

# **TOTAL QUALITY MANAGEMENT IN THE STEEL INDUSTRY**

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# TOTAL QUALITY MANAGEMENT IN THE STEEL INDUSTRY

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## INTRODUCTION:

The steel industry world - over is currently in a phase of transition. It is rapidly moving in most countries towards an era of globalization with its intensely competitive environment, away from the protection once enjoyed as a core industry in the domestic market. This transition appears to be irreversible. The steel industry has, therefore, been reconstructing for the past several years in order to meet the challenges of operating and surviving in a highly competitive and customer - oriented international market both in terms of quality and price.

Total quality management (TQM) has now become imperative for the steel industry to remain competitive and to ensure customer satisfaction. Numerous national and international conferences, workshops, training programmes, specifications etc that have been taking place worldwide on the steel industry quality management bear testimony to the global awareness of TQM. The age - old concept of quality limited to testing and inspection has to be re-oriented and enlarged based on the new approach of the total quality management (TQM) which is being adopted and practised in many steel plants world - over. At the hard core, this total quality management is the right kind of following inputs : man, machine, material, money, method and the milieu. A high quality of these crucial 6 M's and their interactions need to be assured and continuously upgraded to sustain the tenor and tempos of TQM.

It should be noted that the best of these inputs may not give the desired quality

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performance if the right/appropriate quality consciousness is not inculcated at all levels and in activities under a dynamic quality oriented management leadership. A complete indoctrination of the requisite quality culture at various working levels in a steel plant may take years and require painstaking and patient training and retraining of the entire steel plant work force towards the TQM culture/attitude.

### **CHANGED QUALITY CONCEPT**

The specific objectives of any worthwhile TQM would be to deliver customer - perceived quality products in the right time at an economical price, with a greater degree of customer satisfaction and performance reliability. The quality specifications and designs for quality control begin at the consumer's end. The steel industry has to translate these customer needs and design/plan the processes accordingly for the production of steel at an economical price acceptable to the market.

With the rapid internationalization of world trade under conditions of free market economy, the drive for quality in the steel world has gathered a greater momentum. Increased competition between the steel suppliers both from the developed and the developing countries in the domestic as well as international markets can be foreseen.

Quality control functions to-day have, therefore, a much wider spectrum to cover and have to be integrated, as a matter of logic, into the overall management activities of the steel industry. The management policy should, therefore, consider these issues and their immediate and future impact to ensure that the process and technology selected best meets the requirements of the competitive environment and in turn enables the customer to be competitive in his line of products. This would entail greater interaction between the steel plant and the customer.

Let us take, for example, coated steel used for automobile body. Supplying coated auto body steel to the engineering process industry may entail assistance as to how to fabricate or weld such steels in the process line. The steel industry needs to furnish this information and, if required, the know - how to use these coated auto body steels without

any difficulty and with minimum wastage at the processor's end. While designing their products, the steel makers have to consider the likely problems which a consumer may face. The steel quality to be produced in the steel industry has therefore, to be perceived from the customer's view point, instead of leaving the customer to his own devices to use such steels. The quality perception today is putting a strong emphasis on customer satisfaction in terms of product quality/usability at minimum loss, price and greater service reliability in end-use applications.

The requirements of automotive, linepipe, tyre wire and a host of other steels have undergone a tremendous change. Today's automobiles are being designed to be much lighter so as to be more fuel efficient and in turn more environment friendly. Today's auto bodies, therefore, must use a lower quantity of steel but at the same time have higher performance reliability with regard to safety, resistance to corrosion and better service life.

To meet the increasingly stringent customer requirements, steelmakers the world over are now producing tonnage steels which are much cleaner, have superior mechanical properties, better and improved dimensional tolerances, and meet other specific end-use expectations of the processing industries and the ultimate consumer, than those made some two decades earlier.

In terms of product quality and performance reliability, the world steel industry is quietly moving towards globally applicable steel grades, products as well as machinery and equipment. The recent move by the European Community to enforce ISO 9000 standards not only within the Community but also in its international dealings, is bound to spur the adoption of quality management programmes for steel on a global basis. It is heartening to note that the steel industry worldwide is well aware of this crucial need and is already moving towards total quality management in conformity with ISO 9000, IS (Indian Standards) 14,000, BS 5750 or other equivalent internationally applicable standards.

#### **COMPETING STEEL TECHNOLOGIES**

The existing steel technologies can for the most part meet the customer's quality

requirements for steels with enhanced properties; but for some plants this may mean new investment for technological upgrading and bringing in modern technologies. The improvement of the existing process capabilities in such cases will have to be carried out in accordance with a well-thought-out plan of action. The major activities involved are :

- Thorough study of the product - mix and market environment in the foreseeable future.
- Investment in modern plant and equipment.
- In-house development or adaptation of requisite advanced process know how acquired from other sources.
- Revamping old plant and equipment for improved performance.
- Use of better process inputs including raw materials, fluxes, coal etc.
- Training and retraining of personnel at all levels including the upgradation of operating skills and knowledge as well as creating quality consciousness.
- Adopting instrumentation and auto controls wherever required.

Steel plants the world over are switching over to the most favoured steel-making routes, namely BOF and EAF from the past obsolete open - hearth steel-making to remain competitive and abate environmental pollution. Similarly, in respect of casting, continuous casting technologies are being adopted more and more in the place of the age-old and expensive conventional ingot casting practice, excepting where the end use demands it. This changing technological trend in steel-making and casting has resulted in the production of better quality steels at reduced cost. Continuous casting technologies can now fine tune the production of near-net-shape cast products which can be directly rolled to finished products with much higher yields than hitherto possible.

In the years to come, processes and technologies which best satisfy customer demand and successfully counter competitive and other market pressures will find ready acceptability. It should be noted, however, that in the choice of processes and technologies, many interdependent factors like raw materials, infrastructure, service facilities, human resources, national policies, environmental legislation etc play very important role.

## **TOTAL QUALITY MANAGEMENT**

Quality has been defined/perceived in many different ways. Dr Targuchi's definition of quality as production and consumption with "minimum loss to the society" possible reflects the current total quality management philosophy. So far as the steel industry is concerned, it is well-known that if the quality of the raw materials used generates more waste during processing than desirable, they must be upgraded. The technology used for processing the raw materials if not suitable for reducing waste at a reasonable cost, needs also to be improved on a priority basis to ensure quality at an economical price. Again, it is essential for steel plant management to inculcate consciousness at all levels and improve quality in response to consumer requirements and satisfaction.

With the economic liberalization and the rapidly changing political scenario of the world, the steel industry the world over has to operate and survive in a highly complex and rapidly changing industrial environment characterized by :

- i) Rising costs of energy, raw materials and manpower.
- ii) Greater interdependence and globalization of markets.
- iii) Fluctuating exchange rates and depressed markets.
- iv) Emergence of new technologies and equipment and the danger of rapid obsolescence and
- v) Product liability.

The strategy of the steel industry to meet fully the requirements of the highly competitive markets has a strong bearing on the Quality Management concepts which have now become an integral part of the corporate philosophy of the steel industry.

### **TQM - BASES AND ESSENTIALS:**

The bases and essentials of a TQM system (which have been spelled out at length in the ISO 9000 series), are :

- i) The organization structure and the administrative framework required for its effective implementation of the quality system.
- ii) the quality control techniques involving operational practices and procedures

- required to achieve the quality levels required, and
- iii) the quality assurance measures aimed at creating customer confidence and satisfying customer requirements and expectations.

With increasing customer expectations about product quality and reliability at an economical price, there is greater need for continuing improvement of processes, products and services to sustain good economic performance and to remain cost - effective in the highly competitive conditions obtaining today.

#### **PRE-REQUISITES FOR TQM:**

For the successful implementation of a total quality management system, the commitment of the corporate management to quality and its involvement in the quality concept must be total. In this context, certain crucial management responsibilities are inescapable, namely.

- a) a well defined quality policy and objectives
- b) setting up an appropriate organization to manage and implement the quality policy and objectives; and
- c) establishing and maintaining a well documented quality system to ensure that the quality procedures are scrupulously followed and the product conforms to the specified requirements.

The emphasis is on the prevention of deficiencies in quality arising, rather than on their detection after occurrence.

#### **TRAINING FOR TQM:**

Finally, it should also be borne in mind that a TQM system, however well - designed it may be, demands dedicated and motivated personnel to effectively implement it and a fully committed management to guide them. This can only come through a quality-conscious work culture throughout the organization that automatically sustains and improves quality. Broad-based multi - functional TQM systems, as in a steel plant, will require increasing levels of competence of personnel in technical, statistical and information processing capabilities.

A basic requisite of quality implementation is the knowledge of the product, the manufacturing technology, the market and the end-use. Quality specialists will, therefore, need strong basic and technical training along with statistical and computer skills, supported by feed back from marketing personnel. Training must be imparted not only to technical personnel assigned to quality control, but also to other personnel in related areas such as process engineering, product engineering, procurement, marketing etc.

### **QUALITY MANAGEMENT IN THE STEEL INDUSTRY**

The steel industry has come a long way from the old error - prone, inspection - oriented control exercised through quality control inspectors and internal manufacturing standards. Steel plants which have for long utilized quality control systems separately for production units and operations, are now moving towards an integrated Quality Control System synthesizing the data available with various production units.

The phenomenal developments in micro-electronics and instrumentation, computer science and information technology have entirely changed the concept of quality control in steel plants. In fact, process control and information integrated automation have now become prerequisites of improved productivity and better product quality, cost - effective technology, lower cost, energy efficiency and environmental friendliness. Automated process control, integrated information systems, artificial intelligence and expert systems as well as robotics are now being extensively employed in many a steel plant operation. The quality standards are being constantly upgraded and new steels are being developed to meet the increasingly stringent user demands for quality and reliability in performance. It is in this context that the concept of total quality management for steel industry will have to be viewed.

### **INTEGRATED QUALITY CONTROL AND MANAGEMENT**

Total quality management for integrated steel plants would cover the entire range of activities involved in the making, shaping and treating of steel - from the raw materials inputs through coke making, blast furnace iron-making, steel-making in converter shop, continuous casting to rolling, finishing and treating, packing and dispatch to the customer.



In electric arc furnace - based steel plants too, the TQM would extend from the raw materials inputs to Direct Reduction, DRI and scrap to EAF steel-making, continuous casting and subsequent rolling into products etc. Quality control is exercised at every stage in steel plant operations and applies not only to the process control of intermediate products but extends also to the raw materials inputs, intermediate in-process products and services supplied or provided by other agencies. As steel plant activities are dovetailed, the output of one unit or one stage of operation must meet the quality requirements of the next stage of operations.

#### **STEEL PLANT - CUSTOMER INTERACTION:**

The success of total quality management depends to a large extent on close interaction between the steel plant and its customers. The consumers' specific requirements and expectations in respect of quality and reliability in performance is closely monitored to improve the products and the process to meet their requirements and expectations.

This would mean a basic change in the quality policy and perspective of an enterprise and its total commitment to quality. The inculcation of this quality consciousness at every level in the steel plant organization, the development of an appropriate quality management and quality assurance system, documentation, internal review and external audit will be time consuming and will need a good deal of concerted efforts.

#### **MAJOR TRUST OF TQM PLAN FOR STEEL INDUSTRY**

Coming specifically to the quality management problems confronting the steel industry, it is visualized that the steel plants will have to pay special attention to the following areas in their TQM programmes:

- i) **Customer Satisfaction and Assurance** : Satisfaction of the customer demands for quality, value and safety an satisfaction of their quality expectations. This would apply not only to the physical properties of the product, but would extend to

good customer relations with regard to delivery time, form of supply, documentation etc.

- ii) Strict quality control of the product to ensure quality and performance reliability to obviate production loss, product liability suits, loss control and warranties.
- iii) Design, quality and process control : Design, quality, pre-production planning, process control, automation of inspection and testing, computer - aided production/inspection.
- iv) Management, motivation and training : Quality control and assurance programmes in the total production cycle from raw materials inputs through different stages of production to final products and their dispatch to customers. Company's quality professionals should also find ways and means to explain the company's TQM policies and procedures to the suppliers and sub-contractors.
- v) Training, education and skills development: Training of personnel to ensure that appropriate skills are available to keep pace with technological advances and change; training of quality specialists in the scientific and technology areas along with statistical
- vi) Quality - cost effectiveness : Lowering the cost of the product while improving quality.
- vii) New technology : The role of instrumentation, automation and computer control in maintaining, quality standards is becoming more crucial. Hence special training needs to be imparted to personnel assigned to quality functions in new technologies and areas such as a) software quality assurance, b) microelectronics and instrumentation; c) specifications and standards, d) data processing, e) supplier controls, f) international quality assessment and g) non-destructive testing.

### **GLOBALLY ACCEPTABLE QUALITY STANDARDS**

In terms of product quality and performance, the world is moving towards globally acceptable standards, not only for steel grades and products, but also for machinery and equipment. The recent move by the Economic Community of Europe to enforce ISO 9000 series within the Community as well as in its dealings with other nations is bound to spur further TQM within the steel plants around the world.

A major preoccupation of the steel industry in the coming years will be how to remain cost-effective and competitive in an era of rising competition and mounting costs. Another concern is environmental and energy considerations. It has also to contend itself against inroads by competing materials like aluminium, plastics and composites in certain applications. While the inherent strength and flexibility of the steel industry can be expected to enable it to meet these challenges, it has to perform, think and organize itself for total quality management on a global basis to enable it to offer a consumer - perceived quality product at a competitive price. Advances in technology and the ever stringent demands on quality and performance have led to the development of more refined quality control methods and increasingly complex specifications. The search for quality is a never - ending exercise of the steel industry.

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