GE 6757 TOTAL QUALITY MANAGEMENT

VIII SEMESTER

DEPARTMENT OF ECE

UNIT I INTRODUCTION

Introduction – Need for quality – Evolution of quality – Definitions of quality – Dimensions of product and service quality – Basic concepts of TQM – TQM Framework – Contributions of Deming, Juran and Crosby – Barriers to TQM – Quality statements – Customer focus – Customer orientation, Customer satisfaction, Customer complaints, and Customer retention – Costs of quality.

INTRODUCTION:

Quality does not mean an expensive product. On contrary it is fitness for use of the product.

NEED FOR QUALITY:

The need for quality was felt, during World War II due to the unprecedented need for manufacture goods. From them on me hodologies for assuring quality in products and services evolved continuously fin lly lead to TQM.

EVOLUTION OF QUALITY/ CONTRIBUTION OF QUALITY GURU:

SHEWHART **-** Control chart theory
PDCA Cycle

DEMING - Statistical Process Control

JURAN - Concepts of SHEWHART
- Return on Investment (ROI)

FEIGANBAUM - Total Quality Control
- Management involvement
- Employee involvement

ISHIKAWA - Cause and Effect Diagram
- Quality Circle concept

CROSBY - "Quality is Free"
- Conformance to requirements

TAGUCHI - Loss Function concept
- Design of Experiments

DEFINITION OF QUALITY:

1. Quality = Performance / Expectations
2. Quality is defined as the predictable degree of uniformity and dependability, at low cost Suited to the market. (Deming).
3. Quality is defined as fitness for use (Juan).
4. Quality is defined as conformance to requirements (Crosby).
5. Quality is totality of the characteristics of entity that bear on its ability to satisfy stated and implied needs (ISO).

DIMENSIONS OF PRODUCT AND SERVICE QUALITY: PRODUCTQUALITY:

1. Performance - FulfillmentCivildatasofprimaryrequirement

2. Features - Additional things that enhance performance

3. Conformance - Meeting specific st nd rds set by the industry

4. Reliability - Consistence performance over period of time

5. Durability - Long life and less maintenance

6. Service - Ease of repair, guarantee, and warranty

7. Response - Dealer customer relationship, human interface

8. Aesthetics - exteriors, packages, appearance

9. Reputation - Past performance, ranking, branding

SERVICE QUALITY:

1. **Reliability -** Refers to the dependability of the service providers and their ability to keep their promises.
2. **Responsiveness -** Refers to the reaction time of the service.
3. **Assurance -** Refers the level of certainty a customer has regarding the quality of the service provided.
4. **Empathy - Being** able to understand the needs of the customer as an individual.

5. **Tangibles -** Similar to the physical characteristics of quality of products.

6. **Other Dimensions - Time**, Courtesy, Timeliness, consistency, accuracy, credibility and security.

TOTAL QUALITY MANAGEMENT (TQM):

TQM is defined as both philosophy and a set of guiding principles that represent the foundation of continuously improving organization. It is the application of quantitative methods and human resources to i prove all the process within the organization and exceed customer needs now and in the future.

Total Quality Management is an effective system for integrating the quality development, quality maintenanceandqualityimprovement efforts of various groups in an organization continuously, so s to enable marketing, engineering, production and service at the most economic levels which allow for full customer satisfaction.

BASIC CONCEPTS OF TQM:

1. **Management Involvement** – Participate in quality program, develop quality council, direct participat on.
2. **Focus on customer** – who is the customer – internal and external, voice of the customer, do r ght first time and every time.
3. **Involvement and utilisation of entire work force** – All levels of Management
4. **Continuous improvement** – Quality never stops, placing orders, bill errors, delivery, minimize wastage and scrap etc.
5. **Treating suppliers as partners** – no business exists without suppliers.

6. **Performance measures** – creating accountability in all levels.

TQM FRAME WORK:

TQM FRAME WORK

QUALITY GURU'S

TOOLS AND TECHIQUES

CONTRIBUTIONS OF DEMING:

1. Create and publish the Aims and Purposes of the organization.

2. Learn the New Philosophy.

3. Understand the purpose of Inspection.

4. Stop awarding business based on price alone.

5. Improve constantly and forever the System.

6. Institute Training.

7. Teach and Institute Leadership.

8. Drive out Fear, Create Trust and Create a climate for innovation.

9. Optimize the efforts of Teams, Groups and Staff areas.

10. Eliminate exhortations for the Work force.

11a. Eliminate numerical quotas for the work force.

11b. Eliminate Management by objectives.

12. Remove Barriers that rob people of pride of workmanship.

13. Encourage Education and Self-improvement for everyone.

14. Take action to accomplish the transformation.

CONTRIBUTIONS OF JURAN:

THE JURAN TRILOGY
Juran views quality as fitness for use.

Juran Trilogy is designed to reduce the cost of quality over time.

1. QUALITY PLANNING
1. Determine internal & external customers.

2. Their needs are discovered.

3. Develop product / service features.

4. Develop the processes able to produce the product / service features.

5. Transfer plans to operations.

2. QUALITY CONTROL
1. Determine items to be controlled.

2. Set goals for the controls.

3. Measure actual performance.

4. Compare actual performance to goals.

5. Act on the difference.

3. QUALITY IMPROVEMENT
1. Establishment of quality council.

2. Identify the improvement projects.

3. Establish the project teams with a project leader.

4. Provide the team with the resources.
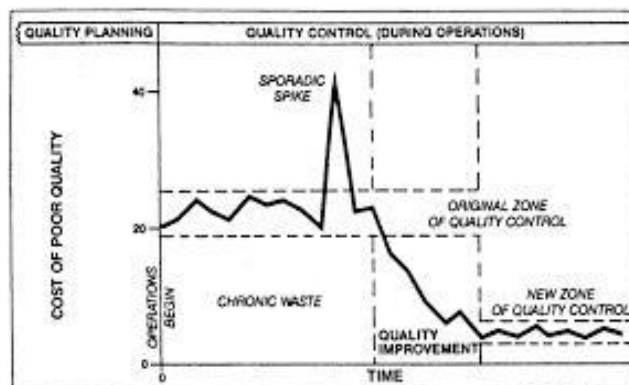
CONTRIBUTIONS OF CROSBY:

The Four absolutes of quality are

1. Quality is defined asCivildatasconformancetorequirements

2. The system for causing Quality is prevention.

3. The performance standard must be zero defec .

4. The measurement of Quality is the Price of Nonconformance

Crosby's Fourteen Points:

1. Management Commitment

2. Quality Improvement Team

3. Quality Measurement

4. Cost of Quality Evaluation

5. Quality Awareness

6. Corrective Action

7. Establish an Ad Hoc Committee for the Zero Defects Program

8. Supervisor Training

9. Zero Defects Day

10. Goal Setting

11. Error Cause Removal

12. Recognition

13. Quality Councils

14. Do It Over Again

OBSTACLES (BARRIERS) IN IMPLEMENTING TQM:

1. Lack of Management Commitment

2. Inability to change Organizational culture

3. Improper planning

4. Lack of continuous training and education

5. Incompatible organizational structure and isolated individuals and departments.

6. Ineffective measurement techniquesandlackof access to data and results.

7. Paying inadequate attention to intern   nd external customers

8. Inadequate use of empowerment nd te mwork

9. Failure to continually improve

BENEFITS OF TQM

Customer satisfaction or ented benefits:
1. Improvement in product qual ty

2. Improvement in product design

3. Improvement in production flow

4. Improvement in employee morale and quality consciousness

5. Improvement in product service

6. Improvement in market place acceptance

Economic improvement oriented benefits:
1. Reduction in operating costs

2. Reduction in operating losses

3. Reduction in field service costs

4. Reduction in liability exposure

QUALITY STATEMENTS

a. Vision statement,
b. Mission statement, and
c.Qualitypolicystatement

1. *The vision statement* Civil datas is a short declaraion of wht on organization as pirto be tomorrow.
2. It is the ideal state that might never be reached; but on which one will work hard continuously to achieve. Successful visions provide a brief guideline for decision making.
3. The vision statement should be coined in such way that the leaders and the employees working in the organization should work towards the achievements of the vision statement.

a) **The mission statement** describes the function of the organization. It provides a clear statement of purpose for employees, customers, and suppliers.
b) The mission statement answers the following questions: who we are? Who are our customers? ; What we do? and how we do it?
   i. *The quality policy* is a guide for everyone in the organization as to how they provide products and service to the customers.

   ii. It should be written by the CEO with feedback from the workforce and be approved by the quality council.
   iii. A quality policy is a important requirement of ISO 9000 quality systems.

CUSTOMER FOCUS:
Customer is the King.
"Quality what the customer wants" It emphasis on the custo er. Customer satisfaction must be the primary goal of any organization, therefore it is essential that every employee in the organization understands the importance of the customer. A satisfied customer will led to increased profits.

CUSTOMER SATISFACTIONMODEL:
Customer satisfaction is not an objective but feeling or attitude. Since it is subjective it is not easy to measure. There re so many facets to a customer experience with a product and service th need to be measured individually to get the accurate picture of customer satisfaction. Customer Satisfaction Model – Teboul

Types of Customers
1. Internal customers
2. External customers

Internal Customers:
1. The customers inside the organization
2. The flow of work, product and service in the organizati
   dependent on one and another.
3. Every person in a
   processCivildatasisconsideredthecutomer operation.

External Customers:

1. Uses the product or service

2. Who purchase the product.

3. Who influence the sale of the Product or services.

Kano Model

CUSTOMER COMPLAINTS:

Customer Satisfaction analysis helps the organization in the following ways:

1. A totally satisfied customer contributes to revenue of the company.
2. A totally dissatisfied customer decrease revenue.

CUSTOMER FEEDBACK:

Customer feedback is required for the following reasons.

1. To discover customer dissatisfaction
2. To identify the customer needs
3. To discover relative priories of quality
4. To compare performance with competition
5. To determine opportunities for improvement.

TOOLS OF CUSTOMER COMPLAINTS:
   a. Comment card
   b. Customer Questionnaire
   c. Focus Groups
   d. Toll Free telephone
   e. Customer Visit
   f. Report Card
   g. Internet & Computers
   h. Employee Feedback.
   i. Mass customization

CUSTOMER RETENTION
It means "retaining the customer" to support the business. It is more powerful and effective than customer satisfaction.
For Customer Retention, we need to have both "Customer satisfaction & Customer loyalty".

The following steps are important for customer retention.

1. Top management commitment to the customer satisfacti n.
2. Identify and understand the customers what they like and dislike about the organization.
3. Develop standards of quality service and performance.
4. Recruit, train and reward good staff.
5. Always stay in touch with customer.
6. Work towards continuous improvement of customer service and customer retention.
7. Reward service accomplishments by the front-line staff.

8. Customer Retention mo es customer satisfaction to the next level by determining what is truly mportant to the customers.
9. Customer satisfaction is the connection between customer satisfaction and bottom line.

COST OF QUALITY:

The Value of Quality must be based on its ability to contribute to profits. Quality related cost is the cost incurred by an organization to ensure that the products / services it provides conform to customer requirements.

DEFINITION:

Quality cost is defined as those costs associated with the non-achievement of products / service quality as defined by the requirements established by the organization and its contract with the customer. Quality cost is the cost of poor products or services. When Quality Cost is too high, it is sign of management ineffectiveness, which affects the organization competitive position.

PREVENTION COST:

"The cost that are incurred on preventing a quality problem from arising."

a. Marketing / Customer/ User
b. Product / Service / Design Development
c. Purchasing
d. Operations
e. Quality Administration

APPRAISAL COST:

"The Cost incurred in assessing that the products / services conform to the requirements"

a. Purchasing Appra sal Cost
b. Operation (Manufacturing or Service) Appraisal Cost
c. External Appra sal Cost
d. Review of test and inspection data:
e. Miscellaneous quality evaluation:

INTERNAL FAILURE COST:

"Cost arises due to internal failures."

a. Product or Service Design Failure Cost:
b. Purchasing failure cost
c. Operations cost

EXTERNAL FAILURE COST:
The cost incurred due to the non conformance of the products or services after delivery of products to the customer.

Quality Improvement Strategy:

1. Project team:
2. Reduce the Failure cost:
3. Prevention of quality cost.
4. Reducing appraisal cost.

UNIT 2 - TQM PRINCIPLES

SYLLABUS: Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen – Supplier partnership - Partnering, Supplier selection, Supplier Rating.

LEADERSHIP:

The success of quality management is to a greater extent is influenced by the quality of the leadership. Peter Drucker, the eminent management thinker and writer quotes: "LeadershipCivildatasisliftingofman'sviions to higher sights, the raising of man's performance to higher standard, the building of man's personality beyond its normal limitations".

Leadership is the process of influencing others towards the accomplishment of goals. Leader triggers the will to o, show the direction and guide the group members towards the accompl shment of the company's goal.

CHARACTERISTICS OF QUALITY LEADERS:

1. They give priority attent on to external and internal customers and their needs.
2. They empower, rather than control, subordinates.
3. They emphasis improvement rather than maintenance.
4. They emphasis prevention.
5. They emphasis collaboration rather than competition.
6. They train and coach, rather than direct and supervise.
7. They learn from the problems.
8. They continually try to improve communications.
9. They continually demonstrate their commitment to quality.
10. They choose suppliers on the basis of quality, not price.
11. They establish organizational systems to support the quality effort.
12. They encourage and recognize team effort.

THE 7 HABITS OF HIGHLY EFFECTIVE PEOPLE:

1. Be Proactive
2. Begin with the End in mind
3. Put First Things First
4. Think Win – Win
5. Seek First to Understand, then to Be Understood
6. Synergy
7. Sharpen the Saw (Renewal)

LEADERSHIP CONCEPTS

A leader should have the following concep s

1. People, Paradoxically, need security nd independence at the same time.

2. People are sensitive to external and punishments and yet are also strongly self – motivated.
3. People like to hear a kind word of praise. Catch people doing something right, so you can pat them on the back.
4. People can process only few facts at a time; thus, a leader needs to keep things simple.
5. People trust their gut reaction more than statistical data.
6. People distrust a leader's rhetoric if the words are inconsistent with the leader's actions.

STRATEGIC QUALITY PLANNING:
Strategic quality planning (SQP) is a systematic approach to defining long-term business goals, including goals to improve quality and the means (i.e., the plans) to achieve them.
Goals should:

☐Improve customer satisfaction, employee satisfaction and process
☐Be based on statistical evidence
☐Be measurable
☐ Have a plan or method for its achievement
☐ Have a time frameforachievingthegoal
☐Finally, it should be challenging yet achiev ble

SEVEN STEPS TO STRATEGIC QUALITY PLANNING:

1. **Customer needs** - Discover the future needs of the customer.

2. **Customer positioning** - Planners etermine where the organization wants to be in relation to the customers.
3. **Predict the future** – Demographics, economic forecasts, and technical assessments or projection tools for predicting the future.
4. **Gap Analysis** – Ident fy the gaps between current state and the future state of the organization. An analysis of core values and concepts are excellent techniques for pinpointing the gaps
5. **Closing the Gap** – A plan has to be developed to close the gap by establishing goals and responsibilities.
6. **Alignment** – Once a plan is developed it must be aligned with the vision, mission, and core valuesand concepts of the organization.
7. **Implementation** – Resources must be allocated to collecting data, designing changes, and overcoming resistance to change.

Employee Involvement:

Employee involvement is one approach to improve quality and productivity. It is a means to better meet the organization's goals for quality and productivity.

MOTIVATION:

"Motivation means a process of stimulating people to accomplish desired goals."

Motivation is the process of inducing people inner drives and action towards certain goals and committing his energies to achieve these g als.

IMPORTANCE OF MOTIVATION:
a. Motivation improvesemployeeinvolvement.
b. Motivation promotes job satisfaction and thus reduces absenteeism and turnover. c. Motivation helps in securing high level of performance and hence enhances efficiency and productivity.

d. Motivation creates a congenial working atmosphere in the organization and thus promotes interpersonal cooperation.

THEORIES OF MOTIVATION:

Though there are many theories of motivation, the Maslow's hierarchy of needs theory and Herzberg's two factor theory are more important from our subect of view.

MASLOW'S HIERARCHY OF NEEDS:

Maslow has set up hierarchy of five levels of basic needs. Beyond these needs, higher levels of needs exist. These include needs for understanding, esthetic appreciation and purely spiritual needs. In the levels of the five basic needs, the person does not feel the second need until the demands of the first have been satisfied, nor the third until the second has been satisfied, and so on. Maslow's basic needs are as follows:

Physiological Needs

These are biological needs. They consist of needs for oxygen, food, water, and a relatively constant body temperature. They are the strongest needs because if a person were deprived of all needs, the physiological ones would come first in the person's search for satisfaction.

Safety Needs

When all physiological needs are satisfied and are no longer controlling thoughts and behaviors, the needs for security can become active. Adults have little awareness of their security needs except in times of e ergency or periods of disorganization in the social structure (such as widespread rioting). Children often display the signs of insecurity and the need to be safe.

Needs of Love, Affection and Belongingness

When the needs for safety and for physiological well-being are satisfied, the next class of needs for love, affection and belongingness can emerge. Maslow states that people seek to overcome feelings of loneliness and alienation. This involves both giving and receiving love, ffection and the sense of belonging.

Needs for Esteem

When the first three classes of needs are satisfied, the needs for esteem can become dominant. These involve needs for both self-esteem and for the esteem a person gets from others. Humans have a need for a stable, firmly based, high level of self-respect, and respect from others. When these needs are satisfied, the person feels self-confident and valuable a person in the world. When these needs are frustrated, the person feels inferior, weak, helpless and worthless.

Needs for Self-Actualization

All of the foregoing needs are satisfied, then and only then are the needs for selfactualization activated. Maslow describes self-actualization as a person's need to be and do that which the person was "born to do." "A musician must make music, an artist must paint, and a poet must write." These needs make themselves felt in signs of restlessness. The person feels on edge, tense, lacking something, in short, restless. If a person is hungry, unsafe, not loved or accepted, or lacking self-

esteem, it is very easy to know what the person is restless about. It is not always clear what a person wants when there is a need for self-actualization.

The hierarchic theory is often represented as a pyramid, with the larger, lower levels representing the lower needs, and the upper point representing the need for self-actualization. Maslow believes that the only reason that people would not move well in direction of self-actualization is because of hindrances placed in their way by society. He states that education is one of these hindrances.

HERZBERG'S TWO FACTOR THEORY:

This theory is also called *motivation-hygiene theory*. This theory is based on two factors: 1. Motivation factors or sati fier , and 2. Hygiene factors or dissatisfiers.

Motivational factors:

1. Achievement
2. Recognition
3. Work itself
4. Responsibility
5. Advancement and growth

Hygiene factors:
1. Supervisors
2. Working conditions
3. Interpersonal relationship
4. Pay and security
5. Company policy and administration

According to Herzberg, maintenance or hygiene factors are necessary to maintain a reasonable level of satisfaction among employees. These factors do not provide satisfaction to the employees but their absence will dissatisfy them. Therefore these factors are called dissatisfiers.

On the other hand, motivational factors create satisfaction to the workers at the time of presence but their absence does not cause dissatisfaction. It can be noted that Herzberg's dissatisfiers are roughly equivalent to Maslow's lower levels, and the motivators are similar to the Maslow's upper levels.

EMPOWERMENT:

Empowerment is investing people with authority. Its purpose is to tap the enormous reservoir of potential contribution that lies within every worker. The principles of empowering people are given below:

1. Tell people what their responsibilities are
2. Give authority
3. Set standards for excellence.
4. Render training.
5. Provide knowledge and inform tion.
6. Trust them.
7. Allow them to commit mistakes.
8. Treat them with dign ty and respect.

CHARACTERISTICS OF EMPOWERED EMPLOYEES:

1. They feel respons ble for their own task.
2. They are given free hand in their work.
3. They balance their own goals with those of the organization.
4. They are ell trained, equipped, creative, and customer oriented.
5. They are critical, have self-esteem, and are motivated.
6. They are challenged and encouraged.
7. They monitor and improve their work continuously.
8. They find new goals and change challenges.

TEAM:

A team is defined as a group of people working together to achieve common objectives or goals.

TEAMWORK:

Teamwork is the cumulative actions of the team during which each member of the team subordinates his individual interests and opinions to fulfill the objectives or goals of the group.

NEED FOR TEAMWORK:

1. Many heads are more knowledgeable than one.
2. The whole is greater than the sum of its members
3. Team members develop rapport which each other.
4. Teams provide the vehicle for improved communication.

TYPES OF TEAMS:

1. Process improvement team.
2. Cross – functional team.
3. Natural work teams.
4. Self – Directed / Self – Managed work teams.

CHARACTERISTICS OF SUCCESSFUL TEAMS:
1. Sponsor
2. Team Charter
3. Team Composition
4. Training
5. Ground Rules
6. Clear Objectives
7. Accountability
8. Well-Defined decision procedure
9. Resources
10. Trust
11. Effective Problem Solving
12. Open Communication
13. Appropriate Leadership
14. Balanced Participation
15. Cohesiveness

1. Sponsor: In order to have effective liason with the quality council, there should be a sponsor. The sponsor is a person from the quality uncil; he is to provide support to the organization.

2. Team Charter: A Civildatas team charter is document that defines the team's mission, boundaries, the background of the problem, the te m's authority and duties, and resources. It also identifies the members and heir ssigned roles – leader, recorder, time keeper and facilitator.

3. Team Composition: The size of the team should not exceed ten members except in the case of natural work teams or self-directed teams. Teams should be diversed by having members w th different skills, perspective and potential. Wherever needed, the nternal and external customers and suppliers should be included as a team member.

4.**Training:** The team members should be trained in the problem-solving techniques, team dynamics and communication skills.

4. Ground Rules: The team should have separate rules of operation and conduct. Ground rules should be discussed with the members, whenever needed it should be revie ed and revised.

5. Clear Objectives: The objective of the team should be stated clearly. Without the clear objective, the team functions are not to be effective.

6. Accountability: The team performance is accountable. Periodic status report of the team should be given to the quality council. The team should review its performance to determine possible team process weaknesses and make improvements.

8. Well-defined Decision Procedures: The decision should be made clearly at the right time by the team.

9. Resources: The adequate information should be given to the team wherever needed. The team cannot be expected to perform successfully without the necessary tools.

10. Trust: Management must trust the team to perform the task effectively. There

must also be trust among the members and a belief in ea h other.

11. Effective Problem-Solving: Problem-solvingmethods are used to make the effective decision.

12. Open Communication: Open communic ion should be encouraged i.e., everyone feels free to speak in the te m wh tever they are thinking, without any interruptions.

13. Appropriate Leadership: Leadership is important in all the team. Leader is a person who leads the team, mot vates the team and guides the team in a proper direction.

14. Balanced Participat on: Everyone in team should be involved in the team's activities by voicing their opinions, lending their knowledge and encouraging other members to take part

15. Cohesiveness: Members should be comfortable working with each other and act as a single unit, not as individuals or subgroups.

ELEMENTS OF EFFECTIVE TEAM WORK:

1. Purpose
2. Role and responsibilities
3. Activities
4. Effectiveness
5. Decisions
6. Results, and
7. Recognition.

STAGES OF TEAM DEVELOPMENT:

Each term takes some Civildatas time to start functioning effectively towards problem solving. Each team goes through six distinct st ges in its development. These are **farming, storming, norming, performing m in enance and evaluating.**

1. Farming stage: When team is cre ted, it consists of group of individuals and team work does not exist at this stage. Team's purpose, members' roles, acceptance of roles, authority and process of functioning are learnt in the formation process.

2. Storming stage: Init al agreements and role allocations are challenged and re-established at this stage of team development. At this stage, hostilities and personal needs often emerge which may be resolved.

3. Norming stage: During norming stage of team development, formal and informal relationships get established among team members. Openness and cooperation have been observed as signs of team's behaviour.

4. Performing stage: At this stage, the team starts operating in successful manner. Trust, openness, healthy conflict and decisiveness of a group's performance can be reached at this stage.

5. Maintenance stage: Functioning of team does not deteriorate overtime. At this stage, the performance of teamwork at the earlier stage will be maintained for some period of time.

6. Evaluating stage: At this stage, team's performance is to be evaluated in view of the set targets. Both self-evaluation and management-based evaluation form this stage of team development.

COMMON BARRIERS TO TEAM PROGRESS:

1. Insufficient training.
2. Incompatible rewards and compensation.
3. First-line supervisorresistance.
4. Lack of planning.
5. Lack of management support.
6. Access to information systems.
7. Lack of Union support.
8. Project scope too large.
9. Project objectives are not s gn ficant.
10. No clear measures of success.
11. No time to do improvement work.

RECOGNITION AND REWARD:

Recognition is process whereby management shows acknowledgement of an employee's outstanding performance. Recognition is a form of employee positive motivation. Recognition of employees is highly essential as people find themselves in a accepted and winning role. To sustain employee's interest and to propel them towards continuous improvement, it is essential to recognize the people. This acknowledgement may be of financial, psychological or both in nature.

Reward is a tangible one, such as increased salaries, commissions, cash bonus, gain sharing, etc; to promote desirable behavior.

METHODS TO RECOGNIZE PEOPLE:

1. Develop a behind the scenes awards specifically for those whose actions are not usually in the lime light, make sure such awards are in the lime light.
2. Create best ideas of the year booklet and include everyone's picture name and description of their best ideas.
3. Feature the quality team of the month and put their picture in a prominent place.
4. Honor peers who have helped you by recognizing them at your staff meetings.
5. Let people attend meetings, commi ees e c; in your place when you are not available.
6. Involve teams with external customers and suppliers, sending them on appropriate visits to solve prob ems and look for opportunities.
7. Invite a team for coffee or lunch any time, not necessarily when you need them for someth ng.

8. Create a visibility wall to display information, posters, and pictures, thanking individual employees and their teams**,** and describing their contributions
9. When you are discussing an individual or group ideas with other people, peers, or higher management make sure that you give them credit.

NEED FOR RECOGNIZATION:

1. Improve employee's morale
2. Show the company's appreciation for better performance
3. Create satisfied workplace
4. Create highly motivated workplace.
5. Reinforce behavioral patterns.
6. Stimulate creative efforts.

TYPES OF REWARDS:

1. Intrinsic rewards
2. Extrinsic rewards

Intrinsic rewards are related to feelings of accomplishment of self-worth.

Extrinsic reward are related to pay or compension issues.

EFFECTS OF RECOGNITION AND REWARD SYSTEM:
1. Recognition and reward go together for letting people know that they are valuable members for the organization.
2. Employee involvement can be achieved by recognition and reward system.

3. Recognition and reward system reveals that the organization considers quality and product v ty as important.
4. It provides the organization an opportunity to thank high achievers.

5. It provides employees   specific goal to achieve.

6. It motivates employees to improve the process.

7. It increases the morale of the workers.

PERFORMANCE APPRAISAL:
The performance appraisal is used to let employees know how they are performing. The performance appraisal becomes a basis for promotions, increase in salaries, counseling and other purposes related to an employee's future.

IMPORTANCE OF PERFORMANCE APPRAISALS:

1. It is necessary to prevail a good relationship between the employee and the appraiser.
2. Employee should be informed about how they are performing on a continuous basis, not just at appraisal time.
3. The appraisal should highlight strength and weakness and how to improve the performance.
4. Employee should be allowed to comment on the evaluati n and protest if

    necessary.

5. Everyone shouldCivildatasunderstandthatthepurpoeof performance appraisal is to have employee involvement.

6. Errors in performance evaluations should be voided.

7. Unfair and biased evaluation will render poor rating and hence should be eliminated.

BENEFITS OF EMPLOYEE INVOLVEMENT:

1. Employees make better dec ons using their expert knowledge of the process
2. Employees are better able to spot and pin-point areas for improvement.

3. Employees are better able to take immediate corrective action.

4. Employee involvement reduces labour / management friction.

5. Employee involvement increases morale.

6. Employees have an increased commitment to goals because they are involved.

CONTINUOUS PROCESS IMPROVEMENT:

Continuous process improvement is designed to utilize the resources of the organization to achieve a quality-driven culture.

PDCA (plan-do-check-act)

PDCA (plan-do-check-act, sometimes seen as plan-do-check-adjust) is a repetitive four-stage model for continuous improvement in business process management.

The PDCA model is also known as the Deming circle/cycle/wheel, Shewhart cycle, control circle/cycle, or plan–do–study–act (PDSA).

PDCA was popularized by Dr. W. Edwards Deming, an American engineer, statistician and management consultant. Deming is often considered the father of modern quality control.

TQM processes are often divided into the four sequential categories: plan, do, check, and act.

Plan*: Define the problem to be addressed, collect relevant data, and ascertain the problem's root cause.

Do: Develop and implement a solution; decide upon a measurement to gauge its effectiveness.

Check: Confirm the results through before-and-after data comparison.

Act: Document the results, inform others about process changes, and make recommendations for the problem to be addressed in the next PDCA cycle.

5S Principles:
The 5S framework was originally developed by just-in-time expert and international consultant Hiroyuki Hirano. The 5S framework is an extension of Hirano's earlier works on justin-time production systems. The 5Ss represent a simple "good housekeeping" approach to improving the work environment consistent with the tenets of Lean Manufacturing System. It pro otes daily activity for continuous improvement. It fosters efficiency and productivity while improving work flow. It encourages a proactive approach that prevents pr blems and waste before they occur. It provides a practical method for dealing with the real problems that workers face every day.

SEIRI / SORT / CLEANUP:

The first step of the "5S" process, Seiri, refers to the act of throwing away all unwanted, unnecessary, and unrelated m teri ls in the workplace. People involved in Seiri must not feel sorry about having to throw away things. The idea is to ensure that everything left in the workp ace is related to work. Even the number of necessary items in the workplace must be kept to its absolute minimum. In performing SEIRI, th s mple guideline is a must:

1. Separate needed tems from unneeded items.
2. Remove unneeded items from working areas.
3. Discard the items never used.
4. Store items not Item not needed now.
5. Remove all excess items from working areas, including work pieces, supplies, personal items, tools, instruments, and equipment.
6. Use red tag to get rid of unneeded items.
7. Store items needed by most people in a common storage area.
8. Store items only needed by each individual in his/her own working area.
9. Organize working / storage area.

SEITON / SET IN ORDER / ARRANGING:

SEITON, or orderliness, is all about efficiency. This step consists of putting everything in an assigned place so that it can be accessed or retrieved quickly, as well as returned in that same place quickly. If everyone has quick access to an item or materials, work flow becomes efficient, and the worker beco es productive. Every single item must be allocated its own place for safekeeping, and each location must be labelled for easy identification of what it's for. Its objective includes; the needed items can be easily found, stored and retrieved, supports efficiency and productivity, First-in first-out (FIFO), and save space and time.

In performing SEITON, follow these guidelines:

1. A place for everything and everything in its place.
2. Place tools and instructional manual close to the point of use.
3. Store similar items together. Different items in separate rows.
4. Don't stack items together. Use rack or shelf if possible.
5. Use small bins to organ ze small items.
6. Use color for quickly dentifying items.
7. Clearly label each item and its storage areas (lead to visibility).
8. Use see-through cover or door for visibility.
9. Use special designed cart to organize tools, jigs, measuring devices, etc., that are needed for each particular machine.

SEISO / SHINE / NEATNESS

SEISO, the third step in "5S", says that 'everyone is a janitor.' SEISO consists of cleaning up the workplace and giving it a 'shine'. Cleaning must be done by everyone in the organization, from operators to managers. It would be a good idea to have every area of the workplace assigned to a person or group of Persons for cleaning. SEISO is not just cleaning, but a whole attitude that includes ensuring everything is in perfect condition. Everyone should see the 'workplace' through the eyes of a visitor - always thinking if it is clean enough to make a good impression. Its objective includes; cleanliness ensures a more comfortable and safe working place, cleanliness will lead to visibility so as to reduce search ti e and cleanliness ensures a higher quality of work and products.

Follow these guidelines in performing SEISO:

1. Use dust collecting covers or devices to prevent possible dirt or reduce the amount of dirt.

2. Investigating the causes of dirtiness nd implement a plan to eliminate the sources of dirt.
3. Cover around cords, legs of m chines nd tables such that dirt can be easily and quickly removed.
4. Operators clean their own equipment and working area and perform basic preventive maintenance.
5. Keep everything clean for   constant state of readiness.

SEIKETSU / SYSTEMIZE / DISCIPLINE

The fourth step of "5S", or SEIKETSU, more or less translates to 'standardized clean-up' It consists of defining the standards by which personnel must measure and maintain 'cleanliness'. SEIKETSU encompasses both personal and environmental cleanliness. Personnel must therefore practice 'SEIKETSU' starting ith their personal tidiness. Visual management is an important ingredient of SEIKETSU. Color-coding and standardized coloration of surroundings are used for easier visual identification of anomalies in the surroundings. Personnel are trained to detect abnormalities using their five senses and to correct such abnormalities immediately.

The guidelines include:
1. Removing used, broken, or surplus items from the work area
2. Making safety a prime requirement by paying attention to noise, fumes, lighting,

1. cables, spills, and other aspects of the workplace environ   ent
2. Checking that items are where they should be

3. Listening to the "voice" of the process and being alert to things such as unusual noises

4. Ensuring that there Civildatas is a place for everything and that everything is in its place
5. Wearing safe working apparel and using s fe equipment
6. Minimizing all waste and the use of valuable resources such as oil, air, steam, water, and electricity

SHITSUKE / SUSTAIN / ON-GOING IMPROVEMENT:
The last step of "5S", SHITSUKE, means 'Discipline.' It denotes commitment to mainta n orderliness and to practice the first 4 S as a way of life. The emphasis of SHITSUKE elimination of bad habits and constant practice of good ones.

Once true SHITSUKE is achieved, personnel voluntarily observe cleanliness and orderliness at all times, without having to be reminded by management. The characteristic of 5S tends to overlap significantly rather than cover very different subjects. Rather than worry about what fits into SEIRI and what fits into Seiton, use them to reinforce each other and implement the whole thing.

KAIZEN: [KAI =CHANGE, ZEN = GOOD]

Kaizen is the practice of continuous improvement. Kaizen was originally introduced to the West by Masaaki Imai in his book Kaizen: The Key to Japan's Competitive Success in 1986. Kaizen is continuous improvement that is based on certain guiding principles:

1. Good processes bring good results
2. Go see for yourself to grasp the current situation
3. Speak with data, manage by facts
4. Take action to contain and correct root causes of problems
5. Work as a team
6. Kaizen is everybody's business

KAIZEN WHEEL:

The Kaizen improvementCivildatasfocusesontheuseof:

1. Value – added and non – value work actives.

2. Muda, which refers to the seven cl sses of waste – over-production, delay, transportation, processing, inventory, wasted motion, and defective parts.

3. Principles of materials hand ing and use of one – piece flow.

4. Documentation of standard operating procedures.

5. The five S's for workplace organization.

6. Visual management.

7. Just – in – time principles.

8. Principles of motion study and the use of cell technology.

9. Poka – Yoke.

10. Team dynamics.

SUPPLIER PARTNERSHIP:

What is Supplier Partnering?

Partnering is a defined as a continuing relationship, between a buying firm and supplying firm, involving a commitment over an extended time period, an exchange of information, and acknowledgement of the risks and rewards of the relationship. The relationship between customer and supplier should be based upon trust, dedication to common goals and objectives, and an understanding of each party's expectations and values.

Benefits of Partnering:

        a. Improved quality;

        b. reduced cost;

        c. Increased productivity;

        d. Increased efficiency;

        e. Increased market share;

        f. Increased opportun ty for innovation; and

        g. Continuous improvement of products / services.

The three key elements to   partnership relationship are
1. Long term commitment
2. Trust
3. Shared Vision

SOURCING:

The three types of sourcing are

1. Sole sourcing
2. Multiple sourcing
3. Single sourcing

SUPPLIER SELECTION

        The suppliers should be selected with the f ll wing ten conditions

1. The supplier should understand clearly the management philosophy of the organization.
2. The supplier should have stable management system.
3. The supplier should maintain high echnic st ndards.
4. The supplier should provide the r w m terials and parts which meet quality specifications required by the purchaser.
5. The supplier should have the required capability in terms of production.
6. The supplier should not leak out the corporate secrets.
7. The supplier should quote right price and should meet the delivery schedule. The supplier should be accessible with respect to transportation and communication.
8. The supplier should be sincere in implementing the contract provisions.
9. The supplier should have an effective quality system such as ISO / QS 9000.
10. The supplier should be renowned for customer satisfaction.

SUPPLIER CERTIFICATION:

A certified supplier is one which, after extensive investigation, is found to supply material of such quality that is not necessary to perform routine testing.

The Eight criteria for supplier certification are

1. No product related lot rejections for at least 1 yearcom.

2. No non-product related rejections for atleast 6 months.

3. No production related negative incidents for atleast 6   nths.

4. Should have passed a recent on-site quality system evaluation.

5. Having a fully agreed specifications.
6. Fully documented process and quality sy tem.

7. Timely copies of inspection and test d   .

8. Process that is stable and in control

SUPPLIER RATING:

Supplier Rating is done

1. To obtain an overall rating of supplier performance.

2. To communicate w th suppliers regarding their performance.

3. To provide each supplier with detailed and true record of problems for corrective action
4. To enhance the relationship between the buyer and the supplier.

UNIT III - TQM TOOLS & TECHNIQUES I

SYLLABUS: The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking – Reason to bench mark, Bench marking process - FMEA - Stages, Types.

The seven traditional tools of quality:

1. Pareto diagram
2. Flow diagram
3. Cause and effect diagram
4. Check sheets
5. Histogram
6. Control charts
7. Scatter diagram

PARETO DIAGRAM:

Pareto charts are used for identifying set of priorities. You can chart any number of issues/variables related to specific concern and record the number of occurrences. This way you can f gure out the parameters that have the highest impact on the specific concern. This helps you to work on the propriety issues in order to get the condition under control.

FLOW CHARTS:

This is one of the basic quality tools that can be used for analyzing a sequence of events. The tool maps out a sequence of events that take place sequentially or in parallel. The flow chart can be used to understand a complex process in order to find the relationships and dependencies between events. You can also get a brief idea about the critical path of the process and the events involved in the critical path. Flow charts can be used for any field and to illustrate events involving processes of any complexity. There are specific software tools developed for drawing flow charts, such as MS Vision

CAUSE AND EFFECT DIAGRAM:

Cause and effect diagrams (Ishikawa Diagram) are used for understanding organizational or business problem causes. Organizations face problems everyday and it is required to understand the causes of these problems in order to solve them effectively. Cause and effect diagrams exercise is usually teamwork. A brainstorming session is required in order to come up with an effective cause and effect diagram. All the main components of a problem area are listed and possible causes from each area is listed. Then, most likely causes f the problems are identified to carry out further analysis.

CHECK SHEET:

A check sheet can be introduced as the most basic tool for quality. A check sheet is basically used for gathering and organizing data. When this is done with the help of software packages such as Microsoft Excel, you can derive further analysis graphs and automate through macros available. Therefore, it is always a good idea to use a software check sheet for information gathering and organizing needs. One can always use a paper-based check sheet when the information gathered is only used for backup or storing purposes other than further processing. Types of check sheet

1. Process distribution check sheets.
2. Defective item check sheets.
3. Defect location check sheet.
4. Defect factor check sheet.

HISTOGRAM:

Histogram is used for illustrating the frequency and the extent in the context of two variables. Histogram is a chart with columns. This represents the distribution by mean. If the histogram is normal, the graph takes the shape of a bell curve. If it is not normal, it may take different shapes based on the condition of the distribution. Histogram can be used to measure something against another thing. Always, it should be two variables. Consider the following exa ple: The following histogram shows morning attendance of a class. The X-axis is the number of students and the Y-axis the time of the day.

SCATTER DIAGRAM:

When it comes to the values of two variables, scatter diagrams are the best way to present. Scatter diagrams present the relationship between two variables and illustrate the results on a Cartesian plane. Then, further analysis, such as trend analysis can be performed on the values. In these diagrams, one variable denotes one axis and another variable denotes the other axis.

CONTROL CHARTS:

Control chart is the best tool for moni oring the performance of a process. These types of charts can be used for monitoring any processes related to function of the organization. These charts allow you to identify the following conditions related to the process that has been
monitored.

☐ Stability of the process
☐ Predictability of the process
☐ Identification of common cause of variation
☐ Special conditions here the monitoring party needs to react
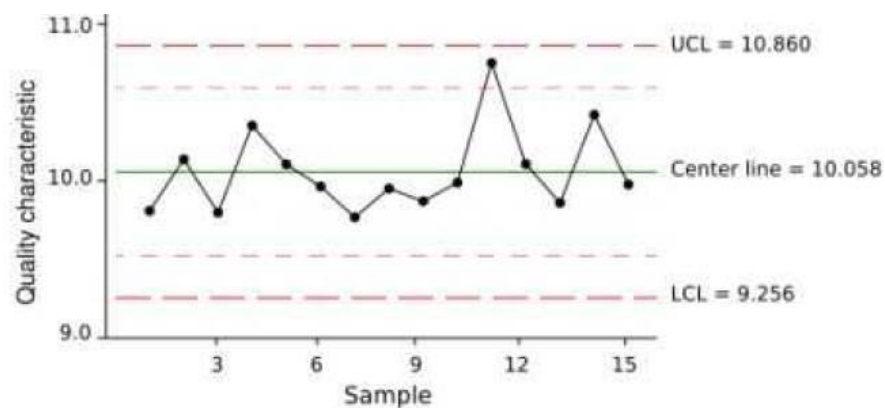
NEW SEVEN MANAGEMENT TOOLS:

These tools, unlike SPC tools are qualitative tools. Most of these tools do not involve the use of numerical data. . Like all management tools these are judgmental tools. Managers are often called upon to make decisions based on their judgement with help of incomplete information or on subjective issues. Team work and techniques like brainstorming are very essential for best results with such tools.

The seven tools we will see are :
1. Affinity diagram
2. Relations diagram
3. Tree diagram
4. Matrix diagram
5. Matrix data analysis diagram .
6 .Process decision programme chart
7. Arrow diagram

AFFINITY DIAGRAM

The purpose of an affin ty d agram is to provide a visual representation of grouping of a large number of ideas or factors or requirements into logical sets of related items to help one organise action plans in systematic manner. The steps in the procedure for preparing an affinity diagram are :

1. Decide the subject or the topic
2. Generate a large number of ideas through brainstorming
3. Decide the number of groups and their titles. Create a card for each group. Enter the title of the group at the top of the card.
4. Distribute all the ideas among the cards. If necessary, create new cards for additional groups.
5. Arrange the cards according to the relationship between the groups.
6. Give a name to the affinity diagram.

Relations Diagram:

The purpose of relations diagram is to generate a visual representation of the relations between an effect and its causes as well as the interrelationship between the causes in complex problems.

The steps in the preparation of relations diagram are:

1. Decide the 'effect' or the problem for which causes are to be found. Write is in the centre of the fl p chart or a board and enclose it in a dark bordered rectangle. Discuss the subject and confirm the 'effect'.
2. Brainstorm to identify the immediate causes for the effect first. Enter these in rectangles around the central dark rectangle. Take care to place causes likely to be related to one another in adjacent positions. It is quite possible that the locations of the causes may have to be changed as one progresses. Hence a hite board is preferable to a flip chart for this exercise. If a flip chart is used, the causes may be written on post-it pads and stuck on the chart so that their location can be changed easily.

3. Connect these immediate causes to the effect by connecting the rectangles of the causes to that of the effect with a line with an arrow pointing towards the effect. Explore the cause and effect relationship among the immediate causes and connect them, keeping in mind that the arrow always points to an effect.
4. Taking each of these immediate causes as an effect, brainstorm to find causes for them one by one. The key question for identifying causes is "why ?". Keep asking the question till the root causes are identified for the immediate, secondary and tertiary causes.
5. Explore the relationship between all the causes and onnect the rectangles as in step-3. Show as many relations among different causes as possible. A large number of routes leading to the s me root causes provides an indication that the root cause may be n important contributor to the problem.

6. Brainstorm to find the more important root causes and more prominent links leading to the effect. Mark these by making the rectangles and the connecting lines darker.
7. If necessary, rearrange the rectangles in such a way that the connecting lines are short and the agram compact.
8. Provide a suitable title to the diagram.

TREE DIAGRAM:

The purpose of the tree diagram is to explore ways and means to achieve an objective, develop a list of alternate means to reach the desired situation in a sequential order and to present them in a visual form.

The steps in the procedure to develop a tree diagram are:

1. Identify a high priority problem that needs to be solved at the earliest.

2. Prepare an objective statement describing the desired situation or the target solution.
3. Decide the appropriate form of the diagram - as ade or tree as well as direction of flowCivildatasafterabriefdiscussion.Place the target solution in the dark rectangle.
4. Brainstorm to identify the primary means o achieve the objective. Arrange them in an appropriate order keeping in mind the likely interrelations between them and place them in rectangles the first level.
5. For each of the primary means, identify secondary means which would be necessary to attain those means. Arrange them in next level boxes.
6. Identify tertiary means required to attain each of the secondary means and place them in a proper order in the next level boxes.
7. Continue the process till the group feels that the end of the line has been reached.
8. If a lo er level means is required to attain two higher level means, it may be connected to both. Rearrange the boxes if necessary to make this possible. Use of POST-IT pads can make such a rearrangement simple.
9. Brainstorm to reach a consensus on the relative importance of the last level means to priorities action.
10. Give a suitable title to the diagram. Application The most important application of the tree diagram is for devising solutions for problems. It helps one to develop a systematic step by step strategy to achieve an objective. It is also useful in monitoring the implementation of solutions by taking care of accomplishment of means at different levels.

MATRIX DIAGRAM:

The purpose of a matrix diagram is to explore the existence and the extent of relations bet een individual items in two sets of factors or features or characteristics and express them in a symbolic form that is easy to understand. The purpose for which the tool is most frequently used is to understand the relation between customer expectations as expressed by the customers and product characteristics as designed, manufactured and tested by the manufacturer.

The steps in the procedure to prepare a matrix diagram are :

1. Decide the two sets of factors for which relations are required to be clarified. Call the set of the main factors 'features' and the set of factors dependent on it counterpart 'characteristics' or characteristics.

2. Divide the features into primary, secondary and tertiary features.

3. Divide the characteristics into primary, secondary and tertiary characteristics.

4. Place the features vertically on the left hand side f the matrix and characteristics horizontally on top of the matrix.

5. Enter the importance of the features on the column after that for the tertiary features.

6. In the main body of the matrix, place symbols at the squares denoting the relationship between the feature and the characteristic meeting the intersection. The symbols to be used are :
- Strong relationship
 - Medium relationship
- Weak relationship
In case there is no relation between the concerned feature and characteristic, leave the square blank to indicate 'no relation'. The relationship should be based on data available ith the team or on the results of a brainstorming session which must be confirmed by collecting necessary data.

7. Title the diagram suitably.

APPLICATIONS:

Matrix diagram, being a very simple table showing relations between individual items in two sets of factors, can be put to a wide variety of uses. The symbolic representation of the relationship makes the diagram so much easier to understand as compared to a table with a lot of figures. Let us see some of the possible applications of a matrix diagram. Matrix diagram can be used to solve problems by arranging data in such a way that the relations between relevant factors are brought into sharp focus. It can be used to understand relations between customer satisfaction and product characteristics, between omplaints and product groups, between complaints and geographical regions, between a product's performance in the market and promotion inputs on it and so on. Once the relations between individual items in se s of f ctors are clearly understood and agreed upon, it becomes easy to solve problems and to plan and implement solutions systematically.

MATRIX DATA ANALYSIS DIAGRAM:

The purpose of matrix data analysis diagram is to present numerical data about two sets of factors in a matrix form and analyse it to get numerical output. The factors most often are products and product characteristics. The purpose then is to analyse the data on several characteristics for a number of products and use the information to arrive at optimum values for the characteristics for a new product or to decide the strong points of a product and use the information for designing a strategy for the promotion of the product.

The procedure for creating a matrix data analysis diagram onsists of the following steps

1. Decide the two factorsCivildataswhoserelationsaretobeanalyses.
2. Check the number of individual items in he wo f ctors.
3. Prepare a matrix to accommodate all the ems of the two factors.
4. Enter numerical data in the matrix.
5. Give the diagram a suitable title.

PROCESS DECISION PROGRAMME CHART:

The purpose of process decision programme chart is to prepare for abnormal occurrences with low probability which may otherwise be overlooked and to present the occurrences as well as the necessary countermeasures to guard against such occurrences in the form of a visual chart. The toolcomforcesone to think of the possible obstacles in the smooth progress of a process or a project and then find ways and means to surmount those obstacles to ensure the successful and timely completion of the process or the project. Thus the t l helps one to prepare a contingency plan to achieve the objective if adverse events cur.

The steps in the preparationCivildatasofprocessdecisionprogramme chart are :

1. Prepare a 'normal' flowchart of the process with all expected events as steps in the chart.
2. Consider the possibility of the process not going as per the plan due to any abnormal, though less probab e, occurrences.
3. Show these occurrences on the flowchart through branching at appropriate locations.
4. Consider how the abnormal occurrence will affect the process and search for ways and means to counter the effect.
5. Show these countermeasures in rectangles connecting the corresponding abnormal occurrence on one side and the process objective or the goal on the other.
6. Give a suitable title to the diagram.

ARROW DIAGRAM:

The purpose of an arrow diagram is to cre te a visual presentation of the steps of a process or tasks necessary to comple e a project with special emphasis on the time taken for these activities. The di gram provides a clear understanding of the schedule of various steps in the process which helps one to monitor the process for ensuring its complet on on time. The steps for preparing an arrow diagram are:

1. List all tasks or act ties that need to be accomplished before the completion of the process or the project.
2. Decide which steps are undertaken in series and which steps can be run in parallel.
3. Arrange the activities in a proper sequence.

4. Prepare 'Event Nodes' at the completion of steps and number them. Where the process is bifurcating into two or more parallel streams, more lines will flow from a node and where the parallel streams are merging, two or more steps will lead to a node.

5. Write the description of the step on top of the line or to the left of the line. Decide the time required for completing each step and write it under or to the right of the line.
6. Calculate the earliest time to reach an event node for the start of the process. Where more than one streams are combining, the maximum time taken by a stream is taken into consideration. This time is entered on the top half of the rectangle. This time is related to the starting time of the process which is taken as zero.
7. After the time for all event nodes including the ompletion of the process or the project is available,Civildatasonecalculatesthelatet time by which an event node must be reached. This is done by st rting t the time of completion and going back step by step. The time is entered on the bottom half of the rectangle. The time indication t ll event nodes will appear as : X Y where X is the earliest time by which the event can be completed and Y is the latest time by which the event shou be completed.
8. Give a title to the diagram. As the calculation of the time indications is extremely important n the construction of an arrow diagram it is necessary that we understand the procedure well. Let us understand the concept through diagram.

SIX SIGMA:

Six sigma stands for six standard deviation from mean (sigma is the Greek letter used to represent standard deviation in statistics). The objective of six sigma principle is to achieve zero defects products/process. It allows 3.4 defects per million opportunities.

DMAIC – It is used for improving existing processes/products.

DMADV – It is applied to new processes/products.

SIX SIGMA PROJECT METHODOLOGY:

DMAIC (Define)

- ☐ Define (What is important?)
- ☐ Base-lining and benchmarking processes
- ☐ Decomposing processes into sub-processes
- ☐ Specifying customer satisfaction goals/sub-goals
(requirements) ☐☐Support tools for Define step:
- ☐ Benchmarking
- ☐ Baseline
- ☐ Voice of Customer (Win Win)
- ☐ Voice of Business (Win Win)
- ☐ Quality Function Deployment & etc.

DMAIC (Measure)
- ☐ Measure (How are we do ng?)
  1. Identifying relevant metrics based on engineering principles and models
  2. Performance measurement: throughput, quality (statistically, mean and variation)
  3. Cost (currency, time, and resource)
  4. Other example of measurement: response times, cycle times, transaction rates, access frequencies, and user defined thresholds

Support tools for Measure step:

Basic tools : Flow chart, Check Sheets, Pareto diagrams, Cause/Effect diagrams, Histograms, and Statistical Process Control (SPC).
Defect Metrics
Data Collection Forms, Plan, Logistics

DMAIC (Analyze)

- ☐ Analyze (What‟s wrong?)

Evaluate the data/information for trends, patterns, causal relationships and "root cause"
Example: Defect analysis, and Analysis of variance Determine candidate improvements

☐   Support tools for Analyze step:

   Cause/Effect diagram
   Failure Modes & Effects
   Analysis Decision & Risk
   Analysis Statistical Inference
   Control Charts
   Capability Analysis and etc.

☐ DMAIC (Improve)
☐ Improve (What needs to be done?)

Making prototype or initial improvement
Measure and compare the results with the simulation results

Iterations taken between Measure-Analyze-Improve steps to achieve the target level of performance

Support tools for Improve step:

Design of Experiments
Modeling
Tolerancing
Robust Design
DMAIC (Control)
Control (How do we guarantee performance?)

Ensuring measurements are put into place to maintain improvementsSupport tools for Control step:
Statistical Controls: Control Charts, Time Series methods Non-Statistical
Controls: Procedural adherence, Performance Mgmt., Preventive Activities.

BENCHMARKING:
      Benchmarking is a systematic method by which organizations can measure themselves against the best industry practices. Benchmarking is a systematic search for the best practices, innovative ideas, and highly effective operating procedures.

BENCHMARKING CONCEPT:

REASONS TO BENCHMARK:

1.   It is a tool to achieve business and competitive objectives.
2.   It can inspire managers (and Organizations) to compete.
3.   It is time and cost effective.
4.   It constantly scans the external environment to improve the process.
5.   Potential and useful technological breakthroughs can be located and adopted early.

PROCESS OF BENCHMARKING:

1.   Decide what to benchmark
2.   Understand current performance
3.   Plan
4.   Types of benchmarking
5.   Study Others
6.   Learn from the Data.

Decide what to benchmark:
1. Benchmarking can be applied to any business or produ tion process.
2. The strategy is Civildatasusuallyexpressedintermsofmi   ion and vision statements.
3. Best to begin with the mission and critical factors.
4. Choosing the scope of the Benchmarking s udy.
5. Pareto analysis – what process to investigate.
6. Cause and Effect diagram – for tracing outputs back.

Understand current performance:

1. Understand and document the current process.
2. Those working n the process are the most capable of identifying and correcting problems.
3. While documenting, it is important to quantify.
4. Care should be taken during accounting information.

Plan:

1. A benchmarking team should be chosen.
2. Organizations to serve as the benchmark need to be identified.
3. Time frame should be agreed upon for each of the benchmarking tasks.

Types of benchmarking:

1. Internal
2. Competitive
3. Process

Study Others:
Benchmarking studies look for two types of information

- How best the processes are practiced
- Measurable results of these practices

Three techniques for conducting the research are

- Questionnaires
- Site visits
- Focus groups

Learn from the data:
- What is the gap? How much is it?
- Why is there a gap? What does the best-in-class do differently that is better?
- If best-in-class practices were adopted, what would be the resulting improvement?

Benchmarking studies can reveal three different outcomes

- Negative gap
- Parity
- Positive gap

SIGNIFICANCE:

1. Benchmarking is a systematic method by which organizations can measure themselves against the best Industry practices
2. It promotes superior performance by providing an organized framework through which organization learn how the " best in class" do things.
3. It helps for continuous improvement.
4. Benchmarking inspire managers (and organization) to compete.
5. Through Benchmark proces organization can borrow ideas, adopt and refine them to gain competitive advantages.

FAILURE MODE AND EFFECTS ANALYSIS:

Failure mode and effect analysis also known as risk analysis is a preventive measure to systematically display the causes, effects, and possible actions regarding observed failures.

OBJECTIVES OF FEMA:

1. The objective of FEMA is to anticipate failures and prevent them from occurring. FEMA prioritizes failures and attempts to eliminate their causes.
2. FEMA is an engineering technique is used to define, identify and eliminate known and or potential failures, problems, errors which occur in the system, design, process and service before they reach the customer.
3. FEMA is a before the event action and is done when existing systems products processes are changed or redesigned.
4. FEMA is a never ending process improvement tool.

TYPES OF FEMA:
1. System FEMA
2. Design FEMA
3. Process FEMA
4. Service FEMA
5. Equipment FEMA
6. Maintenance FEMA
7. Concept FEMA
8. Environmental FEMA

BENEFITS OF FEMA:

1. Improve product/process reliability and quality.
2. Increase customer satisfaction.
3. Early identification and elimination of potential product/process failure modes.
4. Prioritize product or process deficiencies
5. Capture engineering/organization knowledge
6. Document and track the actions taken to reduce risk
7. Provide focus for improved testing and development.
8. Minimize late changesCivildatasandassociatedco.
9. Act as catalyst for teamwork and idea exch nge between functions.

STAGES OF FEMA:

1. Specifying possibilities
   a. functions
   b. possible failure modes
   c. root causes
   d. effects
   e. detection/prevent on

2. Quantifying risk
   a. probability of cause
   b. severity of effect
   c. effectiveness of control to prevent cause.
   d. risk priority number.

3. Correcting high risk causes
   A. prioritizing work
   B. detailing action
   C. assigning action responsibility.
   D. checks points on completion.
4. Re-evaluation of risk
5. Recalculation of risk priority number

UNIT IV - TQM TOOLS & TECHNIQUES II

SYLLABUS: Control Charts - Process Capability - Concepts of Six Sigma - Quality Function Development (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

QUALITY FUNCTION DEPLOYMENT:

It is kind of conceptual map that provides a means of interfunctional planning and communication.

Ultimately the goal of QFD is to translate often subjective quality criteria

into objective ones. That can be quantified and measured and which can then be used to design and manufactureCivildatastheproduct.Itiscomplimentary method for determining how and where priorities are to be ssigned in product development.

BENEFITS OF QFD:

1. Improves Customer satisfaction

2. Reduces Implementation Time

3. Promotes Team Work

4. Provides Documentation

HOUSE OF QUALITY:

THE STEPS IN BUILDING A HOUSE OF QUALITY ARE:

1. List Customer Requirements (WHAT's)
2. List Technical Descriptors (HOW's)
3. Develop a Relationship Matrix Between WHAT's and HOW's
4. Develop an Inter-relationship Matrix between HOW's
5. Competitive Assessments
   a. Customer Competitive Assessments
   b. Technical Competitive Assessments

6. Develop Prioritized Customer Requirements
7. Develop Prioritized Technical Descriptors

Phase 1: product planning

- Step1: list customer requirements
- Step2: List technical descriptors
- Step3: Develop a relationship between WHATS AND HOWS
- Step4: Develop a interrelationship matrix between HOWS
- Step5: Do competitive assessments
- Step6: Develop prioritized customer requirements
- Step7: Develop prioritized technical descriptors.

Phase 2: part development

- Step8: Deploy QFD process down to sub-components level both in terms of requirements and characteristics.
- Step9: Deploy the component deployment ch rt. Relate the critical sub-component control characteristics.

Phase 3: process planning

- Step10: Develop the relationship between the critical characteristics and process used to create the characteristics
- Step11: Develop the control plan relating critical control to critical processes.

Phase 4: production planning

- Step 12: Tabulate operating instructions from process requirements

- Step13: develop prototype and do testing

- Step14: Launch the final product to the market.

TAGUCHI'S QUALITY LOSS FUNCTIONS:

Taguchi has defined quality as the loss imparted to society from the time a product is shipped. Societal losses include failure to meet customer requirements, failure to meet ideal performance and harmful side effects.

TAGUCHI LOSS FUNCTION CURVE

TAGUCHI LOSS FUNCTION CURVE

There are three common quality loss functions.

1. Nominal - the - best.
2. Smaller - the - better.
3. Larger - the - better.

Nominal the best:

Although Taguchi developed so many loss functions, any situations are approximated by the quadratic function which is called the **No inal – the – best** type.

The quadratic function is shown in figure. In this situation, the loss occurs as soon as the performance characteristic, y, departs from the target τ. At τ, the loss is Rs 0
At LSL (or) USL, the loss is Rs. A.

The quadratic loss function is described by the equation $L = k (y - \tau)^2$.
Where,
L = cost incurred as quality deviates from the target.

y = Performance characteristic

τ = target

k = Quality loss coefficient.

The loss coefficient is determined by setting $\Delta = (y - \tau)$, the deviation from the target. When Δ is the USL (or) LSL, the loss to the customer of repairing (or) discarding the product is Rs. A.

Thus, $K = A / (y - \tau)2 = A / \Delta2$.

Smaller – the – better:

The following figure shows the smaller – the – better concepts. The target value for **smaller – the – better** is 0. There are no negative values for the performance characteristic.

Larger – the – better:

In the Larger – the – better concept, the target value is ∞ (infinity), which gives a **zero loss**. There are no negative values and the worst case is at $y = 0$. Actually, larger – the – better is the reciprocal of smaller – the – better. The performance characteristics in Larger – the – better are bond strength of adhesives, welding strength etc.

TOTAL PRODUCTIVE MAINTENANCE:

Total Productive Maintenance (TPM) is an important and effective tool for the excellence. Total productive maintenance (TPM) is keeping the current plant and equipment at its highest productivity level through cooperation of all areas of the organization.

PRINCIPLES OF TPM:

1. Use overall equipment effectiveness as a compass for success.
2. Improve existing planned maintenance system.
3. Work towards zero loss.
4. Provide training to upgrade operation and maintenance skills.
5. Involve everyone and use cross-functional teams.

OBJECTIVES OF TPM:

1. To maintain and improve equipment capacity.
2. To maintain equipment for life.
3. To use support from all areas of the operation
4. To encourage input from all employees.
5. To use teams for continuous improvement.

TPM PHILOSOPHY – CONCEPT OF TPM:

Total Productive Maintenance (TPM) is an extension of the Total Quality Management (TQM) philosophy to the maintenance function.

TPM has the following steps:

1) Management should learn the new philosophy of TPM.
2) Management should promote the new philosophy of TPM.
3) Training should be funded and developed for everyone in the organization.
4) Areas of needed improvement should be identified.
   Loss measurements to identify improvement needs are
   Down time losses
   Reduced speed losses
   Poor quality losses
5) Performance goals should be formulated.
6) An implementation plan should be developed.
7) Autonomous worth groups should be established.

TPM PILLAR:

PILLAR -1 - JISHU HOZEN (Autonomous maintenance) :

This pillar is geared towards developing operators to be able to take care of small maintenance tasks, thus free ng up the skilled maintenance people to spend time on more value added acti ity and technical repairs. The operators are responsible for upkeep of the r equipment to prevent it from deteriorating.

PILLAR -2 – KOBETSU KAIZEN :

"Kai" means change, and "Zen" means good (for the better). Basically kaizen is for small improvements, but carried out on a continual basis and involve all people in the organization. Kaizen is opposite to big spectacular innovations. Kaizen requires no or little investment. The principle behind is that "a very large number of small improvements are move effective in an organizational environment than a few improvements of large value. This pillar is aimed at reducing losses in the workplace that affect our efficiencies. By using a detailed and thorough procedure we eliminate losses in a systematic method using various Kaizen tools.

PILLAR -3 - PLANNED MAINTENANCE :

It is aimed to have trouble free machines and equipments producing defect free products for total customer satisfaction. This breaks maintenance down into 4 "families" or groups which was defined earlier.

1. Preventive Maintenance
2. Breakdown Maintenance
 3. Corrective Maintenance
4. Maintenance Prevention

With Planned Maintenance we evolve our efforts from a reactive to a proactive method and use trained maintenance aff o help train the operators to better maintain their equipment.

PILLAR -4 – Hinshitsu Hozen or QUALITY MAINTENANCE :

It is aimed towards customer de ight through highest quality through defect free manufacturing. Focus is on el minating non conformances in a systematic manner, much like Focused Impro ement. We gain understanding of what parts of the equipment affect product quality and begin to eliminate current quality concerns, then move to potential quality concerns. Transition is from reactive to proactive (Quality Control to Quality Assurance). QM activities is to set equipment conditions that preclude quality defects, based on the basic concept of maintaining perfect equipment to maintain perfect quality of products. The condition are checked and measure in time series to very that measure values are within standard values to prevent defects. The transition of measured values is watched to predict possibilities of defects occurring and to take counter measures before hand.

PILLAR – 5: Development Management / Early Management:

Early management or development management helps in drastically reducing the time taken to receive, install, and set – up newly purchased equipments (known as vertical start – up). Early management can also be used for reducing the time to manufacture a new product in the factory.

PILLAR 6 – TRAINING and EDUCATION:

It is aimed to have multi-skilled revitalized employees whose orale is high and who has eager to come to work and perform all required functions effectively and independently. Education is given to operators to upgrade their skill. It is not sufficient know onlyCivildatas"Know-How"bytheyhould also learn "Know-why". By experience they gain, "Know-How" to overcome problem what to be done. This they do without knowing the root cause of the problem and why they are doing so. Hence it become necessary to tr in them on knowing "Know-why".

PILLAR- 7: SAFETY, HEALTH AND ENVIRONMENT
Target :

1. Zero accident,

2. Zero health damage

3. Zero fires.

In this area focus is on to create safe workplace and a surrounding area that is not damaged by our process or procedures. This pillar will play an active role in each of the other pillars on a regular basis. A committee is constituted for this pillar which comprises representative of officers as well as workers. The committee is headed by Senior vice President (Technical). Utmost importance to Safety is given in the plant. Manager (Safety) is looking after functions related to safety. To create a areness among employees various competitions like safety slogans, Quiz, Drama, Posters, etc. related to safety can be organized at regular intervals.

PILLAR -8 : OFFICE TPM

Office TPM should be started after activating four other pillars of TPM (JH, KK, QM, PM). Office TPM must be followed to improve productivity, efficiency in the administrative functions and identify and eliminate losses. This includes analyzing processes and procedures towards increased office automation. Office TPM addresses twelve major losses. They are
1. Processing loss
2. Cost loss including in areas such as pr curement, accounts, marketing, sales leading to high inventories
3. Communication loss
4. Idle loss
5. Set-up loss
6. Accuracy loss
7. Office equipment break own
8. Communication channel breakdown, telephone and fax lines
9. Time spent on retr eval of information
10. Non ava lab ty of correct on line stock status
11. Customer complaints due to logistics
12. Expenses on emergency dispatches/purchases

PERFORMANCE MEASURES:
Performance measures are required for the managers for managing an organization perfectly.
Performance measures are used to achieve the following objectives.

To establish performance measures and reveal trend.

1. To identify the processes to be improved.
2. To determine the process gains and losses.
3. To compare the actual performance with standard performance.
4. To provide information for individual and team evaluation.
5. To determine overall performance of the organization.
6. To provide information for making proper decisions.

WHAT SHOULD BE MEASURED?

Human resources
1. Lost time due to accidents, absenteeism.
2. Employee turnover.
3. Employee satisfaction index.
4. Training cost per employee.
5. Number of grievances.

Customers
1. Number of complaints from customers.
2. Number of on-time deliveries.
3. Warranty data.
4. Dealer satisfaction.

Production
1. Inventory.
2. SPC Charts.
3. Amount of scrap / rework.
4. Machine do n time.

Research and Development
a. New product time to market.
b. Design change orders.
c. Cost estimating errors.

Suppliers
1. On-time delivery.
2. Service rating.
3. Quality performance.
4. Average lead time.

Marketing / Sales
1. Sales expense to revenue.
2. New product sales to total sales.
3. New customers.

Administration
1. Revenue per employee.
2. Purchase order error.
3. Billing accuracy.
4. Cost of poor quality.

PERFORMANCE MEASURE PRESENTATION:
There are six basic techniques for presenting performance measures. They are

1. Time series graph.
2. Control charts.
3. Capability Index.
4. Taguchi's loss function.
5. Cost of poor quality.
6. Malcolm Baldrige National Quality Award.

SYLLABUS: Need for ISO 9000 - ISO 9001-2008 Quality System - Elements, Documentation, Quality Auditing - QS 9000 - ISO 14000 - Concepts, Requirements and Benefits – TQM Implementation in manufacturing and service sectors.

QUALITY SYSTEM:

In order to assure the quality of a product, the manufacturer ust ensure its quality. So, to ensure this quality it is necessary to make a systematic study and

control check at every stage of production. It is also essential to take critical review of efforts and achievementsCivildatasofthecompanywith re pect to the quality of the product. Thus it is necessary to develop a st nd rd quality system.

ISO 9000 STANDARDS:

The ISO 9000 system is quality m n gement system that can be adopted by all types of organizations belonging to government, public, private, (or) joint sectors. The ISO 9000 system shows the way in creating products by preventing deficiencies, instead of conduct ng expensive post product inspections and rework.

ISO 9000
    a. ISO 9001
    b. ISO 9002
    c. ISO 9003

ISO 9001
Design, Development, Production, Installation & Servicing

ISO 9002
Production, Installation & Servicing

ISO 9003
Inspection & Testing

ISO 9004
Provides guidelines on the technical, administrative and human factors affecting the product or services.

BENEFITS OF ISO 9000 STANDARDS:

a. Achievement of international standard of quality.
b. Value for money.
c. Customer satisfaction.
d. Higher productivity.
e. profitability
f. Improved corporate image
g. Access to global market
h. Growth of the organization
i. Higher morale of employees

CLAUSES (ELEMENTS) OF ISO 9000:

1. Scope
2. Normative Reference
3. Terms and Definitions
4. Quality Management System (QMS)
   4.1 General Requirements
   4.2 Documentation

5. Management Responsibility

   5.1 Management Commitment
   5.2 Customer Focus
   5.3 Quality Policy
   5.4 Planning
   5.5 Responsibility, Authority and Communication
   5.6 Management Review

6. Resource Management
   6.1 Provision of Resources
   6.2 Human Resources
   6.3 Infrastructure
   6.4 Work Environment

7. Product Realization
   7.1 Planning of Product Realization
   7.2 Customer related processes
   7.3 Design and Development
   7.4 Purchasing
   7.5 Production and Service Provision
   7.6 Control of Monitoring and Measuring devices

8. Monitoring and Measurement

      8.1 General
      8.2 Monitoring and Measurement
      8.3 Control of Non-Conforming Product
      8.4 Analysis of Data
      8.5 Improvement

ISO 9000:2000 Quality Systems:

The term I S O 9000 refers to a set of quality management standards. ISO 9000 currently includes three quality standard : ISO 9000:2000, ISO 9001:2000, and ISO 9004:2000. ISO 9001:2000 presents requirements, while ISO 9000:2000 and ISO 9004:2000 present guidelines. ISO's purpose is to facilitate international trade by providing a single set of st nd rds that people everywhere would recognize and respect. The ISO 9000 2000 Standards apply to all kinds of organizations in all kinds of areas. Some of these areas include manufacturing, processing, servicing, printing, forestry, electronics, steel, computing, legal services, financial serv ces, accounting, trucking, banking, retailing, drilling, recycling, aerospace, construction, exploration, textiles, pharmaceuticals, oil and gas, pulp and paper, petrochemicals, publishing, shipping, energy, telecommunications, plastics, metals, research, health care, hospitality, utilities, pest control, aviation, machine tools, food processing, agriculture, government, education, recreation, fabrication, sanitation, software development, consumer products, transportation, design, instrumentation, tourism, communications, biotechnology, chemicals, engineering, farming, entertainment, horticulture, consulting, insurance, and so on.

ISO 9000 is important because of its orientation. While the content itself is useful and important, the content alone does not account for its widespread appeal. ISO 9000 is important because of its international orientation. Currently, ISO 9000 is supported by national standards bodies from more than 120 countries. This makes it the logical choice for any organization that does business internationally or that serves customers who demand an international standard of quality. ISO is also important because of its systemic orientation. We think this is crucial. Many people in this field wrongly emphasize motivational and attitudinal factors. The assumption is that quality can only be created if workers are motivated and have the right attitude. This is fine, but it doe n't go far enough. Unless you institutionalize the right attitude by supporting it with the right policies, procedures, records, technologies, resources, nd structures, you will never achieve the standards of quality that other org niz tions seem to be able to achieve.

ISO 9000 DOCUMENTATION

STRUCTURE

The documentation created for ISO 9000 registration is submitted to the company's 3rd-party reg strar prior to them visiting the site to conduct the actual audit. In fact, one type of documentation is used by the registrar to develop the audit plan for your company. Structuring your ISO 9000 documentation to facilitate the audit process only serves to enhance the potential for a successful audit. This structuring will also make it easy for you to plan and monitor your documentation efforts, both for the registration audit and all subsequent maintenance audits.

DOCUMENT CONTROL AND ISO 9000

Once the documentation structure has been defined and the documentation written, a strategy for controlling it must be put in place. ISO 9000 requires that documentation must be readily available to those who need it, be of current issue, and that all obsolete material be completely removed from the system. The control of documentation, from creation of new material through to the destruction of obsolete material, presents one of ISO 9000's biggest challenges. It is also one of the elements audited by your 3rd-party registrar.

DOCUMENTING ISO 9000

A thorough analysis of each element prior to writing ensures the resulting documentation will meet ISO 9000's criteria. Specific characteristics exist for robust Quality Systems, and these must be clearly established within the organization. Since ISO9000 registration is not a one time occurrence, clearly documented procedures for maintaining compliant Quality System must be in place. Historically, companies have produced policy and procedure manuals which, because they contained corpor te policies, where often not made available to all employees.

As a result, the procedures were also not readily available. ISO 9000's requirement that procedures be read ly available to all persons performing the work usually necessitate the separation of these procedures from the policy manual Perhaps the biggest stumbl ng block for North American businesses is the requirement to clearly define and document the processes that it uses. Developing documentation that tells HOW we do something is not new to us, but accurately describing WHAT it is we do is far less common. Most of our existing documentation is product or department based. ISO looks only at the processes used to create products, and these generally run across many areas of an organization. We can no longer write documentation in isolation, the whole organization must be considered when writing ISO compliant documentation.

WHEN IS ENOUGH, ENOUGH?

One of the complaints often heard about ISO 9000 refers to the large amount of documentation that is perceived to be required. While procedural documentation is important to the proper functioning of an effective Quality System, many companies tend to over document. First and foremost, you must remember that it is your company and the documentation must fit the company, not the standard.
The ISO 9000 series of Quality Standards does indicate key characteristics of a properly functioning Quality System, but how they are implemented is the responsibility of the organization. ISO documentation must reflect what the company does, not what it thinks the ISO audit or will want to hear. In determining whether procedural documentation is required, look at the skill sets of the people performing the task as well as any unique requirements the company may have for completing the task. In many cases, documen a ion will not be required because there is no unique process and/or the person has been trained in how to complete the task.

CLAUSES IN ISO 9001:

ISO 9001 defines 20 elements necessary for quality management system, as listed below:

Management Responsibility (Element 1)

The company has to define its commitment to a quality policy, which is understood, implemented and maintained at all levels of the organization, and to define its quality goals. Responsibilities and authorities have to be defined and documented. The company must provide adequate resources and appoint a member of the management as a representative for quality management. At least once a year, a management review must be held and recorded to evaluate the quality system.

Quality System (Element 2)

A quality manual, covering all elements of the ISO standard, has to be prepared to document the quality system. Procedures must be documented and controlled. The company has to prepare a quality plan to ensure that quality requirements are understood and fulfilled.

Contract Review (Element 3)

The company has to establish and maintain docu ented procedures for contract review, to document the customers' requirements and ensure the capability to fulfill the contract or order requirements. Records of ontract review shall be maintained.

Design Control (Element 4)

The company has to establish and m int in documented procedures to control and verify the design of new product or service to fulfill customers' requirements. The requirements must be identified and there must be design reviews, design verification and design validation. Design changes shall be documented, reviewed and author zed.

Document Control (Element 5)

All documents relevant for quality have to be controlled to ensure that the pertinent issues of appropriate documents are available at all locations. When necessary, they are to be replaced by updated versions. Changes shall be reviewed and approved by the same organization/person that performed the original review or approval.

Purchasing (Element 6)

The company must monitor the flow of purchasing and evaluate the subcontractor's ability to fulfill specified requirements.

Purchaser Supplied Product (Element 7)

Goods supplied by the customer have to be recorded. It must be ensured that they are separately controlled and stored to prevent loss or damage.

Product Identification And Traceability (Element 8)

Where appropriate, purchased and delivered products or services must be made traceable through documentation or batches.

Process Control (Element 9)

All processes of production or service that directly affect quality must be documented and planned and carried out under ontrolled conditions to add consistency to the process. Control of proce parameters and product characteristics must ensure that the specified requirements are met.

Inspection And Testing (Element 10)

The company must ensure receiving inspection and testing, in-process inspection and testing, and final inspection and testing. These inspections and tests must be recorded. Control of inspection, measuring and
Test Equipment (Element 11)

The items of equ pment used for inspection, measuring and testing must be identified and recorded. They must be controlled, calibrated and checked at prescribed intervals.

Inspection And Test Status (Element 12)

The status of the product or service must be identified at all stages as conforming or nonconforming. This is to ensure that only conforming products or services are dispatched or used

Control Of Nonconforming Product (Element 13)

The company must establish procedures to ensure that nonconforming products or services are prevented from unintended use. The disposal of nonconforming products must be determined and recorded.

Correctional Prevention (Element 14)

Procedures must be established to ensure effective handling of customer complaints and corrective actions after identifying nonconformities. The cause of nonconformities is to be investigated in order to prevent recurrence. The corrective action shall be monitored to ensure its long-term effectiveness. Preventive actions are to be initiated to eliminate potential causes of nonconfor ance. Handling, storage, packaging and

Delivery (Element 15)

Documented procedures must be established to ensure that products are not damaged and reach the customer in the required condition

Control Of Quality Records (Element 16)

All records related to the quality sys em must be identified, collected and stored together. The quality records demonstrate conformity with specified requirements and verify effective operation of the quality system.

Internal Quality Audits (Element 17)

The company must establ sh and maintain documented procedures for planning and implement ng nternal quality audits to determine the effectiveness of the quality system. The comments made by internal auditors must be recorded and brought to the attention of the personnel having responsibility in the area audited. Follow-up audit activities shall verify and record the implementation and effectiveness of the corrective action taken.

Training (Element 18)

The company shall establish and maintain documented procedures for identifying training needs and must have a training record for each employee.

Servicing (Element 19)

Where servicing is a specific requirement, the company must establish and maintain documented procedures for performing, verifying and reporting that the servicing meets the specified requirements.

Statistical Techniques (Element 20)

The company must establish and maintain docu ented procedures to implement and control the application of statistical techniques which have been identified as necessary for performance information. This structure looks very theoretical at first glance, but this is because ISO 9000 stipulates the elements of a quality management Civildatassystemforanyenterprie,irre pective of its branch of activity. "ISO 9000 is not a prescriptive st nd rd; it does not detail the how but rather the what. This allows each individu l comp ny to define how it intends to comply with the standard in way th t best suits that company's method of operation". It is possible that some of the elements are of no relevance or almost no relevance in specific sectors.

IMPLEMENTATION OF QUALITY MANAGEMENT SYSTEM:

1. Top Management Commitment
2. Appoint the Management Representative
3. Awareness
4. Appoint an Implementation Team
5. Training
6. Time Schedule
7. Select Element Owners
8. Review the Present System
9. Write the Documents
10. Install the New System
11. Internal Audit
12. Management Review
13. Pre-assessment
14. Registration

PITFALLS OF SUCCESSFULIMPLEMENTATION:

1. Using a generic documentation progr m or nother organization's documentation program
2. Over-documentation or document tion that is too complex
3. Using External Consultants without involvement
4. Neglecting to obtain top management's involvement
5. Developing a system that does not represent what actually occurs

QUALITY AUDITING:

The term Audit refers to regular examination and checking of accounts or financial records, settlement or adjustment of accounts. It also refers to checking, inspection and examination of Production Processes.

PURPOSE OF QUALITY AUDIT:

1. To establish the adequacy of the system.
2. To determine the effectiveness of the system.
3. To afford opportunities for system analysis.
4. To help in problem solving.
5. To make decision making easier etc.

PES OF QUALITY AUDIT:

1. First – Party Audit.
2. Second – Party Audit.
3. Third – Party Audit.

An internal audit (first – party audit) is conducted by personnel within the organization. An external audit is conducted by people from the organization such as the purchasing party (second – party audit) (or) a certified auditing agency (third – party audit).

ISO 14000 STANDARDS:

ISO 14000 standard gives the company background on which to base its Environmental Management System (EMS). This system can be joined with other quality standards and can be implemen ed oge her to achieve the organizations environmental targets. The overall aim of the system is to provide protection to environment and to prevent pollution.

REQUIREMENT OF ISO 14001

There are six elements

1. GENERAL REQUIREMENTS

EMS should include policy, planning implementation & operation, checking & corrective action, management review.

2. ENVIRONMENTAL POLICY (Should be based on mission)

1. The policy must be relevant to the organization's nature.
2. Management's Commitment (for continual improvement & preventing pollution).
3. Should be a framework (for Environmental objectives & Targets).
4. Must be Documented, Implemented, & Maintained.

3. PLANNING

1. Environmental Aspects
2. Legal & other Requirements
3. Objectives & Targets
4. Environmental Management Programs

4. IMPLEMENTATION & OPERATION

1. Structure & Responsibility
2. Training, Awareness & Competency
3. Communication
4. EMS Documentation
5. Document Control
6. Operational Control
7. Emergency Preparedness & Response

5. CHECKING & CORRECTIVE ACTION

1. Monitoring & Measuring
2. Nonconformance & Corrective & Preventive action
3. Records
4. EMS Audit

6. MANAGENMENT REVIEW

1. Review of objectives & targets
2. Review of Environmental performance against legal & other requirement
3. Effectiveness of EMS elements
4. Evaluation of the continuation of the policy

BENEFITS OF ENVIRONMENTAL MANAGEMENT SYSTEM :

GLOBAL BENEFITS

1. Facilitate trade & remove trade barrier
2. Improve environmental performance of planet earth
3. Build consensus that there is need for environmental management and a common terminology for EMS

ORGANIZATIONAL BENEFITS

1. Assuring customers of   commitment o environmental management
2. Meeting customer requirement
3. Improve public relation
4. Increase investor satisfaction
5. Market share increase
6. Conserving input material & energy
7. Better industry/government relation
8. Low cost insurance, easy attainment of permits & authorization

TQM IN MANUFACTURING:

Quality assurance through statistical methods is a key component in a manufacturing organization, where TQM generally starts by sampling a random selection of the product. The sample can then be tested for things that matter most to the end users. The causes of any failures are isolated, secondary measures of the production process are designed, and then the causes of the failure are corrected. The statistical distributions of important measurements are tracked. When parts' measures drift into a defined "error band", the process is fixed. The error band is usually a tighter distribution than the "failure band", so that the production process is fixed before failing parts can be produced.

It is important to record not just the me surement ranges, but what failures caused them to be chosen. In that way, che per fixes can be substituted later (say, when the product is redesigned) with no loss of quality. After TQM has been in use, it is very common for parts to be re esigned so that critical measurements either cease to exist, or become much wider.

Often, a "TQMed" product s *cheaper* to produce because of efficiency/ performance improvements and because there's no need to repair dead-on-arrival products, which represents an mmensely more desirable product.

＊＊＊＊＊＊＊＊＊＊＊＊＊＊＊＊