Report on

Cost Reduction of "CROWN" Project by Quality Control Circle

University of Petroleum and Energy Studies

Submitted by:-

Uns Noor

Vishakh Vardhan

Students (B.Sc. Plant Maintenance & Operations)

Mentor

Mr Rishi Dhiwan

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University of Petroleum and Energy Studies

Submitted to:-

Mrs. Bhavana Lamba

(Course Coordinator)

Submitted by:-

Uns Noor

Vishakh Vardhan

Students (B.Sc. Plant Maintenance & Operations)

Mentor

Mr Rishi Dhiwan

Certificate

This is to certify that Uns Noor & Vishakh Vardhan of BSc Plant Maintenance and Operation from University of Petroleum and energy studies Dehradun, have completed their project at UPES

Project Title: Cost Reduction of "CROWN" Project by Quality Control Circle

Focus: University Of Petroleum and Energy Studies

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(Approved by Dean)
Signature

Dr Rishi Diwan
UPES
Dehradun

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I thank Mrs. Bhavna Lamba (Course Coordinator) Bsc plant maintenance and Operation for her valuable inputs.

UNS NOOR (R220206010)
VISHAKH VARDHAN (R220206012)

Contents

1. Executive summary	**6**
2. Introduction	**7**
3. What is Quality and Quality Control Circle?	**8**
4. Structure of Quality Control Circles	**12**
5. Problem Solving Techniques	**15**
6. Plan-Do-Study-Act cycle (PDSA)	**20**
7. Six Sigma	**21**
8. Case Study on Quality Control Circle	**23**
9. Conclusion	**34**
10. References	**35**

Executive summary

Managing quality is an essential and difficult challenge. Quality is essential because it brings value. Without quality, there will be no value to the customers, there will be no value in the business and the business will stop giving productive results. The opposite of quality is error, and quality management is the effort to bring error under control and reduce error to acceptable levels. Efforts to reduce error are partial, incomplete, or abandoned too soon, before their value is realized. As important as quality is to business, managing to achieve it is extraordinarily difficult. Managing quality is a gigantic job and cannot be done alone. That is where Quality Control circle comes in and makes all the difference.

Quality control circle (QCC) is a small group of employees in the same working area or doing a similar type of work who voluntarily meet regularly for about an hour very week to identify, analyze, and resolve work related problems, leading to improvement in their total performance, and enrichment of their work life. There are various tools of QC which help in work of the circle and will be explained later.

A thorough case study on the quality control circle of Philips Carbon Black Limited (Mundra, Gujarat) has been included in this report. PCBL is a member of RPG group and deals in production of various grades of carbon black and is constructing its fourth plant at Mundra, Gujarat. After introducing QCC at the site, there was

- Improvement in the quality of work
- Reduction in redundant errors
- Enhancement of team spirit and motivation among the employees
- Faster project completion
- Optimum utilization of the money and time invested by the organization

Introduction

Every organization has had experiences of poor quality when dealing all their activities. The experience of poor quality is exacerbated when employees of the company either are not empowered to correct quality inadequacies or do not seem willing to do so. We have all encountered service employees who do not seem to care. The consequences of such an attitude are lost customers and opportunities for competitors to take advantage of the market need. Successful companies understand the powerful impact customer-defined quality can have on business. For this reason many competitive firms continually increase their quality standards. For example, both the Ford Motor Company and the Honda Motor Company have recently announced that they are making customer satisfaction their number one priority. Both firms believe that the way to rebound is through improvements in quality, and each has outlined specific changes to their operations. Ford is focusing on tightening already strict standards in their production process and implementing a quality program called Six-Sigma. Honda, on the other hand, is focused on improving customer-driven product design. Although both firms have been leaders in implementing high quality standards, they believe that customer satisfaction is still what matters most. It was first the Japanese who in 1962 discovered that task performer was able to use not only his hands and feet but also brain-power and join hands with management to improve working through better quality, productivity, safety, etc. Small groups called "Quality Control Circles" were formed in Japan and many other countries (including India) were inspired by them.

Steps towards higher productivity

In order to achieve higher productivity major criteria is the realization of the need for the top notch quality in each of the operations and necessary strategy to achieve it. But for that there are certain myths which need to be banished:

Myths	Facts
Quality is expensive	It is bad quality that will, in long run, results in higher costs.
Attention to quality means lower production	Quality is directly proportional to productivity and profitability if done in a team.
Only workers are responsible for poor quality	Generally 20% of the quality problems are workers controlled and rest are because of the management and the system.
Management alone is capable of resolving problems coming in way of achieving excellence.	The Myth overlooks the fact that it is the task performer who knows better than anyone else what problem are and how to overcome it.
Training is a waste of time, money and efforts.	Training initially takes time, money and efforts but in the long run it saves them. An unskilled worker when given proper training can work as a skilled one.

What is Quality and Quality Control Circle?

Defining "Quality" as a single entity is very tough since it is very vast and depends on the perception of consumers, manufacturers & dealers. The definition of quality depends on the role of the people defining it. Most consumers have a difficult time defining quality, but they know it when they see it. For example, although you probably have an opinion as to which manufacturer of athletic shoes provides the highest quality, it would probably be difficult for you to define your quality standard in precise terms. Further complicating the issue is that the meaning of quality has changed over time. Today, there is no single universal definition of quality. Some people view quality as "performance to standards."Others view it as "meeting the customer's needs" or "satisfying the customer." Let's look at some of the more common definitions of quality.

- **Conformance to specifications** measures how well the product or service meets the targets and tolerances determined by its designers. For example, the dimensions of a machine part may be specified by its design engineers as 3(+-) 0.05 inches. This would mean that the target dimension is 3 inches but the dimensions can vary between 2.95 and 3.05 inches. As these examples illustrate, conformance to specification is directly measurable, though it may not be directly related to the consumer's idea of quality.

- **Fitness for use** focuses on how well the product performs its intended function or use. For example, a Mercedes Benz and a Jeep Cherokee both meet a fitness for use definition if one considers transportation as the intended function. However, if the definition becomes more specific and assumes that the intended use is for transportation on mountain roads and carrying fishing gear, the Jeep Cherokee has a greater fitness for use. You can also see that fitness for use is a user-based definition in that it is intended to meet the needs of a specific user group.

- **Value for price paid** is a definition of quality that consumers often use for product or service usefulness. This is the only definition that combines economics with consumer criteria; it assumes that the definition of quality is price sensitive. For example, suppose that you wish to sign up for a personal finance seminar and discover that the same class is being taught at two different colleges at significantly different tuition rates. If you take the less expensive seminar, you will feel that you have received greater value for the price.

- **Support services** provided are often how the quality of a product or service is judged. Quality does not apply only to the product or service itself; it also applies to the people, processes, and organizational environment associated with it. For example, the quality of a university is judged not only by the quality of staff and course offerings, but also by the efficiency and accuracy of processing paperwork.

- **Psychological criteria** are a subjective definition that focuses on the judgmental evaluation of what constitutes product or service quality. Different factors contribute to the evaluation, such as the atmosphere of the environment or the perceived prestige of the product. For example, a hospital patient may receive average health care, but a very

friendly staff may leave the impression of high quality. Similarly, we commonly associate certain products with excellence because of their reputation; Rolex watches and Mercedes-Benz automobiles are examples.

Differences between Manufacturing and Service Organizations

Defining quality in manufacturing organizations is often different from that of services. Manufacturing organizations produce a tangible product that can be seen, touched, and directly measured. Examples include cars, CD players, clothes, computers, and food items. Therefore, quality definitions in manufacturing usually focus on tangible product features. The most common quality definition in manufacturing is

- **Conformance:** - Degree to which a product characteristic meets preset standards. Other common definitions of quality in manufacturing include
- **Performance:** - Such as acceleration of a vehicle
- **Reliability:** - That the product will function as expected without failure
- **Features:** - The extras that are included beyond the basic characteristics
- **Durability:** - Expected operational life of the product
- **Serviceability:** - How readily a product can be repaired.

It is easy to see how different customers can have different definitions in mind when they speak of high product quality. In contrast to manufacturing, service organizations produce a product that is intangible. Usually, the complete product cannot be seen or touched. Rather, it is experienced. Examples include delivery of health care, experience of staying at a vacation resort, and learning at a university. The intangible nature of the product makes defining quality difficult. Also, since a service is experienced, perceptions can be highly subjective. In addition to tangible factors, quality of services is often defined by perceptual factors. These include responsiveness to customer needs, **courtesy** and **friendliness** of staff, **promptness** in resolving complaints, and **atmosphere**. Other definitions of quality in services include **time**—the amount of time a customer has to wait for the service; and **consistency**—the degree to which the service is the same each time. For these reasons, defining quality in services can be especially challenging.

Definition of Quality Control Circle:

Quality control circle (QCC) is a small group of employees in the same working area or doing a similar type of work who voluntarily meet regularly for about an hour very week to identify, analyze, and resolve work related problems, leading to improvement in their total performance , and enrichment of their work life.

- Number of members:
  The optimum number in QCC is about 8 to 10. It has been realized that any circle with less then 5 members would loose its validity as, due to a high rate of absenteeism in our country, the absence of few members at the meeting may cause a circle to become inactive. At the same time, more than 15 members could result in deprivation of opportunity for active participation of everyone.

- Work-area and type of work:
  Members participating in the circle activities must belong to the same working area and not inter-departmental or inter-disciplinary one. Designations of the members need not necessarily be equal but the work in which they all are engaged should be common.

- Voluntary membership:
  No pressure is to be brought on employees to join or not join. Nor can anyone be barred from joining the circle by virtue of his/her lack of knowledge, qualification or experience.

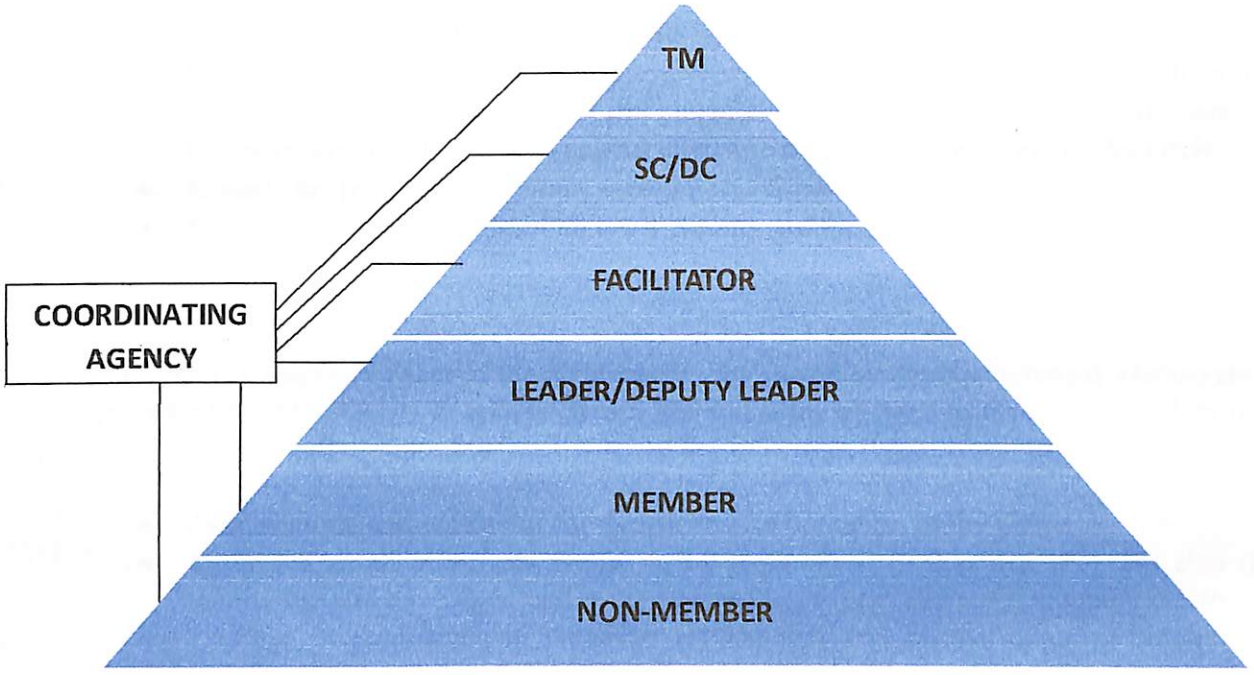
- To identify, analyze and resolve work-related problems:
  Employees who work in any area know what problems are hindering the achievement of good quality, productivity and optimum performance and also their remedies. Such members in QCC themselves indentify problems in their meetings. They also entertain requests from management and other departments to look into certain problems that may be worrying them.

- Leading to improvement in their total performance:
  Due to QCC resolving work-related problems relating to quality, productivity, cost reduction, safety, etc improves. This results in tangible as well as intangible gains to the whole organization.

Tangible gains	Intangible gains
• Better Quality	• Enriched Quality of work life
• Productivity improvement	• Change in Attitude
• Improved Safety	• Harmony & mutual trust
• Greater cost effectiveness	• Better communication
• Better house keeping	• Effective team work
• Increased profitability	• Better human relations
• Waste reduction	• Participative culture
• Reduced absenteeism and grievances	• Human resource development
	• Greater sense of belonging

Structure of Quality Control Circles

The structure of the quality control circle is diagrammatically depicted in the figure below.



TM: Top Management
SC/DC: Steering committee / Departmental committee

Non-members:

In any work-area all the employees may not initially volunteer to join QCC and there would b a few who would prefer, to start with, not to involve themselves in small group activities. All the same, such non-members are important for quality circles.

Members

Members are the basic elements of the structure of Quality circles. There are many queries about who is tangible to become members.
The participation concept was evolved primarily to afford opportunities o those employees who had never been considered capable of using their and whose immense potential was lying unharnessed.

Leader / Deputy Leader

The leader is chosen by members of quality circles. In view of high absenteeism in our country, it is necessary to have a leader and a deputy leader.

A leader / Deputy leader:

- Makes necessary facilities available.
- Assign tasks to different members of the circles.
- Train members in different problem solving techniques and give them necessary guidance whenever required with the help of facilitator and others, if necessary.
- Ensures that every member is involved in the circle.
- Plans the agenda of the meeting carefully and conducts meeting regularly
- Chalks out action plans for a progressive solution through data collection, interaction and sets time bound programmes for implementation of the circle's recommendations.
- Interacts with levels of management to ensure the effective working of the circle.
- Reports the progress to top management and departmental head.
- Maintains the record note of all the meetings and the progress of problems.

Facilitator

Facilitator is a senior officer of the department, nominated by the management. He/she should be one who has got authority to take decisions without delay on most of the recommendations of the quality circle. Further more the facilitator has the following responsibilities:

- Acts as guide and counselor for the successful operation of the circle.
- To convince all other executives in the department to feel that they are also de-facts facilitators and have to extend every support to the operation of the quality circle.
- To develop confidence in members so that they can always bank on him/her for any assistance.

Departmental Committee/ Steering Committee

- Takes an interview of the operation of the circle in the organization as a whole on the basis of reports from the facilitators, and the problem areas are identified and remedial action suggested.
- Takes decision on important recommendations of the quality circle in the organization as a whole on the basis of reports from the facilitators, and problems areas are identified and remedial actions suggested.
- Takes decisions on the recommendations of quality circle falling outside the competence of other levels of management.
- Gives major policy guidelines and directions for the healthy propagation of the concepts.
- Gives financial support.
- Meets regularly once in two to three months as convened by the coordinator.

Coordinating Agency

When the facilitator nurtures the quality circles in his section or department, the coordinating agency organizes the activities of the circles throughout the organization.

The coordinating department:

- Organizes training programmes fro the members as and when new circles are formed
- Convenes meeting of steering committee.
- Organizes top management presentations.
- Coordinates and evolves a consensus for norms to assess the performance of the different quality circles.
- Ensures availability of common facilities to the circle.
- Prepares a budget for the functioning of the quality circle and submits the same to the steering committee.

Top Management

The primary role of the top management is to:

- Convey to all the employees its commitments to the TQM (Total Quality Management) and the concept of QCC.
- Extend the visible support to the quality circle movement.
- Sanction necessary funds for the movements.
- Set an example for others to emulate.

Problem Solving Techniques

Quality circles commonly use certain techniques to identify, analyze and solve problems. They are:

- Brain storming
- Data collection
- Stratification
- Pareto analysis
- Ishikawa diagrams / Cause and Effect Diagrams
- Line graphs
- Scatter diagram
- Histogram
- Control charts
- Check list

Brain Storming:

In brain storming session much effort will be made to identify the problems. Questions for stimulating identification of the problems can be based on:

- Specific jobs that gives most problems.
- Work held because of delays or bottle-necks.
- Operations which can be combined with another o save time.
- Jobs or Procedure that take longer time in completion.
- Reduction in wear & tear of the equipment.

Data Collection

It is collection of facts and figures which gives clear picture of any work situation. The data required may already be available or it has to be generated by making observations over a period of time and recording them systematically.
After the data is collected, it is analyzed and information is extracted through the use of statistical methods.

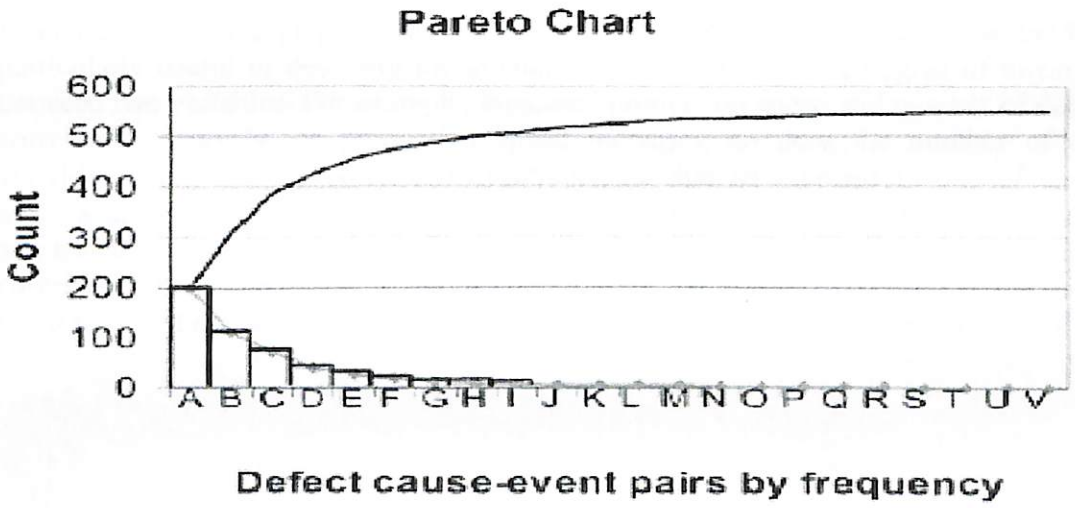
Stratification

Segregating a group of measurements of observations or any other data into several sub-groups on the basis of certain characteristics is called stratification.

Pareto Analysis
Pareto analysis is a technique used to identify quality problems based on their degree of importance. The logic behind Pareto analysis is that only a few quality problems are important, whereas many others are not critical. The technique was named after Vilfredo Pareto, an

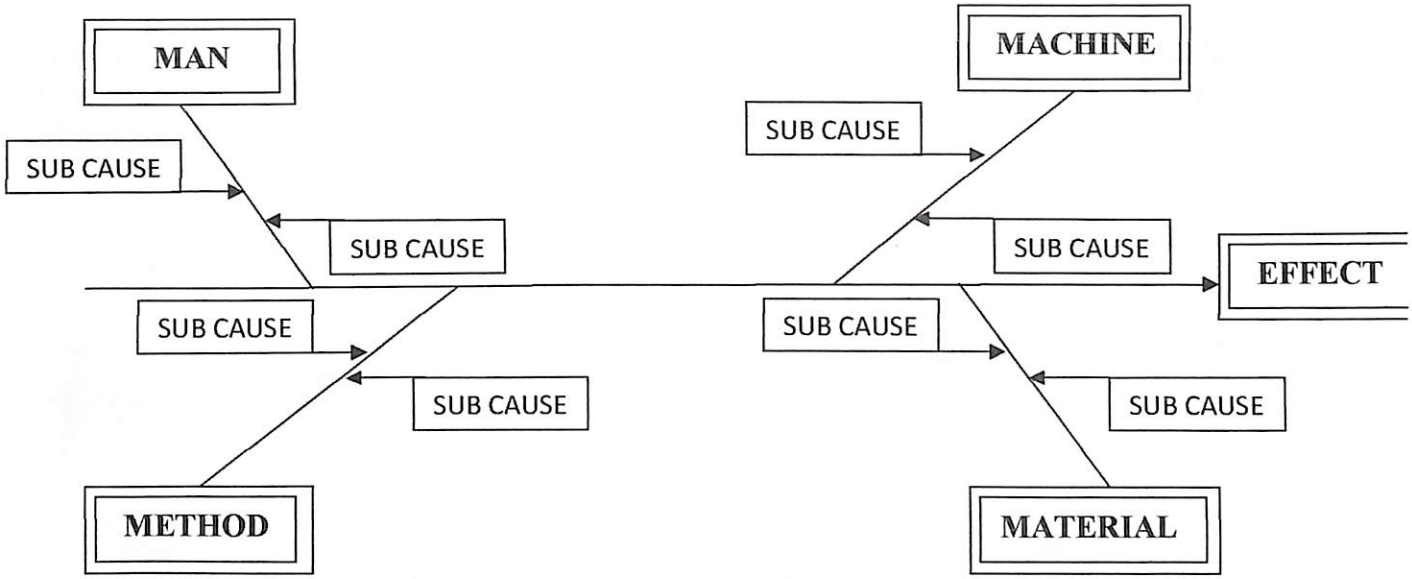
nineteenth-century Italian economist who determined that only a small percentage of people controlled most of the wealth. This concept has often been called the 80–20 rule and has been extended to many areas. In quality management the logic behind Pareto's principle is that most quality problems are a result of only a few causes. The trick is to identify these causes. One way to use Pareto analysis is to develop a chart that ranks the causes of poor quality in decreasing order based on the percentage of defects each has caused. For example, a tally can be made of the number of defects that result from different causes, such as operator error, defective parts, or inaccurate machine calibrations

To prepare the Pareto chart, we gather data about defect events, organize it into cause-effect pairs, and count the number of times each cause-effect pair occurs. We might find this data in help desk logs, where each incident (not each call, but each set of one or more calls related to a single user problem) is logged. When diagnosed, it is a cause-effect pair. Or we might gather the results of statistical quality control or inspection. Any data about a large quantity of defect events on a single set of processes can be analyzed by creating a Pareto diagram.



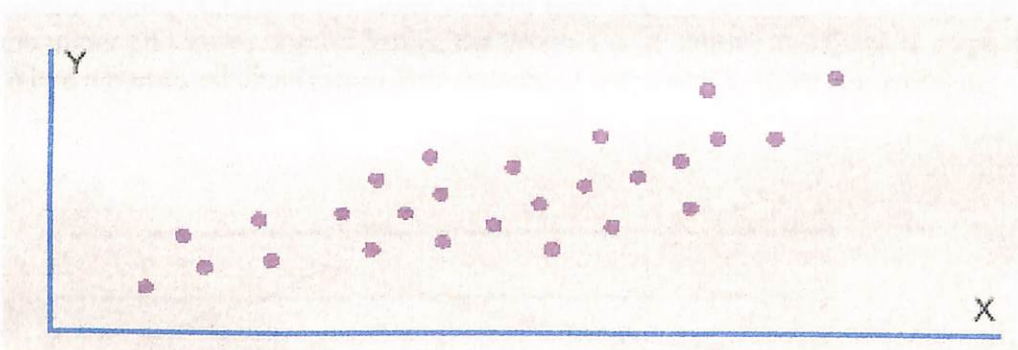
Ishikawa Diagram / Cause and Effect Diagram

Cause-and-effect diagrams are charts that identify potential causes for particular quality problems. They are often called fishbone diagrams because they look like the bones of a fish. A general cause-and-effect diagram is shown in figure below. The "head" of the fish is the quality problem, such as damaged zippers on a garment or broken valves on a tire. The diagram is drawn so that the "spine" of the fish connects the "head" to the possible cause of the problem. These causes could be related to the machines, workers, measurement, suppliers, materials, and many other aspects of the production process. Each of these possible causes can then have smaller "bones" that address specific issues that relate to each cause. For example, a problem with machines could be due to a need for adjustment, old equipment, or tooling problems. Similarly, a problem with workers could be related to lack of training, poor supervision, or fatigue.



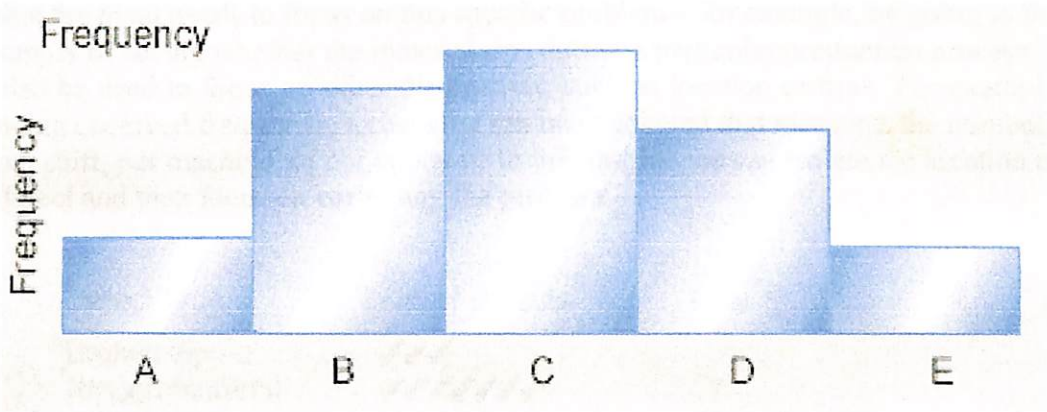
Scatter Diagrams

Scatter diagrams are graphs that show how two variables are related to one another. They are particularly useful in detecting the amount of correlation, or the degree of linear relationship, between two variables. For example, increased production speed and number of defects could be correlated positively; as production speed increases, so does the number of defects. Two variables could also be correlated negatively, so that an increase in one of the variables is associated with a decrease in the other. For example, increased worker training might be associated with a decrease in the number of defects observed. The greater the degree of correlation, the more linear is the observations in the scatter diagram. On the other hand, the more scattered the observations in the diagram, the less correlation exists between the variables.



Histograms

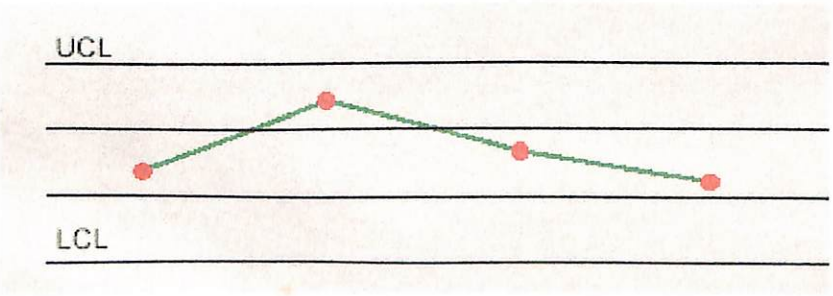
A histogram is a chart that shows the frequency distribution of observed values of a variable. We can see from the plot what type of distribution a particular variable displays, such as whether it has a normal distribution and whether the distribution is symmetrical.



Control Charts

Control Charts Control charts are a very important quality control tool. These charts are used to evaluate whether a process is operating within expectations relative to some measured value such as weight, width, or volume. For example, we could measure the weight of a sack of flour, the width of a tire, or the volume of a bottle of soft drink. When the production process is operating within expectations, we say that it is "in control."

To evaluate whether or not a process is in control, we regularly measure the variable of interest and plot it on a control chart. The chart has a line down the center representing the average value of the variable we are measuring. Above and below the center line are two lines, called the upper control limit (UCL) and the lower control limit (LCL). As long as the observed values fall within the upper and lower control limits, the process is in control and there is no problem with quality. When a measured observation falls outside of these limits, there is a problem.



Check List

A checklist is a list of common defects and the number of observed occurrences of these defects. It is a simple yet effective fact-finding tool that allows the worker to collect specific information regarding the defects observed. The checklist in Figure 5-7 shows four defects and the number of times they have been observed. It is clear that the biggest problem is ripped material. This means that the plant needs to focus on this specific problem—for example, by going to the source of supply or seeing whether the material rips during a particular production process. A checklist can also be used to focus on other dimensions, such as location or time. For example, if a defect is being observed frequently, a checklist can be developed that measures the number of occurrences per shift, per machine, or per operator. In this fashion we can isolate the location of the particular defect and then focus on correcting the problem.

Defect Type	No. of Defects	Total
Broken zipper	///	3
Ripped material	///////	7
Missing buttons	///	3
Faded color	//	2

Plan-Do-Study-Act cycle (PDSA)

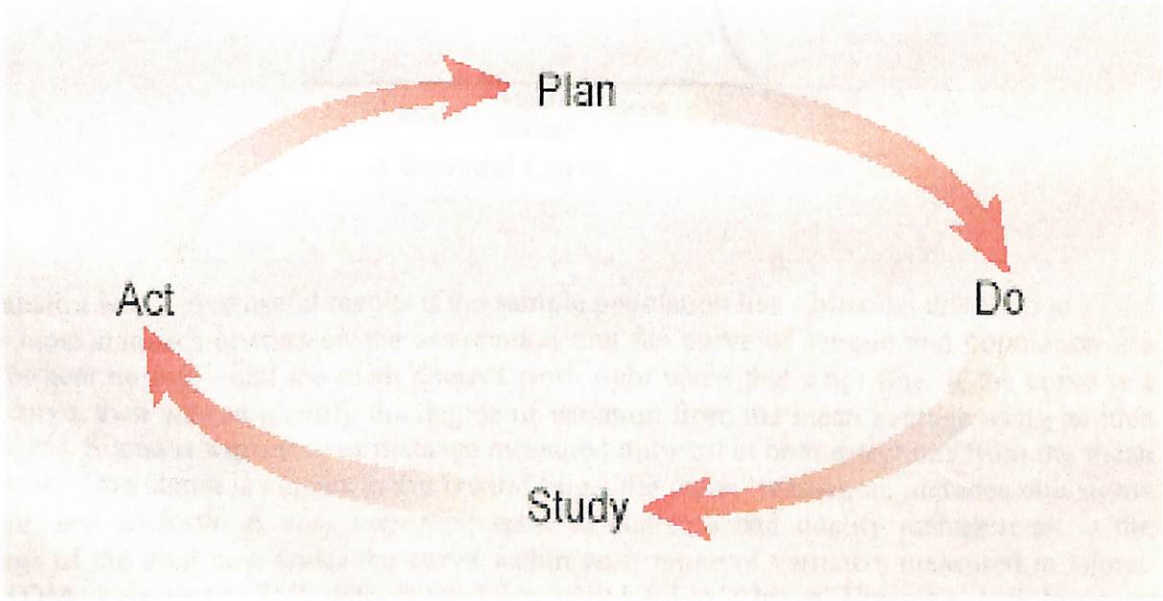
The plan–do–study–act (PDSA) cycle describes the activities a company needs to perform in order to incorporate continuous improvement in its operation. This cycle is also referred to as the Shewhart cycle or the Deming wheel. The circular nature of this cycle shows that continuous improvement is a never-ending process. Specific steps in the cycle are:

- **Plan:** The first step in the PDSA cycle is to *plan*. Managers must evaluate the current process and make plans based on any problems they find. They need to document all current procedures, collect data, and identify problems. This information should then be studied and used to develop a plan for improvement as well as specific measures to evaluate performance.

- **Do:** The next step in the cycle is implementing the plan (*do*). During the implementation process managers should document all changes made and collect data for evaluation.

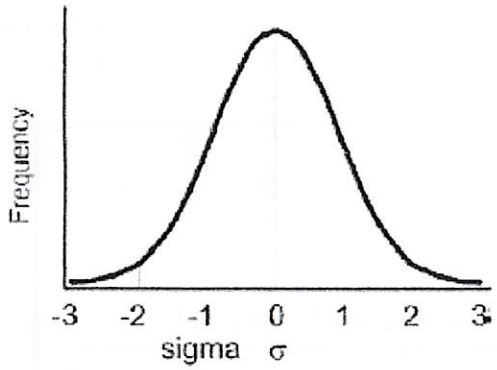
- **Study:** The third step is to *study* the data collected in the previous phase. The data are evaluated to see whether the plan is achieving the goals established in the *plan* phase.

- **Act:** The last phase of the cycle is to *act* on the basis of the results of the first three phases. The best way to accomplish this is to communicate the results to other members in the company and then implement the new procedure if it has been successful. Note that this is a cycle; the next step is to plan again. After we have acted, we need to continue evaluating the process, planning, and repeating the cycle again.

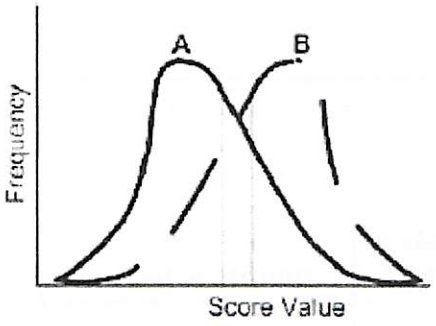


Six Sigma

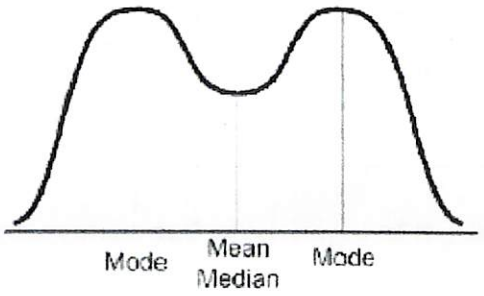
To know Six Sigma, it is necessary to understand the concept of normal curve. The normal curve is the representation of a population that is randomly distributed around a central point called the mean. Our results might vary from the normal curve in a number of ways. If the curve leans one way or the other, it is skewed. If the curve has two peaks, it is bimodal.



A Normal Curve



A Skewed Curve



A Bimodal Curve

Most statistics won't give useful results if the sample population has a bimodal distribution because most statistics operate on the assumption that the curve of sample and population are normal or near normal—and the math doesn't work right when that's not true. If the curve is a normal curve, then we can identify the degree of variation from the mean average using an idea called sigma. Sigma is a quantity or distance measured outward in both directions from the mean of the curve. One sigma is closest to the central line—the mean; two sigma includes one sigma and more, and so forth. A very important issue in statistics and quality management is the percentage of the total area under the curve within each range of variance, measured in sigma. Before TQM, 3 sigma (99.75% defects free) was very hard to achieve. However, U.S. business broke through that barrier in the 1980s, and started to move up. Because the curve is nonlinear, percents are no longer meaningful— everything is way over 99% error-free. So measurement in

percent (events per hundred) are replaced by measurement in events per million at 4 Sigma. Four sigma quality is 999,936.66 good products per million, or only 63.34 failures. Statistically, 4.5 sigma quality has fewer than 7 failures per million. By the time statistical six sigma is achieved, there are fewer than two errors per billion measurable events. That's a lot of quality. If the size of the total population is known, then a ratio can be used to determine likely quantities of any range of values in the whole population. For example, if the sample of 10,000 1-inch screws shows that 9975 screws are between 0.90 inches and 1.10 inches in length, then 3 sigma (99.75%) of the sample fall within that range. If a million screws are produced, then about 997,500 screws are expected to fall within the same range.

Sigma Value	Range (in sigma)	Unit of Measure	Part Under the Curve and Between the Lines	Part Outside the Range (both sides)
In Quality Management			Defect-free per Unit of Measure	Defects per Unit of Measure
1	−1 to +1	Percent	68.27%	31.73%
2	−2 to +2	Percent	95.45%	4.55%
3	−3 to +3	Percent	99.75%	0.25%
4	−4 to +4	Per million	999,936.66	63.34
4.5	−4.5 to +4.5	Per million	999,993.20	6.80
5	−5 to +5	Per million	999,999.43	0.57
6	−6 to +6	Per billion	999,999,998.03	1.97

Table for Sigma values and percentages of the sample

Case Study on Quality Control Circle

Name of the organization: **Philips Carbon Black Limited (PCBL)**

Place: Mundra, Gujarat

Type of work: Greenfield "**CROWN**" Project (Under Construction)

Progression of QCC:

- Formed on 2nd July, 2008.
- First meeting on 4th July, 2008.
- Conducted every Monday, Wednesday & Friday from 3PM to 4PM.

Members:

- Mr Sudipto Gosh (Head Electrical Department)
- Mr Viki Vyas (HR manager)
- Mr Ashutosh Tiwari (Asst Engineer-Mechanical Department)
- Mr Kushal Panchal (Asst Engineer-Mechanical Department)
- Mr S Mohanty (Asst Engineer- Electrical Department)
- Mr Prakash Yadav (Asst Engineer-Civil Department)

Introduction

PCBL is pioneer in carbon black manufacturing in India. It started its operation as early as in the years 1960. at present PCBL are having 3 plants in India ,located at Durgapur in West Bengal (WB), having 400 Tones Per Day (TPD) ,Cochin in Kerala, having 120 TPD and Palej in Gujarat, having 280 TPD.PCBL is the part of RPG group, the 5th largest conglomerate in India with turn over of over Rs 12,00 billion.

PCBL is fastest growing carbon black company in the world having global rank of 9th. It is the largest player in India, with domestic market share of 41% and the exporter from India, exporting to 15 countries .Its head office is in Kolkata, WB.



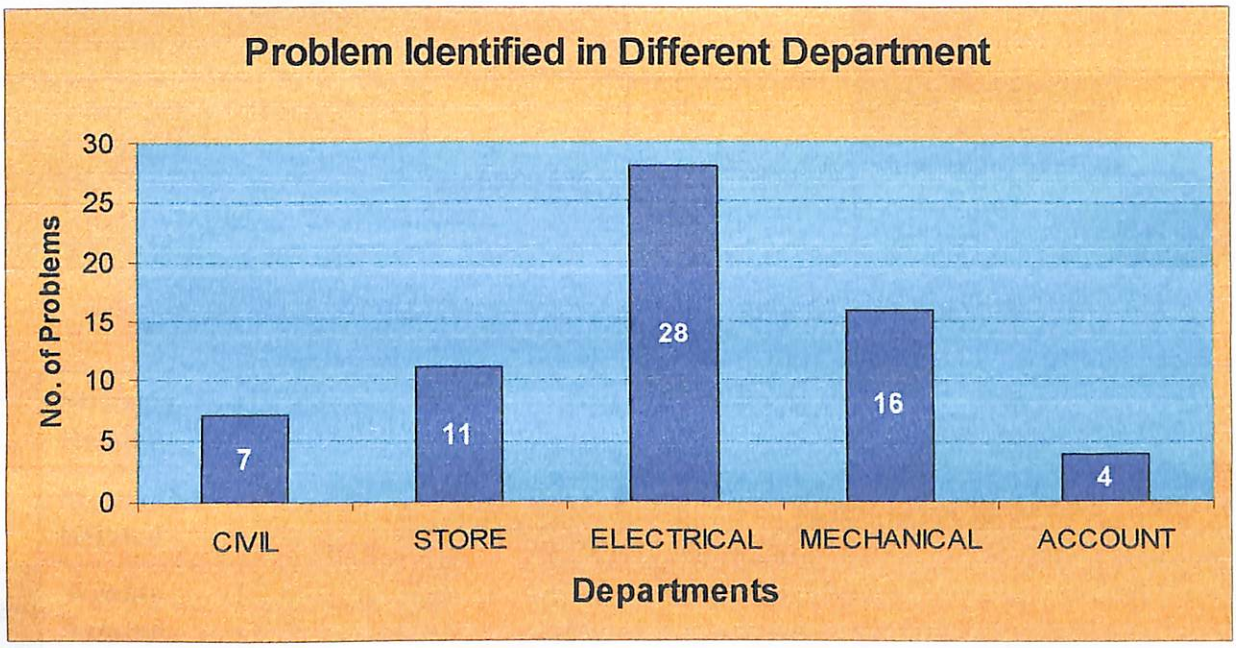
PCBL Mundra site artistic view

Need of QCC at PCBL Mundra site

Before the QCC started at Mundra site, there were lots of problems, breakdowns which were eating up the time and money of the organization. It is a Greenfield project where mechanical, electrical, civil, finance, stores & purchase departments go hand in hand and work simultaneously. The work was divided to different vendors on contract bases. Since there were multiple vendors working at a same place and for a same goal, so the most common root cause of most of the problems/breakdown was miscommunication or lack of communication. So there was an urgent requirement for a committee or an agency which could provide a path for communication (upward, downward and lateral), improves the quality of work, reduces redundant errors, enhances team spirit and motivation among the employees, faster completion of project, to safeguard the investment made by the organization and to ensure its optimum utilization. That is where QCC came in and made all the difference.

Number of problems in different

The first step of the QCC was to identify the most problematic department or the department where the most number of problems occurred in last three months or so and is shown by the bar graph below.



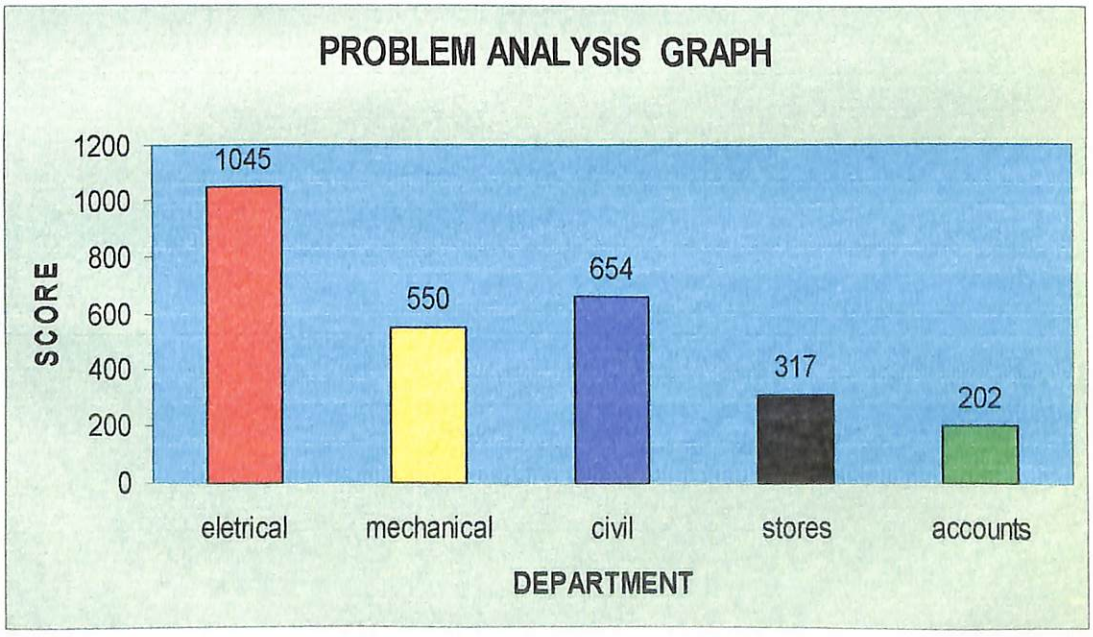
It is evident from the graph that the most number of problems/breakdown/faults/failures occurred is the electrical department. The main work of electrical department was the power distribution in different areas of the site where various fabrication, construction, erection jobs were being done. The main source of power there was from the diesel generators (DG) placed. These DG's offered flexibility, continuity and full control over the power supply to different areas. Once the job at particular area was completed, DG there was shifted to some other area or was relieved of its services.

Problem analysis data sheet

Based on certain parameters & criteria, the members of QCC made a data sheet (shown below) for further scrutiny of the faults/failures/problems in the different departments and individual scores were given. Based on these score bar graph was plotted which showed that how the electrical department outperformed the other departments in this scenario.

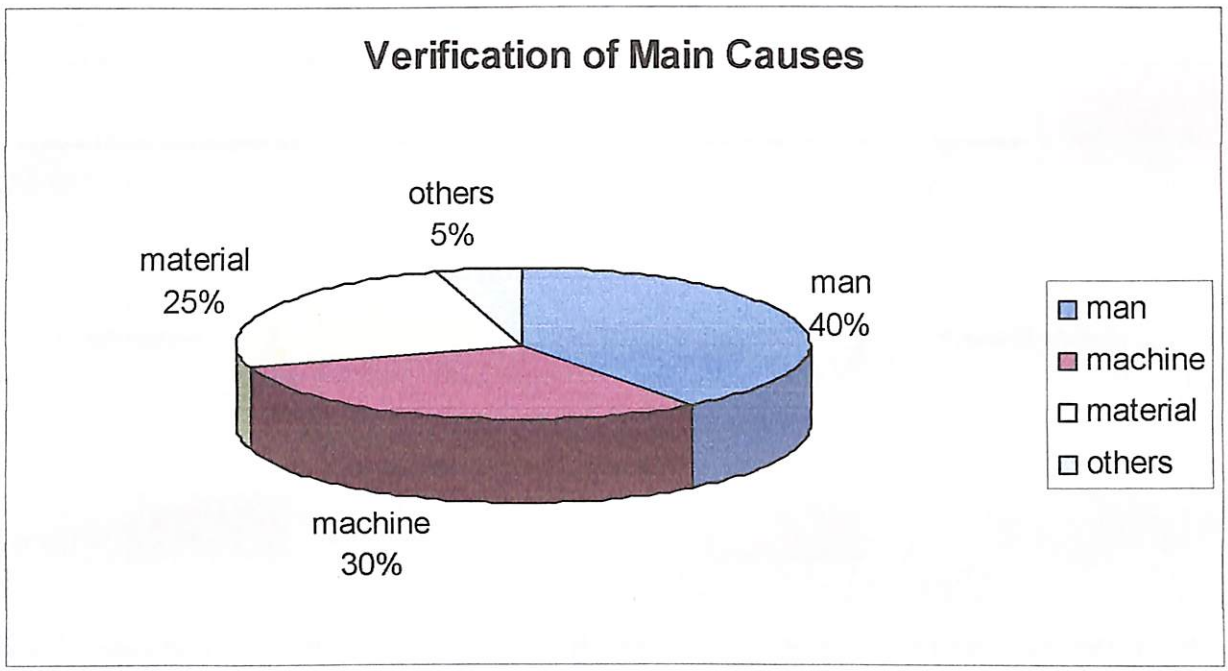
SL. NO	CRITERIA	PROBLEMS				
		ELECTRICAL	MECHANICAL	CIVIL	STORES	ACCOUNTS
1	ALIGNED WITH CORE OBJECTIVES					
2	HIGH PROBALITY OF SUCCESS					
3	EASY TO IMPLEMENT					
4	READILY AVAILABLE DATA					
5	DOABLE WITHIN A MONTH					
6	REPEATABLE					

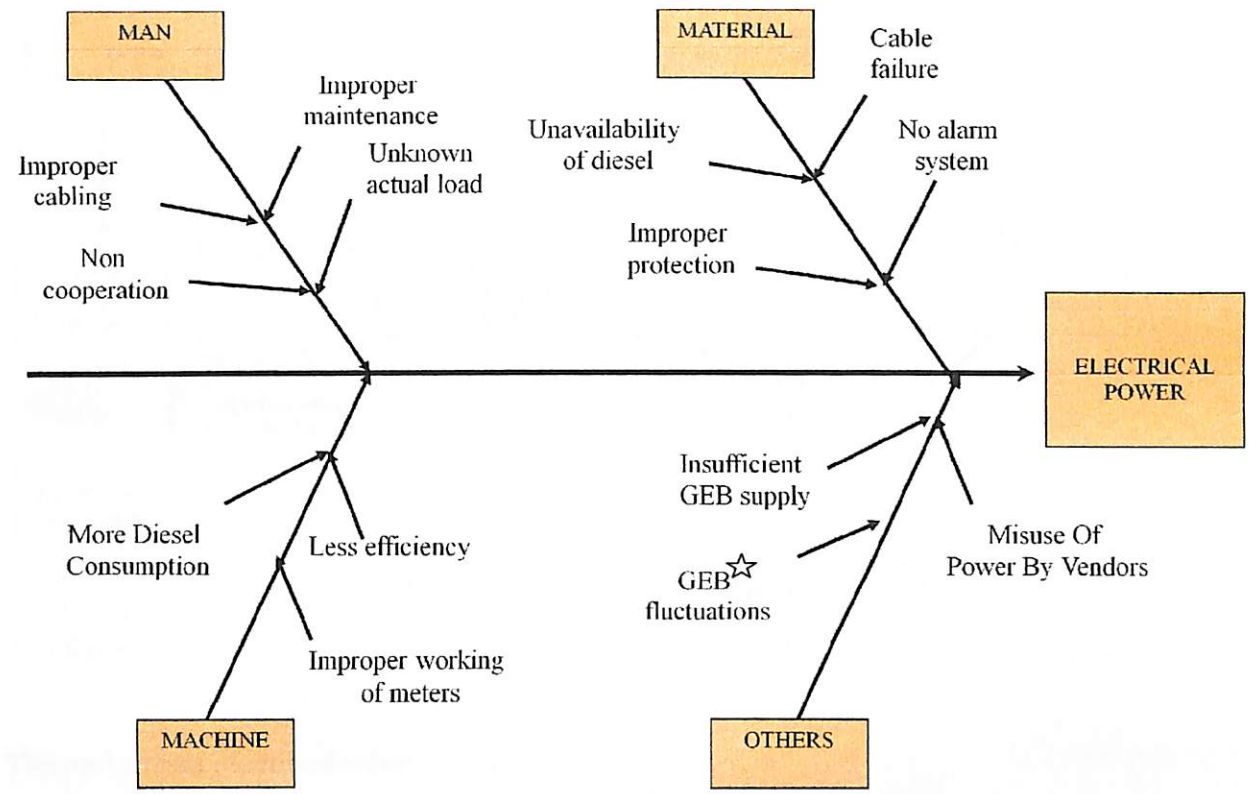
	Strongly Related
	Moderately Related
	Weakly Related



Root cause analysis of Electrical faults/failures

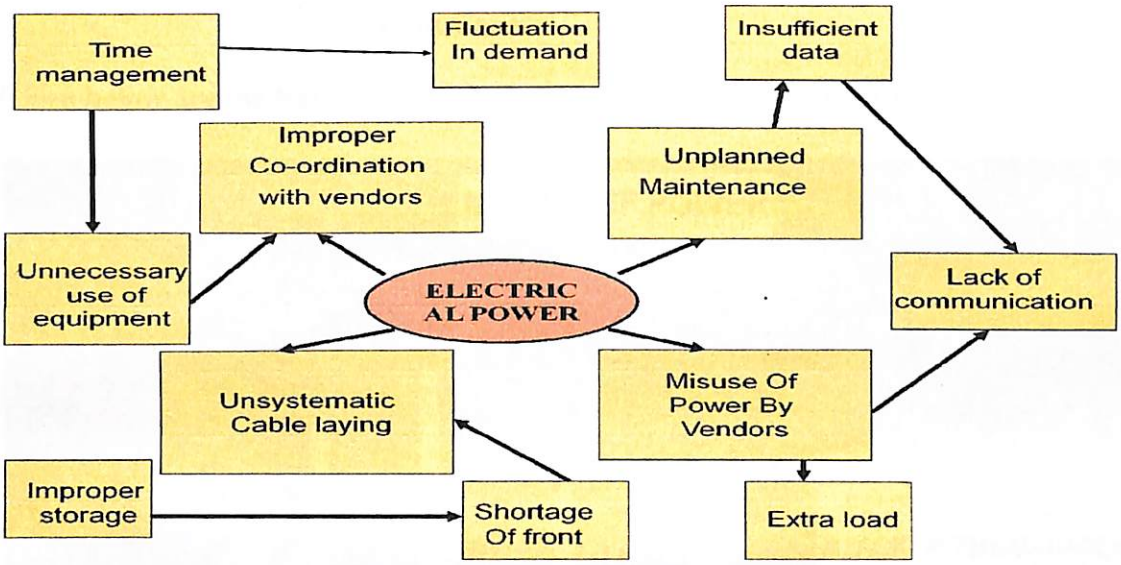
It was evident that the most number of problems were electrical in nature so the circle performed a rigorous Root Cause Analysis of all the problems. Main causes or the Mother causes are given in the pie chart below.





☆GEB: Gujarat Electricity Board (Some of the permanent power was being supplied by the board)

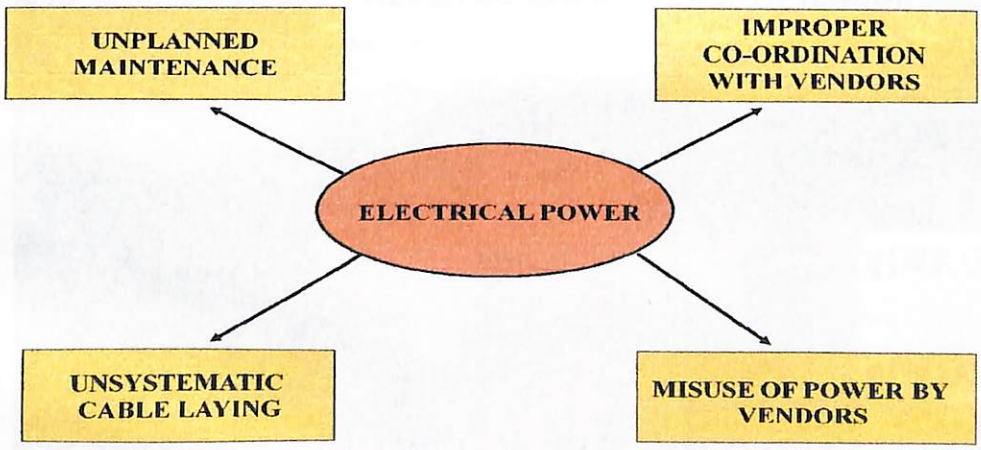
The figure above shows a **Cause & Effect** diagram for all the main causes. Cross Functional teams held brainstorming sessions to open-up all probable causes utilizing Cause & Effect diagram. Subsequent consensus building narrowed down the probable causes.



The figure above shows a **Relationship Diagram**. The complex issue of Electrical Power Problem was clarified by using logical Relation diagram.

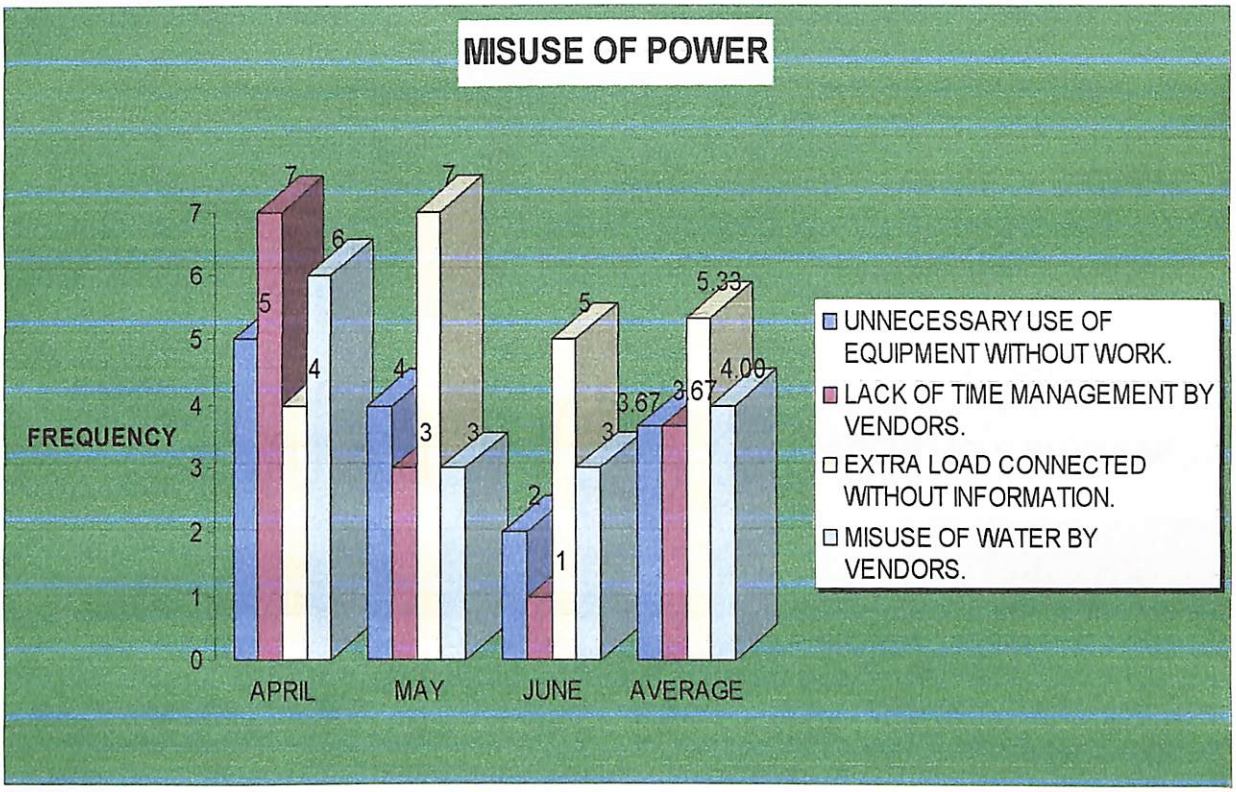
The root causes identified were:

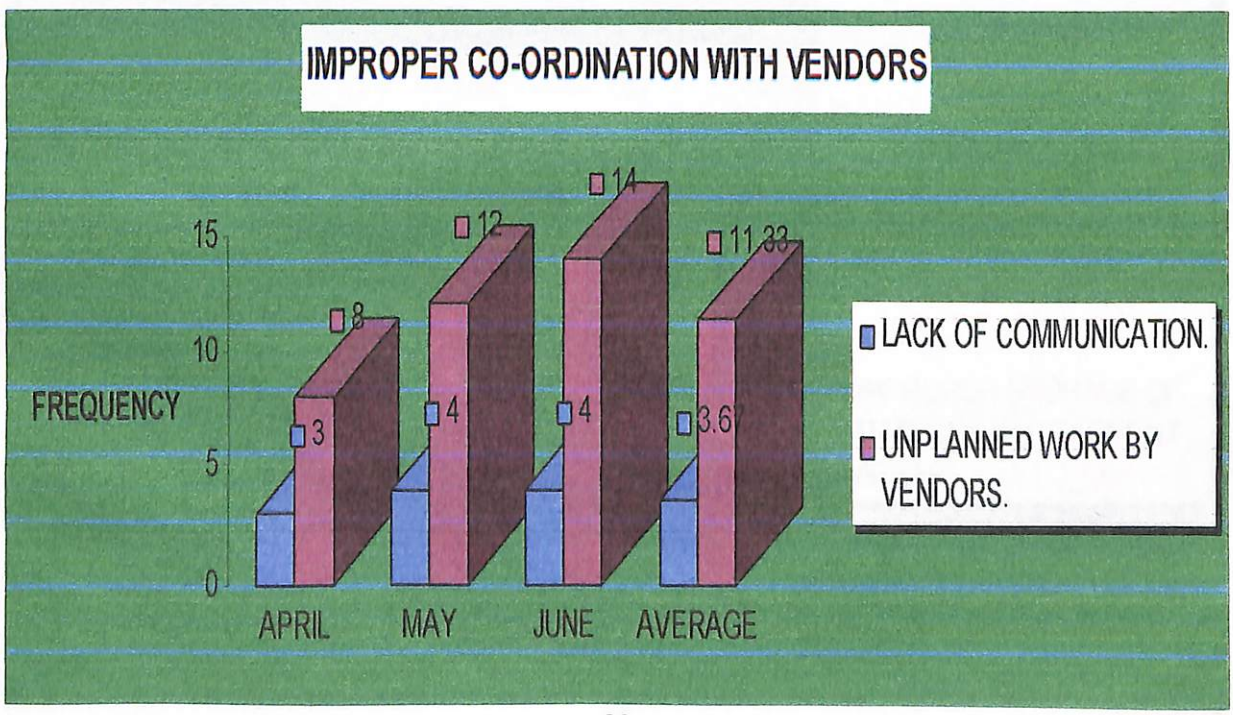
1. Unplanned Maintenance
2. Unsystematic Cable laying
3. Misuse Of Power By Vendors
4. Improper Co-ordination with vendors

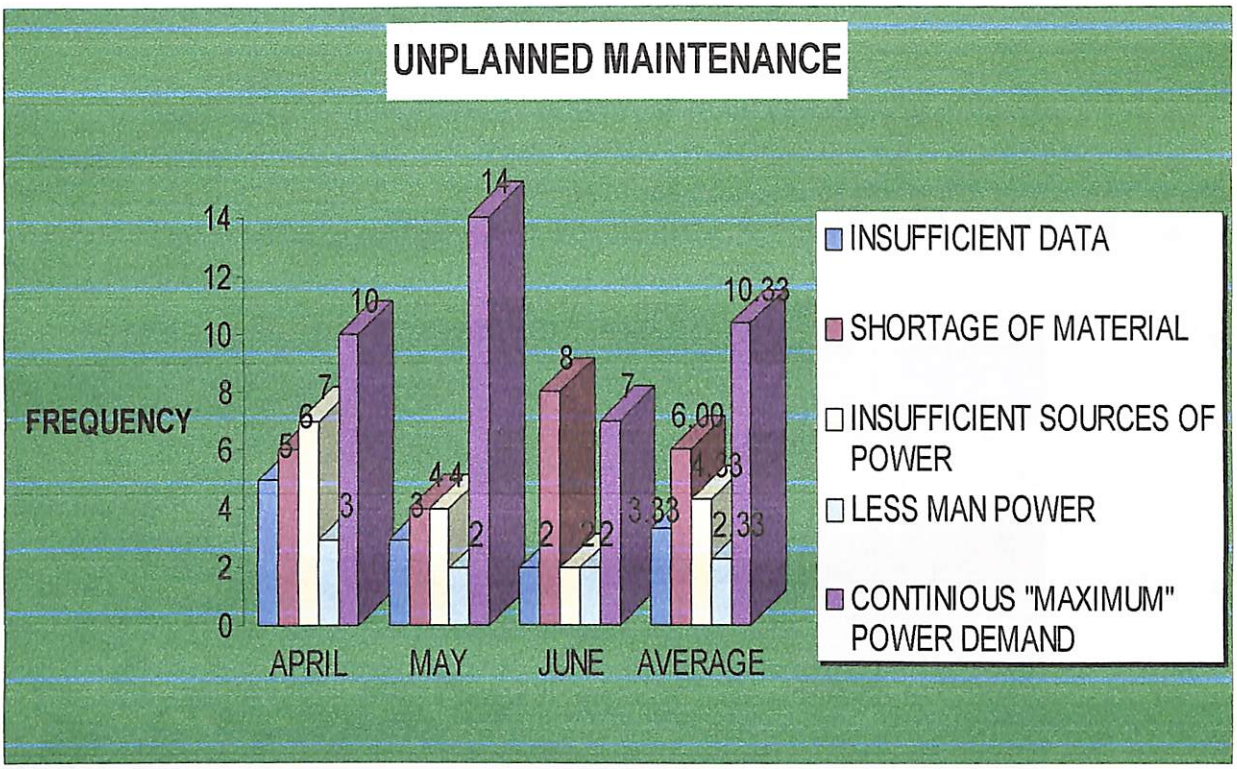


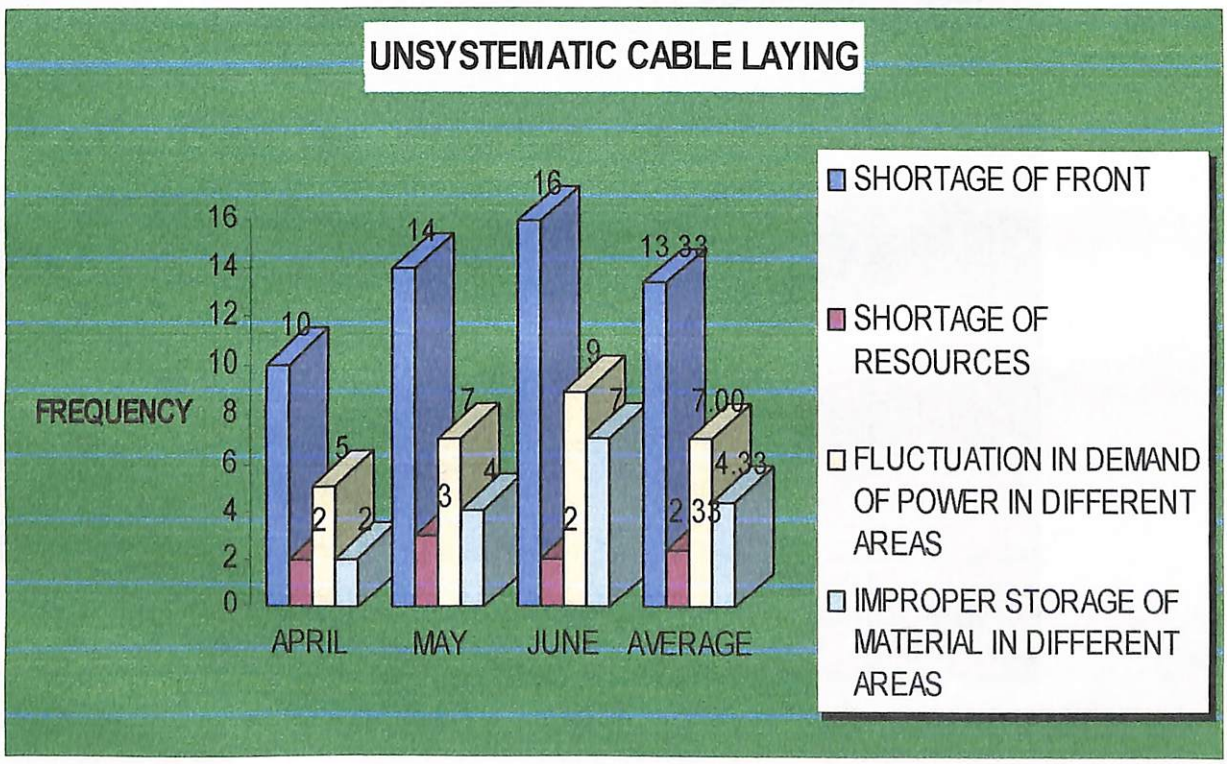
Root Causes

Given below are the bar charts of the root causes for further scrutiny.






UNPLANNED MAINTENANCE
FREQUENCY
14
12
10
8
6
4
2
0
APRIL
MAY
JUNE
AVERAGE
INSUFFICIENT DATA
SHORTAGE OF MATERIAL
INSUFFICIENT SOURCES OF POWER
LESS MAN POWER
CONTINIOUS "MAXIMUM" POWER DEMAND

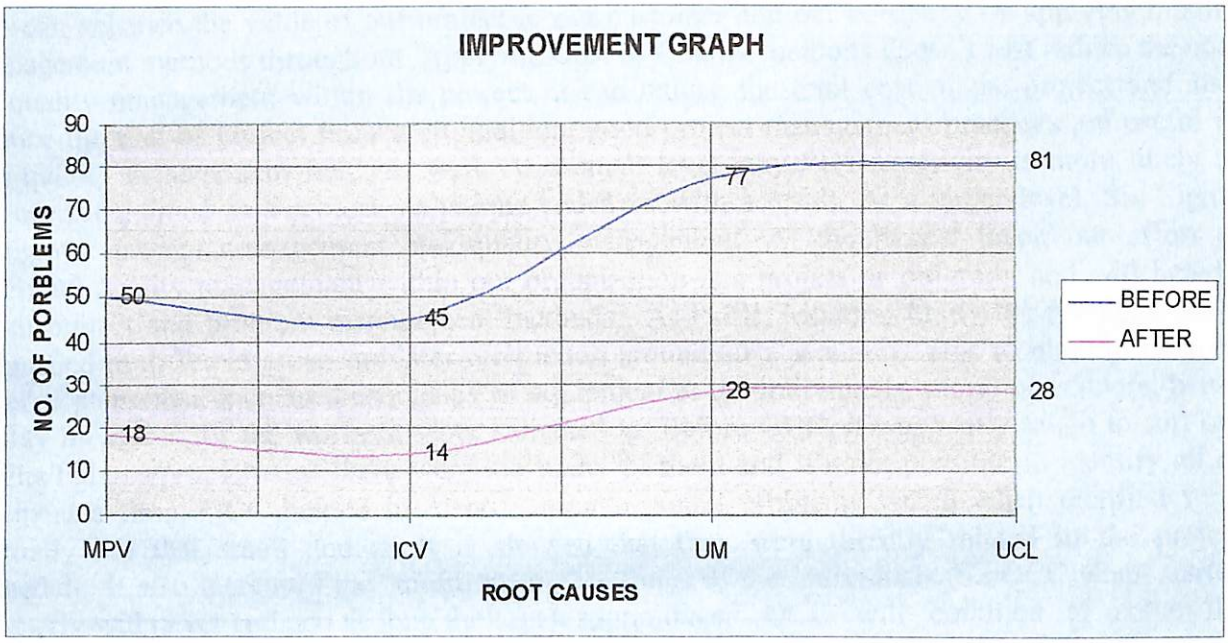

UNSYSTEMATIC CABLE LAYING
FREQUENCY
16
14
12
10
8
6
4
2
0
APRIL
MAY
JUNE
AVERAGE
SHORTAGE OF FRONT
SHORTAGE OF RESOURCES
FLUCTUATION IN DEMAND OF POWER IN DIFFERENT AREAS
IMPROPER STORAGE OF MATERIAL IN DIFFERENT AREAS

How QCC brought improvement?

After all the analysis and planning, it was time to act. So all the team members, along with the other guest members, other employees (non members), vendors and the unskilled labor thought for the most easiest, feasible & permanent solutions for the root causes and their sub root causes. There are series of tables given below that tells about the rectification strategy of the QCC at PCBL Mundra site.

PROBLEM	PLAN OF ACTION	TIME FRAME	STARGTING DATE	ENDING DATE
MISUSE OF POWER				
UNNECESSARY USE OF EQUIPMENT WITHOUT WORK.	AWARENESS PROGRAMME ORGANISED FOR TECHNICIAN, REGULAR INSPECTION BY OFFICERS, FINE IMPOSED.	3 DAYS/ WEEKLY	10/7/2008	13/7/08
LACK OF TIME MANAGEMENT BY VENDORS.	SCHEDULE WAS MADE & STRICTLY IMPLEMENTED BY MANAGEMENT.	1 DAY	10/7/2008	11/7/08
EXTRA LOAD CONNECTED WITHOUT INFORMATION.	INSPECTION BY ELECTRICAL DEPT AT REGULAR INTERVALS AND IMPOSING FINE ON THOSE VENDORS WHO PRACTISED SUCH KIND OF ACTIVITIES.	DAILY	14/7/2008	31/8/08
MISUSE OF WATER BY VENDORS.	LEAKAGES WERE IDENTIFIED AND REPARED BY PLUMBER. EXTRA RESERVOIR MADE FOR CONSTRUCTION WORK. CIRCULAR GIVEN TO VENDORS REGARDING WATER SUPPLY TIMING.	7 DAYS	15/7/2008	22/7/08
IMPROPER CO-ORDINATION WITH VENDORS				
LACK OF COMMUNICATION.	MEETING WAS ORGANIZED AT REGULAR BASIS WITH THE VENDORS AND ITS WORKERS, DOWNWARD AND UPWARD COMMUNICATION WAS PROMOTED.	WEEKLY	14/7/2008	25/7/08
UNPLANNED WORK BY VENDORS.	SCHEDULE WAS MADE & STRICTLY IMPLEMENTED BY MANAGEMENT.	3 DAYS	14/7/2008	31/8/08

UNPLANNED MAINTENANCE				
INSUFFICIENT DATA	CHECK SHEET, DAILY & WEEKLY PROGRESS REPORT WAS MAINTAINED BY OPERATORS.	DAILY	14/7/2008	31/8/08
SHORTAGE OF MATERIAL	MATERIAL STOCK SHEET WAS PREPARED WEEKLY.	WEEKLY	14/7/2008	25/8/08
INSUFFICIENT SOURCES OF POWER	SPARE MOBILE DIESEL GENERATORS WERE HIRED.	7 DAYS	10/7/2008	11/7/08
LESS MAN POWER	EFFICIENCY ENHANCEMENT PROGRAMME WAS CONDUCTED.	3 DAYS	10/7/2008	13/7/08
CONTINIOUS "MAXIMUM" POWER DEMAND	SPARE MOBILE DIESEL GENERATORS WERE HIRED.	7 DAYS	10/7/2008	11/7/08
UNSYSTEMATIC CABLE LAYING				
SHORTAGE OF FRONT	MEETING WITH CIVIL DEPARTMENT WAS CONDUCTED AND SUITABLE ROUTE WAS IDENTIFIED.	7 DAYS	15.7.2008	22.7.08
SHORTAGE OF RESOURCES	MEETING WAS CONDUCTED BETWEEN VENDORS, STORE & PURCHANSE AND ELECTRICAL DEPT ON WEEKLY BASIS.	WEEKLY	14.7.2008	25.8.08
FLUCTUATION IN DEMAND OF POWER IN DIFFERENT AREAS	INSPECTION BY ELECTRICAL DEPT AT REGULAR INTERVALS. LOAD-TIME SCHEDULE WAS MADE AND DISTRUBUTED AMONG ALL VENDORS.	DAILY	14.7.2008	31.8.08
IMPROPER STORAGE OF MATERIAL IN DIFFERENT AREAS	RECCOMENDATION FOR PROPER STORAGE WAS MADE BY QCC AND GIVEN TO HIGHER MANAGEMENT FOR APPROVAL.	.....	21.7.2008	28.7.08



MPV: Misuse of power

ICV: Improper Coordination with Vendors

UM: Unplanned Maintenance

UCL: Unsystematic Cable Laying

Conclusion

We can enhance the value of our project to our customer and our company by applying quality management methods throughout. Applying Cost of Quality methods doesn't just reduce the cost of quality management within the project, it can reduce the total cost of the project and also reduce the risk of project failure. In addition, good project management practices are useful in the quality management field, as well. At a small level, any PDCA activity is more likely to succeed if defined as a project—a unique endeavor with a result. At a larger level, Six Sigma integrates project management and quality management. At the largest level, our effort to overhaul quality management within our organization is a project or program, and will benefit from project and program management methods. At PCBL Mundra, firstly the problems were identified in different areas and later rectified to around 60% accuracy. This resulted in reduced overall plant cost, increased efficiency of equipment & the individuals, moral of vendors, better safety measures for the workers, work satisfaction. Before QCC, it was really tough to sort out faults/failures/problems as there were too many of them and it's not possible to identify all of them at a time. QCC helped in identification of small problems which when rectified were actually not that small and analysis showed that they were directly related to the project schedule. It also increased the 'multi-tasking' abilities of the individuals. So QCC when started properly will never end and as long the organization lives, QCC will continue to solve the 'never ending issues', big or small, which collectively end up in some major breakdown.

References

- Kemp, Sid (Project Management Professional) "*Quality Management Demystified*".
- Bhattacharya, Jayanta "*Quality Control and Management*".
- "*Quality Control*" : Wikipedia.com
- Sahani, Akhil "*Quality Control Circle: A Quality Get Together*" : Articlebase.com