity emerged.

The preventive maintenance had been recognized by many Japanese companies for improvement of equipment availability and also autonomous maintenance by production operators. This freed the maintenance personnel from the routine maintenance tasks. This by 1979-80 made easier for introduction of TPM where the maintenance function took the task of maintenance planning based on equipment performance and equipment modification for improved reliability and maintainability, development of reliability and maintainability specifications for new equipment and machinery designing-out-of-maintenance.

Application of productive maintenance for maximization of plant and equipment effectiveness in the pursuit of economic effectiveness and achievement of optimum life cycle cost of production equipment was one of the important factors in Japanese success in quality and productivity.

ESTABLISHING A SYNERGY BETWEEN TPM AND ISO 9000

Basic Approach of TPM

TPM employs JISHU HOSEN (Ownership/autonomous maintenance) as strategy to give operators ownership and responsibility for their equipment. Simple cleaning, inspecting defective condition, lubricating, bolt tightening, setting standards for daily cleaning and checking makes operators develop a close relationship and understanding for their equipment.

The causes of equipment failure and poor product quality are inter-disciplinary in nature and to achieve the aim of maximization of equipment effec-

tiveness, it is necessary to have 'maintenance-oriented plant management and a plant-oriented management structure to support it. Therefore TPM focussed on the following:

- (i) total effectiveness in pursuit of economic efficiency and improvement of productivity and profitability,
- (ii) total maintenance taking from periodic, routine, or preventive maintenance activities to condition-based maintenance of plant and machinery for building reliability and maintainability features aimed at maintenance prevention and designing-out-of maintenance, and
- (iii) total participation work force through motivation, job enlargement of operators, enhancement of skills by training of maintenance staff and institution of small group activity at every level of the organization.

Adoption of the life cycle approach for improving the overall performance of production equipment ensures economic life cycle cost of physical assets. This includes building-in of reliability and maintainability features and the extension of the useful life of the assets. Since TPM deals primarily with production equipment, it used in manufacturing industries. These assets therefore include plant and machinery.

Improving productivity through a highly motivated work force which can be achieved through job enlargement in which all workers are given a range of challenging jobs in order to develop their skills at different equipment and machinery. Improving the overall performance of plant and machinery, which should also take into account the effective use of such production equipment through the minimization of losses not only due to breakdowns, but also due to poor quality and losses due to set-up, adjustment, idling and minor stoppages of the equipment and equipment operating at reduced speeds.

The use of voluntary small group activity for identifying the likely cause and frequency of failure of critical equipment, possible plant and equipment modifications which will result in significant savings, and efforts to fully utilize existing equipment through availability.

BASIC APPROACH OF ISO 9000

ISO 9000 Quality Management System standards represent international consensus on quality

management issues. They provide overall improved competitiveness as they ensure control, consistency, assurance of high standards, improved productivity and most importantly improved quality. They lay down tangible parameters to assess quality management system for ensuring consistency in quality of supplies.

The quality management system of an organization is influenced by the objectives of the organization, by its products and by the practices specific to the organization, and, therefore, quality management systems also vary from one organization to another. A major purpose of quality management is to improve the systems and processes so that continuous improvement of quality can be achieved. This is also the purpose of TPM

The principal concepts of ISO 9000 series are to:

- (a) achieve, maintain, and continuously improve the quality of products or services in relationship to the requirements of customers for quality;
- (b) improve the quality of operations of the organization so as to meet continually all the customer and other stake holders' stated or implied needs;
- (c) provide confidence to internal management of the organization and other employees that the requirements for quality are being fulfilled and maintained, and that quality improvement takes place;
- (d) provide confidence to the customer and other stake holders that the requirements for quality are being, or will be, achieved in the delivered product;
- (e) provide confidence to the organization that quality system requirements are fulfilled.

The ISO 9000 series is quite explicit that the quality system should be documented, established and maintained to ensure conformity to defined customer requirements for quality. Therefore the preparation and use of documentation are intended to be dynamic high-value-adding activities.

The basic philosophy of ISO 9000 is 'write what you do, do what you have written and maintain records'. Formal approval and issue of documentation

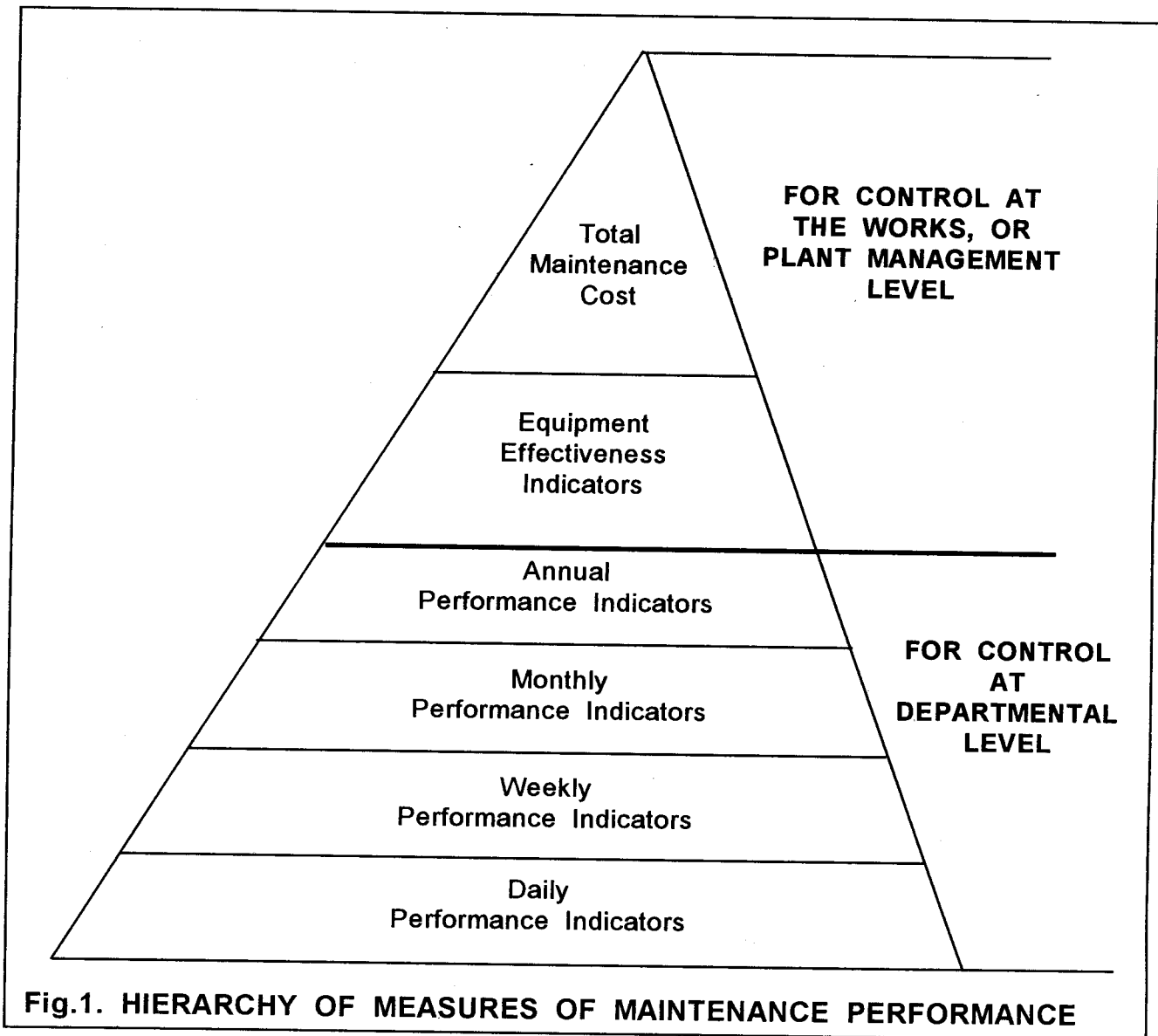
is required by ISO 9000. It is also a requirement of the ISO 9000 series that control is exercised to ensure that only pertinent documents are at the place of work and obsolete documents removed from places of work.

NEED FOR ADOPTION OF TPM IN INDIAN INDUSTRIES

TPM is a practical method of achieving the aim of maintenance-oriented management through a positive investment in human resources in order to fully utilize existing equipment through improved equipment and machinery availability. This assures product quality through reduced maintenance cost and saving in labour. The implementation of TPM requires dedication and takes a considerable amount of efforts but economic gains obtained from the successful implementation of TPM are very attractive. The experiences in Japan and the US have shown that TPM has potential of reducing break downs and defect rates by more than 90 percent, customer complaint and claims by 75 percent, production cost by 30 percent, product and work-in progress inventories by 50 percent and increases plant effectiveness by 1.5 to 2 times.

Today production equipment are capable of much higher production rates and are necessarily becoming increasingly sophisticated, and therefore, much more expensive. This results in a situation wherein the price paid by a manufacturing organization for the loss of one hour of production on an equipment, or a machine, is much greater today than it was ever before, since the machine hour rate is much higher and the loss of production capacity, or the loss of opportunity is also much greater. Moreover, one must realize that this loss is going to be greater in future than it is now. Thus to be able to stay in business, the manufacturing organizations have to ensure much higher levels of equipment availability. This level of equipment availability cannot be achieved with an ethos that production operators only run the machines and the maintenance department attends to all maintenance activities.

The routine maintenance activities should be carried out by production operators to keep the machines in good running order, such as cleaning of the machines, periodic lubrication, periodic checks and inspections and minor adjustments and repair. Thus relieving maintenance departments to attend to more pressing tasks requiring higher levels of skills such as preventive replacement of critical components, equipment overhauls and necessary plant modifications. The production operators will then



own the machines and equipment they work with thus minimizing break downs.

Maximization of equipment availability results in minimization of quality loss, and minimization of set-up, adjustment, idling and minor stoppages and speed losses leading to improvements in standards, processes, methods and procedures. This situation can be achieved through innovative ideas and suggestions for reforms and improvements coming from involvement and a sense of belonging through active participation wherein individuals voluntarily join a group to discuss their problems and suggest better ways of doing what they are doing. This group meets and discuss problems with housekeeping, quality, equipment availability and productivity and to suggest reforms and improvements.

The ISO 9000 Quality Management System which has recognized maintenance as one of the important factors for process management, is the right route for implementation of TPM in industries. With over 150000 enterprises already certified around the world to ISO 9000, total productive management will achieve its objectives better through the medium of ISO 9000 quality system.

TPM PREVENTS LOSSES DUE TO IMPROPER MAINTENANCE

TPM places stress on the elimination of losses which result from improper planning and execution of Total Productive Maintenance regime. These losses fall in the following categories:

- (i) losses due to breakdowns of production equipment and machinery,
- (ii) losses due to defects and defective products and components,
- (iii) losses due to equipment set-up
- (iv) losses due to adjustments of equipment
- (v) losses due to idling and minor stoppages of equipment,
- (vi) losses resulting from equipment operating at lower capacities which in turn, results in lower productivity and yield losses.

The management of the maintenance function requires measurement of maintenance performance. Without proper evaluation of effectiveness of maintenance, realistic target setting and planning of improvement programme cannot be carried out. It is necessary to apply appropriate models and techniques for measuring maintenance effectiveness. A hierarchy of measures of maintenance performance is given in Figure-1.

These losses can be reduced by:

- (i) Eliminating of major equipment related losses through participation of all employees.
- (ii) Involvement of production operators in periodic (daily, weekly, etc.) autonomous maintenance activities, which include daily inspection, cleaning, lubrication, etc. to maintain basic equipment condition.
- (iii) Restoration and maintenance of equipment to optimal operating condition and elimination of accelerated deterioration of equipment.
- (iv) Improvement of maintainability of existing equipment and machinery by continuous up gradation and innovation.
- (v) Increased efficiency and cost-effectiveness of equipment maintenance work through better planning, scheduling and control.

BENEFITS OF TPM

There are many tangible and intangible benefit in implementation of TPM. The important tangible benefits are:

- (i) reduction in the number of unexpected machinery and equipment failures causing loss in productivity,
- (ii) reduction in the direct cost of maintenance,
- (iii) reduction in quality costs:
 - (a) internal failure costs due to defective products and defects in production processes, and,
 - (b) external failure costs in the form of a significant reduction in customer complaints, product recalls and concession claims.
- (iv) reduction in work-in-process maintenance inventory, and
- (v) increase in productivity and better utilization manpower, material and machinery.

TPM not only brings economic gains but also creates a more congenial working environment leading to improved productivity.

CONCLUSIONS

As competition increases, asset management and maintenance in gaining importance. It is difficult to be competitive yet saddled with inefficient use of material, manpower and machinery. TPM provides an opportunity to constantly look into the problems of equipment performance and resultant productivity. It is a preventative measure to avoid crisis management.

ISO 9000, which encompasses the entire gamut of activities of an enterprise, should address the requirements as process control mechanism in a larger context of TPM. Once these aspects are documented as part of the ISO 9000 system, implementation becomes easier. Therefore it is easier to realize TPM through implementation of ISO 9000 Quality Management System.