orders. The quantity involved is small, usually "one off" or "several off", and is normally concerned with special projects, models, prototypes, special machinery or equipment to perform specialized and specific tasks, components or assemblies to provide replacement for parts in existing machinery, etc. Large turbo-generators, large engines, boilers, processing equipment, special electronic equipment, materials, handling machines, shipbuilding, and many other manufacturing activities are of the job product

Three types of job production can be defined, according to the regularity of manufacture :

1. A small number of pieces produced only once.

2. A small number of pieces produced intermittently when the need arises.

3. A small number of pieces produced periodically at known time intervals.

When the order is to be executed only once, there is little scope for improvement of production techniques by introducing intricate method studies, special tools, or jigs and fixtures, unless the technical requirements justify it. But, if the order is to be repeated, tooling and jigging as well as specially designed inspection gauges should be carefully considered because the effect on production time may be appreciable.

Repeated orders for the same items usually do not require repeated planning, a fact that is reflected in the production costs of the product. Production control is also simplified in the case of repeated orders. The dispatchers and expenditors are familiar with the design, and from their past experience they can watch out for any expected difficulties in the course of production. The planning and control of schedules also becomes a simpler task when orders are repeated, especially at regular intervals, and a master schedule can be constructed in which production time is balanced against plant capacity. But such a state of affairs is rather rare. Usually the majority of job production orders are executed only once, and only a small percentage of them are repeated regularly or intermittently.

Scheduling is dependent on assessment of production times, and estimating (although it can be greatly improved by experienced and skill of estimators) is based on judgement and is too often reduced to a rule-of-thumb affairs. Scheduling must therefore be constantly amended to take account of reality, and this factor has a serious bearing on assessment of delivery dates, the output of the shop is mainly governed by plant capacity, and as soon as the local presented by incoming customers' orders exceeding this output a queue of orders is formed. When immediate increase of plant capacity is impracticable, the length of the queue is a major factor governing the sales policy of such a plant, and a certain amount of discrimination in order selection may be essential.

2.3 Batch production

Batch production is the manufacture of a number of identical articles, either to meet a specific order or to satisfy continuous demand. When production of the batch is terminated, the plant and equipment are available for the production of similar or other products. As in job production policies regarding tooling fixtures, and other aids are dependent on the quantities involved. If the order is to be executed only once, there will be less justification for providing elaborate production aids than when the order is to be repeated.

In batch production, too, three types can be mentioned :

1. A batch produced only once.

2. A batch produced repeatedly at irregular intervals, when the need arises.

3. A batch produced periodically at known intervals, to satisfy continuous demand.

Here, again, planning and control become more simplified as quantities increase and as manufacture becomes more regular. Two principal problems arise in batch production: the size of the batch and the scheduling of production.

The solution to these problems depends on whether governed by external orders only or whether the plant is producing for internal consumption. In the case of external

orders, the batch size is normally determined by the customer to suit his specific circumstances. The plant, in this case a vendor, is mainly concerned with the effect of these orders on its production schedules and with the issues arising out of having to meet set delivery dates. When the plant produces to stock, both the batch size and scheduling problems are matters for internal management decisions. The problem of optimal batch sizes has to take into account the set-up costs, which are involved before each production run, and the carrying costs incurred when the finished product is held in stock. The batch size determines the length of the production run and effects both the production schedule and batch size considerations of other products.

Batch production is a very common feature in industry. Machine tool work, especially capstan and turret lathes, press work, forging and casting processes some glass manufacturing, and chemical processes very often operate on a batch basis. Batch production is suitable for product layout configurations.

2.4 Continuous production

Continuous production is also known as repetetive manufacturing or mass production and is the specialized manufacture of identical articles on which the equipment is fully engaged. Continuous production is normally associated with large quantities and with a high rate of demand. While in the job and batch classes the rate of production normally exceeds the rate of demand, continuous production is justified only when its rate can be sustained by the market. Here, full advantage should be taken of repetitive operations in the design of production auxiliary aids, such as special tools, fixtures, positioners, feeders and materials handling systems, inspection devices, and weighing and packing equipment.

Two types of continuous production can be defined :

1. Mass production
2. Flow production.

The difference between the two types is mainly in the kind of product and its relation to the plant. In mass production

a large number of identical articles is produced, but in spite of advanced machanization and tooling, the equipment need not be specially designed for this type of article alone. Both plant and equipment are flexible enough to deal with other products involving the same production processes. In management decides that a certain time should be discontinued, the machinery can be switched over to produce another article, and such a change in policy will usually not involve major modifications is plant layout, although changes in tooling may be quite substantial. A shop of automatics is an example associated with mass production. Although the automatics may be continuously engaged on the production of, say, a certain type of opinions, they can be switched over to production of screws or similar machine elements when the need arises. Another example is a highly machanized press shop that can be utilised for the production of different components or products made of sheet metal, without having to introduce major changes in the shop layout.

In ***flow production***, the plant, its equipment, and layout have been primarily designed to manufacture the product is question. Flexibility in the selection of products for manufacture is confined to minor modification in layout of designs of models. Notable, examples are automobiles, engines household machinery, chemical plants, etc. A decision to switch over to a different kind of product may not only result in extensive tooling (this is often needed even when only the model is changed) but also basic changes in layout and equipment policy. especially when special purpose machines and complex materials handling systems are involved.

Production planning and control in continuous production is usually far simpler than in job or batch production. Extensive effort is required for detailed planning before production starts, but both scheduling and control need not usually be vary elaborate. The output is either limited by available capacity or regulated within given limits to conform to production targets based on periodic sales forecasts.

There are many cases where plants are not confirmed to one particular type of production. Even very large plants engaged in manufacturing end products of the flow type resort very often to batch production of most of the components required for the assembly line. This situation arises from uneven production rates of different components, which cannot always be adjusted by engaging more machines or manpower on the "slow" items. Also, the rate of demand on the assembly line, so that different parts may have to be produced in succession on the same machines, leading to a clear case of batch production and inventory problems. Production planning and control in such plants may become rather involved because of the different types of production which are simultaneously employed in various departments.

2.5 Advantages and disadvantages of a mass production system

A mass production system operating as a continuous flow line shows the following advantages and disadvantages :

Advantages

(*i*) It ensures a smooth flow of material from one work-station to the next.

(*ii*) It takes minimum period for the total production time per unit.

(*iii*) There is minimum material handling since the work-stations are so located as to cut down the distance between consecutive operations.

(*iv*) Hardly any special training is needed by operators at the production line, with the result that the training is simple and inexpensive.

(*v*) Simple production, planning and control system can be followed.

(*vi*) The space required is less by work intransit and for temporary storage of material.

Disadvantages

(*i*) In the event of breakdown of one machine, there will be complete stoppage of the remaining jobs on other machines.

(*ii*) Maintenance and repair work becomes most difficult.

(*iii*) Originally the layout is established by the product but any changes incorporated in the product design result in major changes in the layout.

(*iv*) The pace of production is known by the 'slowest' machine.

(*v*) There is a general supervision on the production since the supervisor of a line takes care after diverse machines on the line.

(*vi*) Most generally, it is felt that high investments are needed due to the specialized nature of the machines.

2.6 Classification of mass production system

(*A*) *Classification according to the quantity of product made*

(*i*) Job shop production

(*ii*) Batch production

(*iii*) Mass production (continuous production)

(*B*) *Classification according to type of Industry :*

(*i*) Basic production

(*ii*) Conversion and

(*iii*) Fabrication

(*C*) *Classification as per functions within a factory :*

(*i*) Processing operation

(*ii*) Material handling

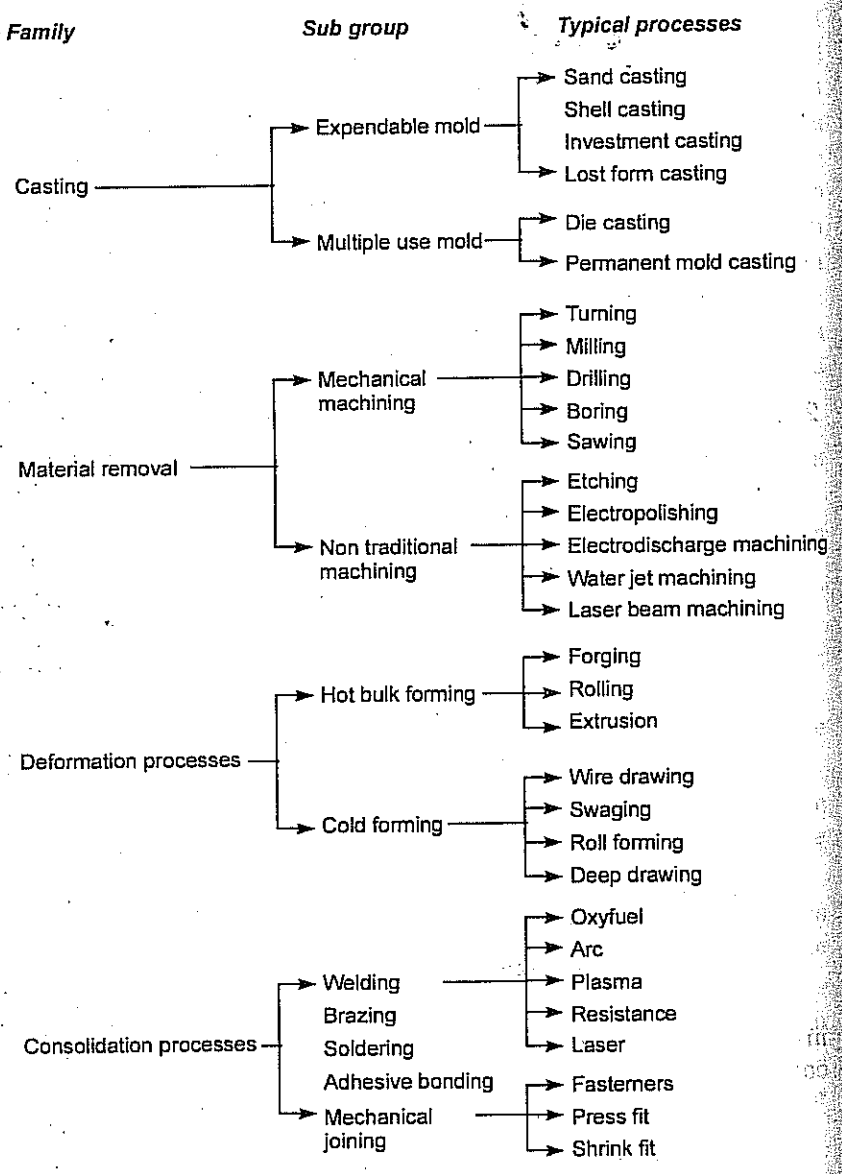
(*iii*) Assembly

(*iv*) Inspection and test

Selection of a manufacturing process : Selection of a manufacturing process depends upon the following considerations :

1. Shape
2. Properties
3. Service
4. Manufacturing
5. Cost.

Materials processing families, subgroups, and typical processes :



2.7 GLOSSARY

Batch production : This is the manufacture of a number of identical articles, either to meet a specific order or to satisfy continuous demand when production of the batch is terminated, the plant and equipment are available for the production of similar products.

Continuous production : This is the specialized manufacture of identical article on which the equipment is fully engaged. It is normally associated with large quantities and with a high rate of demand.

Flow production : In this, the plant, its equipment, and layout have been primarily designed to manufacture the product in question. Flexibility in the selection of products for manufacture is confined to minor modification in layout of designs of models.

High production : Production quantities one 10,000 to millions of units.

Job production : This is the manufacture of products to meet specific customer requirements of special orders. The quantity involved is small, usually "one off" or "several off", and is normally concerned with special projects, models, prototypes, special machinery etc.

Job shop : A manufacturing enterpise devoted to producing special or custom-made parts or products, usually in small quantities for specific customers.

Low production : Production quantities in the range of to 100 units per yr.

Master production schedule : It is a listing of the products and related components to be made, when they are to be delivered, and in what quantities.

Medium production : Production quantities in the range of 100 to 10,000 units annually.

Single model line : It is one that produces many units of one product, and there is no variation in the product.

MULTIPLE/OBJECTIVE TYPE QUESTIONS

Fill in the blanks that appropriate word/words :

2.1 Job production is the manufacture of _____ to meet specific customer requirements of special orders.

2.2 Batch production is the manufacture of a number of _____ articles either to meet a specific order or to satisfy continuous demand.

2.3 Continuous production is the specialised manufacture of identical _____ on which the equipment is fully engaged.

2.4 Continuous production is normally associated with _____ quantities and with a high _____ of demand.

ANSWERS

Fill in the blanks :

2.1 specific product ; 2.2 identical ; 2.3 articles ; 2.4 large, rate.

EXERCISES-2

2.1 In the manufacturing process, discuss briefly following :

(*a*) Job production

(*b*) Batch production.

2.2 Define the term 'Continuous production'.

2.3 Discuss briefly the two types of continuous production.

2.4 Discuss briefly the advantages and disadvantages of a mass production system.

2.5 What are the major differences between the manufacturing process jobs and batch production ?

2.6 Which products are mostly suited for mass production and why ?

2.7 Explain why mass production is accepted by automated manufacturing units nowadays. Give reasons for your answer.

2.8 How mass production system is classified according to quantity of product required to manufacture ?

3

Fundamental of Casting

3.1 Introduction 3.2 Casting 3.3 Casting terminology 3.4 Methods of casting 3.5 Solidification of pure metals 3.6 Pattern 3.7 Risers and Riser Design 3.6 Solidification of pure metal 3.8 Sand conditioning 3.9 Methods of casting in metallic moulds 3.10 Shell moulding process 3.11 CO_2 moulds hardening process 3.12 Mould of other materials 3.13 Characteristics of various moulding process 3.14 Continuous casting 3.15 Defects in castings 3.16 Illustrative problems 3.17 Glossary * Multiple/Objective type questions * Exercises.

3.1 Introduction

Materials for manufactured parts or machines have such diversified properties that even when performance and cost are considered, it is often difficult to decide the proper material for a given purpose. One material may have higher strength, another better corrosion properties, and yet another may be more economical. Hence, most choices are a compromise among a number of materials using the best engineering data and judgement available. Copper, for example, may be alloyed in hundreds of ways to produce materials with special properties.

There are various methods by which a product or part can be made. Each method has its own benefits and limitations.

In this chapter we shall discuss a few generally known methods of casting of *ferrous* and *non-ferrous* metals.

Non-metallic materials will not be dealt within this text-book.

3.2 Casting

Casting is one of the earliest metal shaping method known to human race. It is one of the most essential manufacturing process used in engineering. *Casting process is based on the property of a liquid to take up the shape of the vessel*

ANSWERS

(A) Multiple choice :

14.1 (a)	14.2 (d)	14.3 (a)	14.4 (c)	14.5 (a)	14.6 (d)
14.7 (d)	14.8 (d)	14.9 (a)	14.10 (d)	14.11 (a)	14.12 (a)
14.13 (a)	14.14 (a)	14.15 (c)	14.16 (a)		

(B) Fill in the blanks :

14.1 integrated
14.2 all
14.3 design, conformance
14.4 measurable
14.5 tolerance
14.6 control
14.7 natural or inherent
14.8 reliability
14.9 coordination, prevention
14.10 failure
14.11 every body's, nobody's
14.12 factors
14.13 fitness
14.14 authority
14.15 cardle, grave.

(C) Matching :

14.1 (i) (c)	(ii) (d)	(iii) (b)		
14.2 (i) (b)	(ii) (c)	(iii) (a)		
14.3 (i) (c)	(ii) (d)	(iii) (b)		
14.4 (i) (b)	(ii) (a)	(iii) (c)	(iv) (f)	(v) (d)
14.5 (i) (c)	(ii) (a)	(iii) (d)		
14.6 (i) (b)	(ii) (d)	(iii) (c)		

EXERCISES-14

14.1 Explain the concept of 'Total Quality'.

14.2 (a) List the fundamental factors affecting the quality.
(b) Discuss the effect of any six of the above factors on quality.

14.3 (a) What is 'quality function' in industry ?
(b) Explain the various activities carried out by the function in industry.
(c) With the help of a neat sketch, explain how the various activities are related with each other.

14.4 Discuss briefly, the principles of 'Quality Control'.

14.5 What are the different components of 'Quality Control' ? Explain.

14.6 Discuss briefly the benefits of a quality control programme.

14.7 With the help of a neat sketch explain the major elements of quality assurance system.

14.8 Discuss briefly sub-functions of quality control.

14.9 What do you understand by the term 'Quality information equipment engineering' ?

14.10 Write a short note on 'Quality auditing' ?

14.11 What points should be remembered during quality audits ?

14.12 What do you understand by product audit and why it is necessary ?

14.13 Write a short note on off-line and on-line quality control.

15

Quality Circle and Total Quality Management

15.1 Introduction 15.2 Concept of quality circle 15.3 Objectives of quality circle 15.4 Motivation 15.5 Rules for quality circles 15.6 Characteristics of quality circles 15.7 Scope of quality circles 15.8 Duties of quality circle leader 15.9 Duties of quality circle member 15.10 Advantages of quality circle 15.11 Disadvantages of quality circle 15.12 Limitations of quality circle 15.13 Total quality control 15.14 Phases to Achieve total quality control 15.15 Total quality management (TQM) 15.16 Concept of total quality management 15.17 The elements of total quality management 15.18 Deming's 14 points approach to TQM 15.19 Benefits of TQM 5.20 Glossary * Multiple/Objective type questions * Exercises.

15.1 Introduction

'Quality circle' (QC) can be described as a small group of employees of the same work area, doing similar work, that meets voluntarily and regularity to identify, analyse and resolve work-related problems. This small group with every member of the circle associated fully with all the activities, utilising problem solving techniques to achieve control or improvement in their respective fields and also help self and mutual development in the process. The concept behind quality circles is that, in most cases, the persons who are closest to an operation are in a better position to contribute ideas that will lead to an improvement in it.

The new concept of the Quality circle lies in the assumption "respect for the human individual", as against the traditional assumption based on suspicion and mistrust between management and its employees. Quality circles built mutual trust and create greater understanding between the

management and the workers. Co-operation and not confrontation is the main objective. The sole aim to Quality circle is to build people, developing them, arousing genuine interest and dedication to their work to improve quality, productivity, cost reduction etc.

In this chapter we shall also discuss about total quality management (TQM). The function of TQM is to improve the quality of work of all the people at all the functional areas of the concern. Implementing TQM involves the process of a complete change in the behaviour of people working in the concern.

TQM utilises the fundamental ideas of group activity, participation of all, application of statistical and other QC tools, self-development and creativity. It imbibes the philosophy that there is always an alternative better method of doing things.

15.2 Concept of Quality Circle

The concept of quality circle has three broad attributes are as follows :

(*a*) Quality circle is a form of participative management.

(*b*) Quality circle is a problem solving technique.

(*c*) Quality circle is a human resource development technique.

It is based on the concept that suggestions affecting the work place should come from those who perform the work and who have the greatest knowledge about the job. A quality circle ties to overcome barries that may exist within the prevailing organizational structure so as to foster an open exchange of ideas.

It assumes that a group of individuals working together will invariably come up with better solution than one individual working alone. Quality circles are a specifically structured from and mode of participative management.

15.3 Objectives of Quality Circle

Objective of quality circle, which contribute to the improvement and development of the enterprise and directly or indirectly the interest of the employees.

The following are the main objectives of the quality circles :

(*a*) To improve quality, productivity, safety and cost reduction, thus, contribute to the improvements and development of the enterprise.

(*b*) To provide opportunities to the workers to use their wisdom and creativity.

(*c*) To encourage team split, cohesive culture among different levels and sections of the employees.

(*d*) To promote self and mutual development including leadership quality.

(*e*) To fulfil the self-esteem and motivational needs of employees.

(*f*) To improve the quality of lifestyle of the employees.

(*g*) To improve communication within the organisation.

15.4 Motivation

Motivation is the main core of QC philosophy.

The philosophy of quality circle is to make better use of human resources. It is based on the belief that every organisation has a vast store of untapped talent, brains, abilities and ideas. The first step towards a business philosophy conductive to quality circles is the discovery of this valuable resource, by the management.

A motivation is defined as the inner state of mind that energises, activities or moves and directs our behaviour towards some goals. Motivation is the process of creating conditions in a workplace which will encourage employees to try their utmost to achieve the goals set by the management.

The main object of motivation is to create conditions in which people are willing to work with enthusiasm, initiative interest; with full satisfaction, with a full sense of responsibility, loyalty and proper discipline and with pride and confidence in a most cohesive manner so that the goals set up the company are achieved effectively.

15.5 Rules for Quality Circles

The following are the rules for quality circles :

1. Each member can contribute an idea on his turn in rotation.

2. Each member provides only one idea per turn regardless of how many he or she has in mind.
3. In cast anyone has no idea during any particular rotation, he or she may just say "pass."
4. Care must be taken not to make adverse comments or criticise on the ideas which are contributed by the member of members, even when the idea offered may not be very sound or outdated. On the other hand, the management should welcome their ideas.
5. During brain storming (it is a technique for stimulating a group of people to come out with ideas on specific problem), no evolution of suggested idea should occur. This is also applied to high officers who should keep restraint and should not utter the phrases like "we have tried it before", "impractical", doubtful, etc.
6. Member can cast their votes by show of their hands.
7. Only those votes are taken which are supporting the ideas and discard those against the idea.
8. Time allotted brain storming session should be variable. The length of the time that can be spent profitably will vary according to the nature of the problem and the group itself. In general at least one hour should be devoted for such sessions.
9. Minutes of the session containing the ideas offered by the members should be recorded and maintained.
10. It is usually helpful to initially set a goal.
11. In the event of all members saying "pass", the first phase of brain-storming session comes to end. It follows that all ideas have been exhausted.
12. Display all the ideas recorded on the sheet.
13. A large number of ideas are then narrowed down by the process of voting. The voting technique works nicely and effectively as the members are experts in their areas.
14. Leader of the session draws a circle around those ideas which got the large number of votes. In this way, members decide as to how many of the top ideas will be so identified for serious consideration.

15. Finally, the idea ranked in the session can be taken up for analysis or solution later on.

15.6 Characteristics of Quality Circles

The following are the characteristics of quality circles as management tool for improving productivity and quality :

1. A quality circles is a small group of volunters/ workers whose lower limit is three and upper limit twelve.
2. The volunters/workers interested in some area of work improvement may come together to form a circle.
3. The members meet regularly under the leadership of their immediate supervisor.
4. The basic role of quality circles is to identify the problems and solved the problems for improving quality and productivity.
5. The members receive recognition in the form of award, reward, certificates and privileges.
6. The members meet regularly every week or every month or according to an agreed date and time.
7. It contributes to job satisfaction of their members by creating feelings of accomplishment from identifying and solving challenging problems.
8. Circle leaders and members are trained in simple problem solving techniques which identify causes and develop solutions.
9. It contributes to their left-esteem and self confidence through acceptance of their recommendations by the management.
10. The quality circle work is characterised by the attributes of high skill variety, goal setting and feed back.

15.7 Scope of Quality Circles

Quality circles are not limited to manufacturing organisations only. They are applicable to all organisations where there is a scope for group based solution of work related problems. Quality circle relevant for big factories, organisations,

school, hospital, universities, research institutions, banks, government offices and nongoverment buildings etc. *i.e.*, any other place where people at large are involved in the identify and solution of problems and improvement of work.

The scope of quality circles is also not limited by a definition of quality. It is concerned with concept of total customer satisfaction with products and services and not merely with design, conformance and performance with some standards.

15.8 Duties of Quality Circle Leader

In order to make quality circles a grand success, circle leader has the following duties to perform :

(*i*) To assume responsibility to guide the members.

(*ii*) To make his members certain as to what is going on.

(*iii*) To channelise the discussion.

(*iv*) To provide equal opportunity to each and every members.

(*v*) To assign specific task to each member.

(*vi*) To conduct meetings and ensure participation by all members.

15.9 Duties of Quality Circle Member

(*i*) To contribute to identify and finding solutions to problems.

(*ii*) To attend the training seriously with concentration.

(*iii*) To contribute to implementing solutions to problem of the quality circle

(*iv*) Not discuss for inclusively personal problems.

(*v*) To contribute to the problem solving activities of the quality circle as per the acquire skills.

(*vi*) To demonstrate mutual respect among the members.

(*vii*) Each member should keep focus at all the times on organisational problems related to the work of quality circle.

(*viii*) Each member involve in the problem solving should offer views, opinions and ideas freely.

15.10 Advantages of Quality Circle

The advantages of quality circle are as under :

(*i*) It develops self-confidence.

(*ii*) It creates the sense of achievement.

(*iii*) It develops the ability of individual to get along smoothly with others.

(*iv*) It provides an opportunity to acquire new knowledge by shearing each other's knowledge and experience.

(*v*) It encourages creativity job satisfication.

(*vi*) It provides a sense of belonging and achievement.

(*vii*) It results in overall gains by the untiring effect of the individual benefits.

(*viii*) It provides a creating team spirit and unity of action.

(*ix*) Safety improvement.

15.11 Disadvantages of Quality Circle

The disadvantages of quality circle are as under :

(*i*) Lack of support from the top management leaves the circle at the loose end.

(*ii*) It takes sufficient time to show good result in QC's. Too high an expectation in too short a time can destroy the circles at the beginning itself.

(*iii*) If new head of the section fails to appreciate QC philosophy, QC will not succeed.

(*iv*) When the objectives of the company are not clearly defined, the QC will fail.

(*v*) When the required capital sanctions are not forthcoming for implementation, QC will fail.

(*vi*) There should be no feeling from the management's side that QC is a waste of time. Regular participation in the sessions is essential.

(*vii*) Leaders and members are to be oriented properly.

(*viii*) Freedom to discuss in any language known to other members.

(*ix*) It is most essential that complete understanding exist among members.

15.12 Limitations of Quality Circle

The following limitations of quality circle are as under :

(*i*) The overall productivity may decrease initially.

(*ii*) A large investment of time and money is required for a concept.

(*iii*) Mistakes are inevitable as employees adjust to a new way of doing things.

(*iv*) After quality circle implemention, a period of confusion may arise. This confusion arises because people experiment with new ideas.

(*v*) Changes in system and control may become necessary.

(*vi*) Employees of the organisations who are habituated to depend on their supervisors for direction.

15.13 Total Quality Control

In the previous chapter, we discuss about the quality, quality control, cost of quality, quality of design and statical quality control etc. In this chapter we discuss the total quality control, total quality management.

Total Quality Control : TQC is an effective system of integrating quality reliability, quality development, quality maintenance and quality improvement efforts of the different groups in an organisation/firms. TQC gives stress on prevention of defects rather than rectification. The concept of total quality is different from product quality and much more. All the operations of an organisation market search, the needs of the customer the optimal use of raw materials and other inputs (such as man, machine) product design and development, manufacturing processes, marketing, sales, service after sales the whole of it comprise total quality. A good example of total quality control is Hewlett Packard.

The following are the total quality control functions.

1. Development of product design based on needs of customers or end users and cost effective.
2. Reliability and development testing
3. Vendor development and quality control
4. Training of line staff and customers (if required)
5. Proper interaction with service engineering
6. Quality control of raw materials

7. Frequently inspection during the manufacturing
8. Frequently inspection during the testing
9. Quality planning for control of assembly operations
10. Quality audit.
11. Feedback from customers from time to time.

15.14 Phases to Achieve Total Quality Control

The following are six (c's) identifiable phases to achieve total quality control :

(*a*) Comprehension

(*b*) Commitment

(*c*) Competence

(*d*) Communication

(*e*) Correction

(*f*) Continuance

They are discuss one by one

(*a*) *Comprehension :* It should be definable and measurable.

(*b*) *Commitment :* For an organisation, clarity of concepts and policies.

(*c*) *Competence :* Procedures to evaluate quality, develop method, tests to understand the price of non-conformance to quality.

(*d*) *Communication* : To create awareness, resolve conflicts, co-ordinate activities through communication create an image of product quality and reliability.

(*e*) *Correction* : Solve problems of non-conformance problems are big due to lack of knowledge.

(*f*) *Continuance :* To maintain the importance of the total quality control, ensure exposure to sustained programmes, innovation of new techniques.

It provides feedback at various stages for comparison with specifications and for initiating control action to bring about addition, alteration, modification and any changes at appropriate stages. It involves all departments of the organisations at various levels and provides for interaction, coordination and monitoring of various activities through prompt communication and control system.

15.15 Total Quality Management (TQM)

Total Quality Management (TQM) is a new approach which leads to improve the effectiveness of the company as a whole and a sincere attempt to ensure the active participation of each and every member to work together to minimise errors, deficiencies and wastage and rejection.

It should be carefully noted that the total quality of a product is solely dependent upon the quality of many components and activities associated with it.

It involves the process of adequate control and inspection in all the various activities.

The following gives the different phases involved in the total 'Quality Management' programme :

(*i*) Product design specification and development.

(*ii*) Procurement of sources.

(*iii*) Process planning.

(*iv*) Production method.

(*v*) Inspection and testing.

(*vi*) Package and storage.

(*vii*) Sales and distribution.

(*viii*) After sales service.

(*ix*) Market research and feedback.

15.16 Concept of Total Quality Management

TQM is to build an organisation that produces products and services that are considered best-in-class by its customers. This means that to achieve best-in-class in quality, every piece of the business must be done right the first time and every piece of the business must continue to improve. TQM has been accepted throughout the world wide now-a-days. Many organisations are trying to adopt TQM as a way of life. In fact TQM is the need of all modern organisations. It is a system approach to quality management and a journey to achieve excellence in all aspects of organisation's activity. The quality standards/specifications do not remain the same every time. They are to be addition, alteration or modified to meet the changing requirements of the customers. The launching of

ISO:9000 series standards is an attempt to help the industrial organisations in adopting TQM to improve their quality and productivity. *For more details for ISO : 9000 has been dealt in detail in chapter 16 (next chapter) of this book.*

15.17 The Elements of Total Quality Management

The following are the main element of total quality management :

1. Top management commitment and involvement
2. Customer involvement
3. Design products for quality
4. Design production processes for quality
5. Control production processes for quality
6. Developing supplier partnerships
7. Customer service, distribution, and installation
8. Building teams of empowered employees
9. Benchmarking and continuous improvement

1. *Top management commitment and involvement :* Top management gets involved and stays involved from setting business strategy based on using product quality as a weapon to capturing global market share to rewarding employees for achieving excellence in product quality.
2. *Customer involvement :* Customer wants drive the TQM system. The characteristics that they value most are built into products from design to after sale service.
3. *Design products for quality :* What customers want sets the basic attributes of product design ? Excellence in performance, features, reliability, serviceability, durability, appearance and service are critically affected by design.
4. *Design production processes for quality :* Production machinery and workers form a system of production that should be designed to produce products with the dimensions of quality that customers want.

5. *Control production processes for quality :* As products and services are produced, the quality performance of production is monitored and managed to ensure that only products and services of superior quality are produced.
6. *Developing supplier partnerships* : Selecting and developing suppliers that fit into the TQM system is an important priority. Long-term relationships are cultivated so that suppliers deliver parts of perfect quality.
7. *Customer service, distribution, and installation :* Packaging, shipping, installation and customer service can be crucially important to customer's perceptions of quality.
8. *Building teams of empowered employees :* Making TQM work rests in the end with employees. They must be trained, organised, motivated and empowered to produce and service products and services of perfect quality.
9. *Benchmarking and continuous improvement :* Standards used to measure progress are taken from the performance of other world-class companies. Then these standards become the basis for long-term continuous improvement.

15.18 Deming's 14 Points Approach to TQM

Deming proposed 14 principles of quality management, which focus on the role of management and a participating employee/work force. These principles are aimed at creating an organisational climate in which stastical methods can be implemented for quality improvement. W. Edwards Deming's ideas are embodied in his 14 points for managers :

1. Create constancy of purpose toward produce quality to achieve organisational goals.
2. Refuse to allow commonly accepted levels of poor quality
3. Stop depending on inspection to achieve quality.
4. Use fewer suppliers, selected based on quality and dependability instead of price.

5. Instill programs for continuous improvement of costs, quality, service and productivity.
6. Train all employees on quality concepts.
7. Focus supervision on helping people to do a better job.
8. Eliminate fear, create trust, and encourage two-way communications between workers and management.
9. Eliminate barriers between departments and encourage joint problem solving.
10. Eliminate the use of numerical goals and slogans to make workers work harder.
11. Use statistical methods for continuous improvement of quality and productivity instead of numerical quotas.
12. Remove barriers to pride of workmanship.
13. Encourage education self-improvement for everyone.
14. Clearly define management's permanent commitment to quality and productivity.

Permeating those points is a philosophy based on the belief in the worker's desire to do a good job. Workers are taught statistics so that they can keep control charts on their progress toward improved quality. Everyone in the organisation, from board members to receives training in quality control concepts and statistics and every one is encouraged to suggest ideas for improvement.

Deming also introduced to Japanese companies the plan-do-check-act (PDCA) cycle, which was originally developed by walter sheward. The PDCA cycle, shown in Fig. 15.1 represents the concept of continuous improvement as an endless cycle of actions. In the first step-**Plan**, a process is studied, potential improvements are identified, and a plan is developed to implement the improvements. In the second step-**Do**, the plan is tried on a test basis and results are documented. In the third step-**Check**, the plan is thoroughly evaluated based on the testing to see if it improves the process. In the fourth step-**Act**,

the plan is permanently implemented as part of the normal operation. The PDCA cycle than starts over with the first step again.

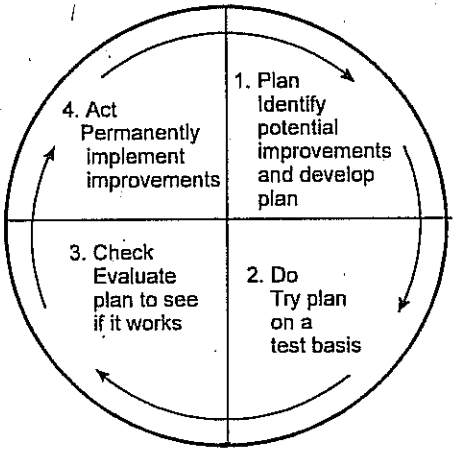


Fig. 15.1 PDCA cycle

15.19 Benefits of TQM

(a) Benefits for the company

(*i*) Reduced quality costs of the company

(*ii*) Increased market share

(*iii*) Better product quality of the company

(*iv*) Employees/work force are more creative and quality conscious

(*v*) Product and productivity improvement

(*vi*) Increase problem solving capacity

(*vii*) Improved profitability of the company

(*viii*) Improvement in human relationship

(b) Benefits to customers

(*i*) Number of problems are less with the product or service.

(*ii*) Better customer care between organisation and customer.

(*iii*) Great satisfication among the customer and organisation.

(c) Benefits to staff or employee

(*i*) More recognition and appreciate

(*ii*) Empowerment

(*iii*) Enhancement of job interest and security

(*iv*) Improvement in skills

(*v*) Reduced employee complain.

15.20 GLOSSARY

Motivation : Motivation is defined as the inner state of mind that energises, activates or moves and directs our behaviour towards some goals. It is the process of creating conditions in a workplace.

Quality circle (QC) : A small group of employees of the same work area, doing similar work, that meats voluntarily and regularity to identify, analyse and resolve work-related problems.

Total quality management (TQM) : A approach which leads to improve the effectiveness of a company as a whole with participation of each and every member to work together to minimize errors.

MULTIPLE/OBJECTIVE TYPE QUESTIONS

Fill in the blanks :

15.1 Motivation is the main core of 'Quality _____ philosophy.

15.2 One of the advantages of quality circle is that it _____ self-confidence.

15.3 Another advantage of quality circle is that it encourages _____.

15.4 If new head of the section fails to appreciate QC philosophy _____ will not succeed.

ANSWERS

Fill in the blanks :

15.1 circle 15.2 develops

15.3 creativity 15.4 QC.

EXERCISES-15

15.1 What are the chief objectives of 'Quality circle' ?

15.2 What are the concept of quality circle ?

15.3 Write a short note on 'Motivation'.

15.4 What are the main rules for quality circles ?

15.5 Give a list of the rules governing a 'Quality circle' programme.

15.6 Give a list of duties to be performed by a quality circle leader and member.

15.7 Enumerate chief advantages of QC programme.

15.8 Enumerate chief disadvantages of QC programme.

15.9 Describe the terms total quality control. What are its functions?

15.10 Write a brief note on 'Total Quality Management' (TQM).

15.11 What are the main concept of total quality management ?

15.12 What are the Deming's 14 points approach to TQM ? What do you understand by the PDCA cycle ?

15.13 Write a short note on the following :

(*a*) Objectives of quality cycle

(*b*) Characteristics of quality circles

(*c*) Benefits of TQM

16

ISO 9000

16.1 Introduction 16.2 What is quality ? 16.3 What is meant by quality system and total quality management (TQM) ? 16.4 What are ISO 9000 series standards ? 16.5 ISO 9000 16.6 Are the standards easy to understand and to implement ? 16.7 What are major challenges with ISO/9000 ? 16.8 What is driving international ISO adoption ? 16.9 Does ISO registration get your product into the European community ? 16.10 What is conformity assignment ? 16.11 How do you comply with the standards ? 16.12 Glossary * Multiple/Objective type questions * Exercises.

16.1 Introduction

To ensure the quality it is necessary to make systematic controls at every stage and also to take critical review of efforts and achievements of the company with respect to quality of the product. For making systematic control, co-operation of every employee is needed, since quality depends on every person working in the organisation. Every employee's involvement is utmost important in understanding the problems, finding solutions and implementing them. All these actions would lead to maintain and improve quality and reliability of the product.

An increasingly large number of managers are recognizing that ISO 9000 is extremely important for their organizations. Since the beginning of 1990s, the term ISO 9000 has been steadily stealing the limelight in discussions on quality, reliability and global competitiveness. Though there is a phenomenal interest in ISO 9000, yet, there is a lot of confusion about what it is.

Managers want to know how and why was ISO 9000 developed. Can it improve the quality of products ? Whether it would help in exports. How much it costs to implement ISO 9000 quality system. Whether customers care about it. How can a company comply with these standards ? What is meant be