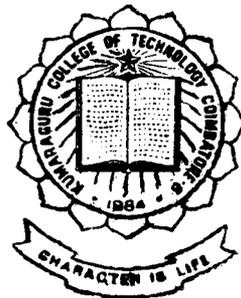# QUALITY DATA INTEGRATION

Thesis submitted in partial fulfilment of the requirements for the award of the degree of
MASTER OF ENGINEERING IN MECHANICAL ENGINEERING
(INDUSTRIAL ENGINEERING)
of BHARATHIAR UNIVERSITY

By
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(Reg. No. 9837H0012)

Under the Guidance of
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DEPARTMENT OF MECHANICAL ENGINEERING
KUMARAGURU COLLEGE OF TECHNOLOGY
(Affiliated to Bharathiar University)
COIMBATORE - 641 006

1998 - 1999

CERTIFICATE

Department of Mechanical Engineering

Certified that this is a bonafide report

of

The thesis work done by

V. SANGEETHA

(Reg. No. 9837H0012)

at

KUMARAGURU COLLEGE OF TECHNOLOGY
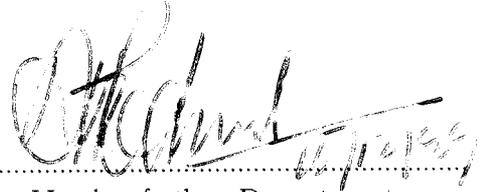
COIMBATORE - 641 006

During the year − 1998 - 99

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This is to certify that this project work titled " **QUALITY DATA INTEGRATION**" is the bonafide work of **V . SANGEETHA Roll No. 98 MIE 12,** student of Final semester , M.E.(Industrial Engineering), Kumaraguru College of Technology, Chinnavedampatti, Coimbatore - 641 006.

It is also certified that the above work was carried out in Bharat Heavy Electricals Ltd., Tiruchirappalli - 621 014 between July 1999 and November 1999 under my guidance for Quality Assurance department.

The software was demonstrated by her and we are using it now and we can use it for the future also.

This project work is of high order and very useful to the organisation.

Place : Tiruchirappalli

Date : *Dec 9, 1999*

(**A.V.KRISHNAN**)
SENIOR DEPUTY GENERAL MANAGER
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ACKNOWLEDGMENT

SYNOPSIS

Today quality management is the part of every company's strategic planning activities. With the introduction of ISO 9000 standards more formal quality systems are born and other factors such motivation for quality, Culture for quality. Internal customer concepts have brought revolution in the management of quality aspects. Thus the industry is moving into a new era called **Total Quality Management.** Companies which have planned their business in this direction have adopted the Total Quality Management principles and introduced measurement of their critical processes to deliver defect free product and services. Such companies are moving towards World class quality and produce Six Sigma quality outputs.

It must be appreciated that every organisation houses a hidden factory. Whose job is to produce waste. Waste - is anything that the customer did not pay for. Even successful organisations today, have hidden factories costing them 10 to 30% of their sales. Today 'Decisions are Made' based on data and inferences using statistical tools and scientific approaches. The use of information from process data for prevention activities widely used in all process.

This thesis aims at integrating the various quality data captured as a part of daily management such as inspection records, Product non conformities and site feed back. The data thus captured will be integrated into a common database for effective analysis and identification of corrective and preventive actions to prevent recurrence of problems.

This thesis would logically adopt the standard Computer languages and statistical techniques to process the data leading to meaningful information which can be feed back into the process for improvement. It is felt that such integration of quality would help in identifying and prioritising the improvement efforts for effective results.

ABBREVIATIONS

1.	AI	-	Authorised Inspector
2.	API	-	American Petroleum Industries
3.	ASME	-	American Society for Mechanical Engineers
4.	BAP	-	Boilers Auxillaries Plant
5.	BHEL	-	Bharat Heavy Electricals Limited
6.	CAR	-	Commissioning Action Request
7.	CC	-	Customer Complaints
8.	DIPC	-	Direct Ignition of Pulverised coal
9.	FBCB	-	Fluidised Bed Combustion Boiler
10.	HPBP	-	High Pressure Boiler Plant
11.	HRDC	-	Human Resource Development Center
12.	IBB	-	Indian Boiler Board
13.	NB	-	National Board of Boilers
14.	NCR	-	Non Conformance Report
15.	OP&C	-	Operation, Process & Control
16.	PDCA	-	Plan-Do-Check-Act cycle
17.	PGMA	-	Product Group & Manufacturing Assembly
18.	QA	-	Quality Assurance
19.	QBE	-	Query by Example
20.	QC	-	Quality Control
21.	QDI	-	Quality Data Integration
22.	R&D	-	Research and Development
23.	SAR	-	Site Action Request
24.	SQC	-	Statistical Quality Control
25.	SQL	-	Structured Query Language
26.	SSTP	-	Seamless Steel Tube Plant
27.	TQC	-	Total Quality Control
28.	TQM	-	Total Quality Management

CONTENTS

A CUSTOMER IS THE MOST IMPORTANT VISITOR ON OUR PREMISES. HE IS NOT DEPENDENT ON US . HE IS NOT AN INTERRUPTION ON OUR WORK.HE IS THE PURPOSE FOR IT. HE IS NOT AN OUTSIDER ON OUR BUSINESS. HE IS PART OF IT. WE ARE NOT DOING A FAVOUR BY SERVING HIM. HE IS DOING US A FAVOUR BY GIVING US AN OPPORTUNITY TO DO SO.

-MAHATMA GANDHI.

Chapter - 1

Introduction

INTRODUCTION

Today people have satisfaction with the product / services only when they have high quality and competitive price (low). And the customers know how of products and services are growing very rapidly, because of the effective world wide communications.

The quality will never be a problem if the attitude of the people employed are quality conscious and a belief with continuous improvement. The scenario in India is fast changing because of global competition. Hence the Total Quality Management has become a part of every company's strategic planning activities.

In a large manufacturing system, the quality is the contribution of every subsystem involved for manufacturing. A small percentage of deviation of quality characteristics in each subsystems would contribute to a considerable percentage of deviation at a final stage of the product. Hence, the quality is everybody's concern.

A revolution is taking place in many countries on the management of quality aspects with the introduction of formal quality systems such as ISO 9000, IS 14000. Hence the companies are planning to win over the customers by delivering defect free products and services. The people are talking about world class quality in every product / service in India.

Hence, the management has to identify and take preventive steps in order to achieve, Total Quality. The decisions made should continuously improve the quality. Commonly in all manufacturing systems, they are having their own system of quality and data recording. The decision for quality problem will be made based on the data captured in the stages of manufacturing. The data thus captured will be integrated into a common database for effective analysis with the help of statistical tools and a standards of computer language. This study aims at such a kind of integration to identify the corrective and preventive measures to avoid the recurrence of the quality problems.

The quality system is studied in BHEL, Trichy and the above thesis is carried out at BHEL Trichy.

Chapter - 2

About the Organisation

ABOUT THE ORGANISATION

2.1 BHEL - History

The first plant of what is today known as "Bharat Heavy Electricals Ltd.,", was established nearly 40 years ago at Bhopal and the genesis of the Heavy Electrical Equipment Plant Industry in India. BHEL is today the largest engineering enterprise of its kind. in India, with a well recognised track record of performance, making profits continuously since 1971 - 72. It has achieved a sales turnover of Rs. 6000 crores with pretax profit of Rs. 1000 crores in 1996 - 97.

BHEL'S Network

BHEL caters to core sectors of Indian Economy like Power, Industry, Transportation, Transmission, Defence etc. The Network comprises of the following :

* Fourteen manufacturing divisions

* Nine service centres

* Four Power sectors

* Four regional centres

The network enables the company to be closer to its customers and serve them with suitable products, systems and services at competitive prices. The BHEL is now embarking upon the Total Quality Management for its

operations by having attained ISO 9000 certification. BHEL has adopted the European Quality model of European foundation for quality management.

Business sectors

To provide a strong market orientation BHEL's operations are organised around the business sectors viz., power, industry and international.

power sector

Power sector comprises of thermal, nuclear gas and hydro power plant business. Today BHEL supplied sets account for nearly 54404 MW or 65% of the total installed capacity of 83700 MW in the country as against nil in 1969 - 70.

BHEL manufactures 235 MW nuclear sets and has commenced production of 500 MW sets. In all, more than 720 sets of thermal, hydro, gas and nuclear have been contracted on BHEL to date. The power plant, equipment manufactured by BHEL is based on contemporary technology comparable to the best in the world and is also internationally competitive.

Industry sectors

BHEL is a major contributor of equipment and systems to process industries. These include captive Power Plant, Industrial Boilers and steam

turbines, Gas turbines, Waste heat recovery boilers. Heat exchanger and Pressure vessels, Electrical machines, Seamless steel tubes and so on.

Other areas :

Transmission

BHEL supplies a wide range of transmission products upto 400 KV class. These include transformers, switch gears and capacitors.

Transportation

A high percentage of the trains operated by Indian Railways are equipped with BHEL's traction and traction control equipment including the metro at Calcutta. The range includes 3900 HP broad gauge AC locomotives, 5000 HP AC/DC locomotives, battery powered locomotives.

Non conventional energy sources

Technologies for exploiting non-conventional and renewable sources of energy include wind generators, solar power based pumps lighting and heating system.

BHEL manufactures wind generators upto 250 KW rating.

International operations

BHEL's products, services and projects have been exported to 52 countries ranging from the United States in the west to New-zealand in the far east.

Technology upgradation and R & D

BHEL has upgradation of its products and related technologies to contemporary levels through collaborations with leading world organisations.

By in house R &D, several technologies were developed like Fluidised Bed Combustion Boilers (FBCB) and Direct Ignition of PULVERISED Coal (DIPC)

Human Resource Development

The most praised asset of BHEL is its 67000 employees. The HRD departments help is not only keeping their skills updated and finally honed but also add new skills when required.

Future outlook

The company is actively pursuing business possibilities in many of the emerging market segments by offering customers a combinations of various options like arranging financial packages, equity, participation, consortium approach, joint ventures etc. The company has initiated various in house measures aimed at reducing cycle time, bringing about higher productivity in its operations improving quality. For quantum improvement in selected areas

business process re-engineering techniques are also being postured as a management initiative.

2.2   BHEL - Tiruchirappalli

Bharat Heavy Electricals Limited, Tiruchirappalli, established in 1963, has three manufacturing plants today.

* High Pressure Boiler Plant, Trichy. (HPBP)

* Seamless Steel Tube Plant, Trichy. (SSTP)

* Boiler Auxiliaries Plant, Ranipet. (BAP)

BHEL, Trichy has seen over the years growth in capacity turn over and profitability. Hand in hand with product diversity and newer product technologies which have been developed, absorbed and adopted to Indian conditions. The modern facilities have been continuously added to raise capability and improve quality and productivity. There has also been a matching growth of auxiliaries and subcontractors.

All along it has been the commitment to grow and excel that has raised BHEL, Trichy to its present stature of a lending engineering and manufacturing organisation.

Anything and everything is after the power. The **"Power to the Nation"** has been, the main objective of this organisations. Today boilers and auxiliaries supplied by BHEL, Trichy account for about 70% of the total installed thermal, power generating capacity in the country.

BHEL, HPBP plant at Trichy specialises in the manufacture of boilers for thermal and nuclear power stations of units sizes upto 210 MW and 235 MW respectively. It also manufactures industrial process steam boilers in different sizes to meet the requirements of fertiliser plants, sugar mills, chemical factories and petro chemical industries. These are designed for a wide range of fuels namely coal fuel, oil, asphalt blank liquor and any other combinations there of.

BHEL, Trichy is geared to manufacture 500 MW boilers for the first time in the country.

BHEL plant at Trichy is specially engaged in the design and manufacture of the following :

1.   Boilers for thermal and nuclear power stations

2.   Package boilers for process industries

3.   Boiler house auxiliaries

4.   Valves and fittings

This plant is fully equipped to undertake to design and manufacture a total range of boilers for thermal power stations and process industries.

BHEL, Trichy has the expertise for project studies, evaluations and other preliminary investigations for turn key projects.

CHART NO.: 1

ABOUT THE ORGANISATION

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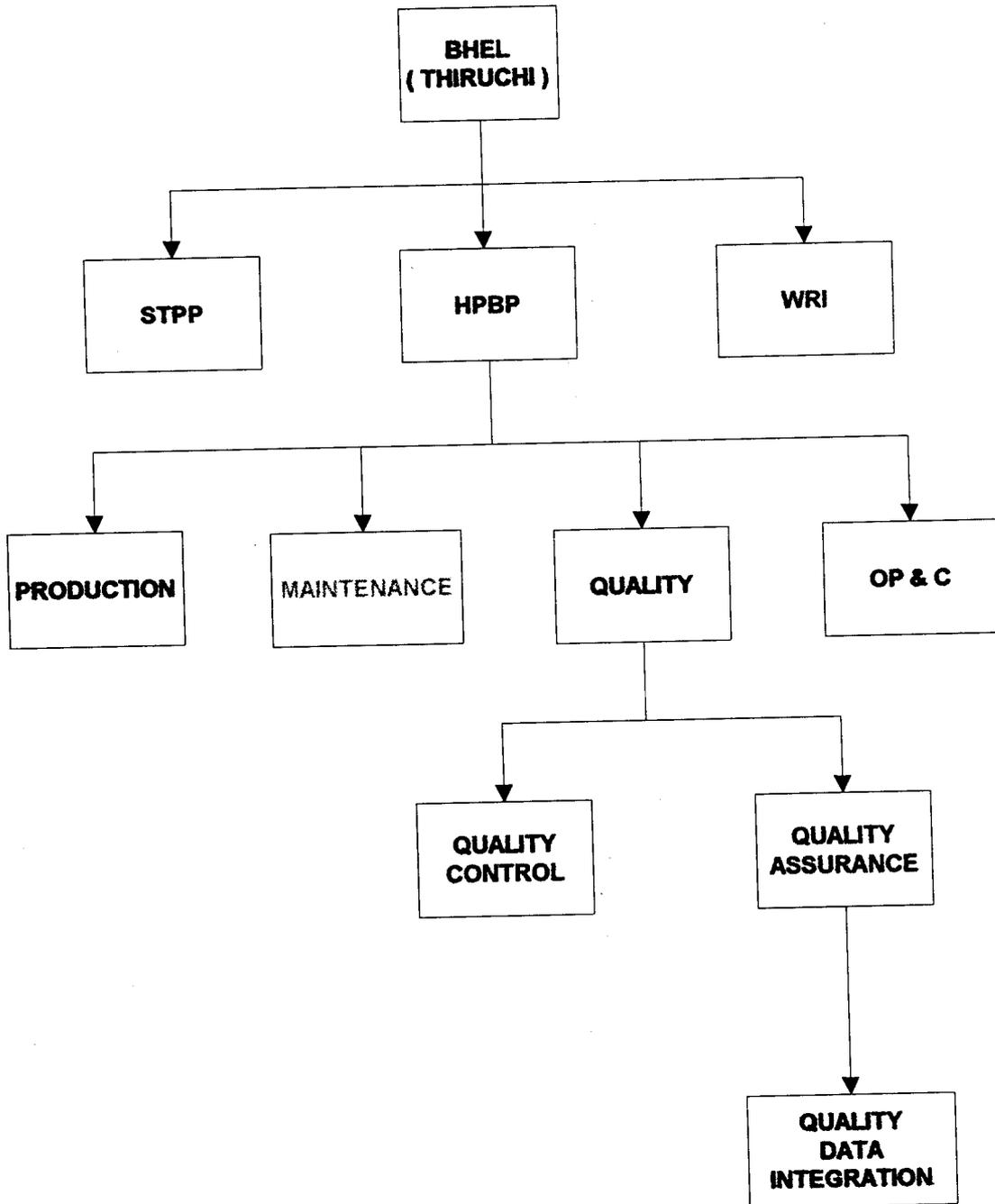
LITERATURE SURVEY

3.1 Quality - is an Endless Journey

'Quality Improvement Concept - It is a continuous one which should not be attempted on a grand scale but pursued in small, incremental, manageable steps'.

- Susan berk

The concept of quality control as a distinct discipline emerged in the United States in 1920's. At the time, quality control was intended simply to control or limit the creation of defective items in industrial processes. The earliest quality control idea was to impact the output of the manufacturing process and then sort defective products from good ones.

Quality Development

1920's	Statistical methods applied to manufacturing (Shewhart)
1940's	Increased Emphasis on process improvement (Deming & Juran) World War II
1950's	Deming Assists Mac. Arthur in Japan
1960's & 1970's	Japan emerges as world quality leader (Deming, Ishi Kawa, Taguchi)
Late 1960's	TQC : Total Quality Control emerges in US
1960's to 1970's	Zero defects movement in US (Croshy)

1980's - 1990's   TQM : Total Quality Management emerges in US

(Deming, Juran, Taguchi, Croshy)

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Continuous Improvement

TQM emposes a philosophy of continuous improvement in all areas of an organisation. This philosophy ties in closely with the quality measurement and universal quality responsibility concepts mentioned above. Quality measurement is needed in order to focus improvement efforts appropriately and continuous improvement should be pursued in all areas. This TQM concept focuses on finding short falls in administrative manufacturing and service. Processes that can detract from a quality output and improving the process to eliminate undesirable outputs. Instead of finding some one to blame when things go wrong, (or limiting the application of a corrective action to fix a specific defect). TQM practitioners instead zero in on the process deficiencies that allowed the problem to exist. Eliminating process deficiencies will prevent future defects. There is another extremely significant aspect to the continuous improvement concept. It should not be attempted on a grand scale, but pursued in small, incremental manageable steps.

Basic Total Quality management Elements

* A sustained management commitment to quality.

* Focusing on customer requirements & expectations

* Preventing defects rather than detecting them

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*   Recognising that responsibility for quality in universal.

*   Quality measurements

*   A continuous improvement approach to do business.

*   Root cause corrective action.

*   Employee involvement and empowerment

*   The synergies of team work

*   Process improvement

*   Thinking statistically

*   Bench marking

*   Inventory reduction

*   Value improvement

*   Supplier teaming

*   Training

Bench marking is nothing but identifying other organisations that perform well and incorporating their wisdom into our organisation. For each and every element we can go for the following strategy for implementing continuous improvement

i.   Define current status

ii.   Define continuous improvement objectives

iii.   Select continuous improvement projects

iv.   Assign teams

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v. Define process

vi. Define sources of variability

vii. Develop potential improvements

viii. Perform experiments

ix. Modify potential upgrades as required

x. Implement pilot process upgrade

xi. Measure results

xii. Implement and move on to next project

And follow the same strategies for the next project also, thus the Quality journey continues. The short definitions that has achieved acceptance is "Quality is customer satisfaction". "Fitness for use" is an alternative short definition. As we all know that 'Fitness' differs with variety of people and 'satisfaction' differs with stages and standards of people. Human thirst never ends and the journey of quality also going on proceeding behind the customer.

In this journey, each developed countries are having their own way of proceedings. And being a developing country. We, Indians have to follow them.

US version of TQM structure

They are having four blocks that can be put as the base of Quality Management structure

* The First block is **'Training'**

According to the leading proponent of total quality, **Kaoru Ishikawa**, "TQC starts and ends with training but TQC training never ends". He told that "We started off in the way. I would always recommend to others - by consulting outside experts and organisations. They gave us training, philosophy which we realised, we could easily adopt with examples tailored to our own organisations and which we could propagate through people with whom our own employees could readily identify".

Their journey of training continues as.

a. **Philosophical training**

   * Juran / Croshy

   * Deming / Ishikawa

b. **Awareness training**

   * Introduction to quality

   * TQC awareness

   * Customers No.1

   * Policy deployment

c. **Problem solving training**

   * Team

       - Quality Improvement Training

       - Effective teams

       - Client development system

- Business process analysis

- Quality function deployment

* Specialist

- Statistical process control

- Design of experiment

- Taguchi

* Individual

- Systematic management

- Systematic trouble shooting

d. Customer / Supplier training

- Cost of ownership

- Cycle time reduction

* The second block is **quality organisation** which runs in **parallel** with functional organisation.

* The third block is '**Team problem solving'**.

There are two approaches

1. Effectiveness team

2. Quality Improvement team

The First team is voluntary participated. They select the local problems and they present the team presentation only after the completion of the project. The team is permanent one. The training in problem solving and

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inter personnel techniques are given to them and it creates an environment of participation.

The second team is appointed by the management and the problem is assigned by the managers to them and they have to give mile stone feed back to the quality steering team. Usually the problems are cross functional and the team is not permanent. They are trained only in problem solving and it obtains maximum benefit from human resources.

* The fourth block is 'Calibration' of their own people's understanding of the TQC process by external consultants, to sample about 10% of our site population, taking particular care to cover all level of functions.

U.K. versions of TQC :

Do's

1. Train continuously

2. Involve everyone

3. Be honest (good/bad)

4. Actively participate

5. Establish team work

6. Review the process

7. Focus on customers

8. Recognise success

9. Structured decision making

10. Be patient

Dont's

1. Use exhortation

2. Having zero defect days

3. Sign the pledge

4. Delegate TQM

5. Focus on results

6. Change your mind

7. Look for short cuts

-"Measure the benefits not the expense, don't delegate responsibility for the programme, don't focus on results too soon. Don't try to take short cuts and keep the accountants at bag for a while, at least".- is the advice to the managers by *Ken Sanders.*

The new / present dimension of quality - Deming

Demings 14 points which are forming the base of quality at now. They are

1. *Constancy of Purpose*

    - Create constancy of purpose for continual improvement of products and service

2. *The new Philosophy*

    - Learn and adopt the new philosophy. We are in a new economic age, created in Japan

3. *Cease dependance on mass inspection*

   - Eliminate the need for mass inspection as the way of life to

   achieve quality.

4. *End Lowest - tender contracts*

   - End the practice of awarding business, solely on the basis of

   price tag.

5. *Improve Every process*

   - Improve constantly and forever every process for planning,

   production and service.

6. *Institute Training*

   - Institute modern methods of training on the job for all,

   including management to make better use of every employee.

7. *Institute leadership*

   - Adopt and Institute leadership aimed at helping people to do

   better job.

8. *Drive out fear*

   - Drive out fear through, effective two way communication.

9. *Break out barriers*

   - Break out barriers between departments and staff areas

10. Eliminate Exhortations

- Eliminate the use of slogans, posters and exhortations for the work force, demanding Zero defects and new levels of productivity without providing methods.

11. Eliminate orbitrary numerical targets

- Eliminate work standards that prescribe quotes for the work force and numerical goals for people in management.

12. Permit pride of workmanship

- Remove the barriers that job hourly workers and people in management of their right to pride of workmanship

13. Encourage Education

- Institute a vigorous programme of education and encourage self improvement for every one.

14. Top management commitment and action

- Clearly define top management's permanent commitment to ever improving quality and productivity.

Deming's Chain reaction

1. Improve quality

2. Decrease cost, because of less rework, fewer mistakes, fewer delays snags, better use of machine time and materials.

3. Improve productivity

4.   Capture the market with better quality and lower price

5.   Stay in business

6.   Provide jobs and more jobs

Deming's Cycle

1. Plan a change or a text aimed of improvement

2. Carry it out (referable in a small scale).

3. Study the results what we learn.

4. Adopt the change / Abondon it / Run through the cycle again, possibly under different environment condition.

PDCA Cycle
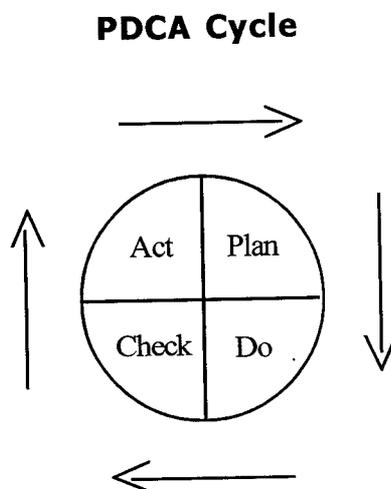
And now the Quality journey continuous with.

* Policy deployment.

       - Long term focus.

      - Break through process.

* SQC.

       - Management of fact

       - Reduction in variation.

* Taguchi design of - Experiments-.

       - Loss function

       - Robust processes.

* Quality function deployment.

       - Design for customer satisfaction.

Thus Quality journey proceeds.

QUALITY JOURNEY OF BHEL - TIRUCHY

Milestones of quality

1.   Functional

*   1972   First Export to Malaysia

*   1976   Consolidation of systems, First Quality Control manual for Manufacturing

*   1979   Exposure to Statistical Quality control Techniques

*   1981   Promoted Annual Quality Improvement Plans

*   1982   Introduction of Quality Circle concepts

*   1984   Quality Assurance Manual in line with BS 5750

*   1991   National Accreditation for Calibration Centre and Plant Laboratory

*   1992   QA Programme updated to ISO 9000 Standards

*   1994   QA Programme updated to latest revision of ISO 9001

*   1995   TQM Movement started

*   1997   Quality documentation made on - line

*   1998   Six Sigma Quality Programme initiated

*   1999   Environmental Management Systems Manual prepare

II   Product Certifications

*   ASME "S" .... Renewed SIX times

*   API "6A" .... Renewed TWICE

*   ASME "U + U2"

*   API "6D"

*   NB "R" Stamp

The Actual Quality Journey of BHEL Tiruchippalli is given as functional miles tones of Quality, and as this study is a step in Six Sigma quality programme, this study is a incremental bit of BHEL quality journey.

3.2. Common Quality System in Manufacturing systems

A large organisation needs to develop and comply to a comprehensive quality system to enable smooth functioning. The program has to be established to cover engineering. Procurement, manufacturing, quality, finance, marketing. Human Resource development and services to customers.

Quality Policy

Each manufacturing system is having their objective towards quality as their 'Quality Policy mostly they are customer oriented i.e., an authorised quality policy declaring management's commitment towards quality of product and services. It is something like, 'to maintain a leading position in the design, manufacture and supply of products and services of consistent quality meeting the national / international standards, Codes/statuatory regulations and to meet the expectations of our customers'.

Under quality department, large manufacturing systems are having two divisions like.

* Quality control

* Quality Assurance departments

⇒ Operational techniques and activities that are used to fulfil requirements for quality i.e., an online system is quality control department.

⇒ Quality assurance comprises all the planned and systematic activities

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implemented within the quality system, and demonstrated as needed, to provide adequate confidence that an entity will fulfil requirements for quality, ie., an offline system.

It is the department which is responsible for the overall quality of the product from vendor selection to product service life. The quality assurance engineer is the designer of the plans, procedures and methods for achieving quality assurance.

Departmental activities

Quality Assurance Manual at manufacturing systems highlights a comprehensive quality system as below.

Contract review : - An exclusive contracts groups reviews contract requirements along with engineering technology and quality groups for feasibility and product reliability.

Design Control :- Engineering Group will translate the contractual, code and statutory requirements into design documents (Drawings / specifications).

Quality Assurance Group :- It will provide support in preparing quality work instructions for procurement, testing of materials, in process inspection testing and certification.

Procurement :- Materials and components are purchased as per the quality work instructions by purchase group from approved vendors through Third party inspection.

Certain components are manufactured through approved subcontractors. Quality group will provide necessary support in approving the vendors.

During manufacturing

Quality Assurance Group is authorised to establish QA systems, prepare QA manual, issue quality plan for products, testing procedures, conducting quality audits and review / resolution of non conformances during manufacture and field problems.

Operation and process control group (OP&C) will select and sequence the process and release process sheets (OPS) to achieve the quality and engineering requirements.

The maintenance of manufacturing facilities like machines, tools, handling equipment is done as per specified schedule to facilitate smooth and reliable working.

Plant laboratory work group provides in house support for mechanical, metallurgical, chemical testing include failure investigation.

Inspection & Testing during manufacture is done by quality control group. The responsibilities include.

* Stage inspection of product.

* Recording, reporting of product non conformances and ensuring up gradation / rejection of non conforming products.

* Certification of product quality records.

* Ensuring timely calibration of instruments and gauges.

Preservation handling, Storage and Shipping

These are very important for maintaining the quality level of a product during transportation and storage prior to erection and commissioning. This is ensured by laboratory, shipping and quality control groups in that order.

These objectives are met in the organisation through an integrated management approach involving cross functional working, which is support by company standardisation of formats for all major system related functions.

This is the commonly adopted system of quality in manufacturing concerns.

3.3   Software - An overview

Introduction

d BASE IV - a high powered relational data base manager for IBM PC and compatibles,

We can use - dBASE IV to create files that contain the necessary data. And we can display information in a format that best meets our needs with the various capabilities built into dBASE IV.

We can perform many tasks like.

-    Creating files to store your data.

-    Viewing and editing the data.

-    Selecting specific Information and producing reports.

within d BASE IV through the "control centre"

Creating a database to store our data, is a straight forward process. After choosing the create option from the data panel of the control centre. We define the name and types of fields which we use.   We can store a variety of different kinds of data with dBASE such as text, numeric values, dates and logical information.

We can also design custom forms to contain categories of data at desired locations along with borders or descriptive text.

The dBASE IV's Query can be used to extract subsets of data from the database.

The dBASE IV provides a report to get more detailed information from the database. It can be used to create a quick columnar - style report with no more than one function key combination. For any additional flexibility, we can use the powerful report generator built into dBASE IV to design custom reports in a format of our choice.

The dBASE IV has the capability to draw complex relationships between multiple database files. It is a most suitable one for any advance use. The macros of dbase IV are used for series of actions as if individual commands are entered at the key board for carrying out actions. Complex tasks are performed through programming.

* The center of any management information system is database, which is any collection of related information grouped together as a single entity.

    Although database management is a computer term, it can also apply to the ways in which information is catalogued, stored and used manually.

*   A database manager that draws information from different database files linked by one or more common fields is known as a "relational database manager".

*   dBASE IV lets anybody to carry out operations in one of two ways as follows.

★   By choosing the options from a detailed series of menus starting at a screen called the control center.

★   By typing in a series of commands at a screen prompt known as the 'dot prompt'.

History

dBASE II   - first popular database manager for micro computers.

dBASE III, III+, IV - having corrected every noticable complaint about early versions of dBASE by Ashton - Tate.

dBASE IV   - can handle one billion records and upto 255 fields / record

-    upto 4000 characters can be placed in a single character field.

-    upto 6400 characters can be placed in a memo field.

-    Can sort multiple fields and work with upto 99 fields at the same time.

Network Software Requirements

The network operating system, can be any of the following.

* Novell SFT Netware / 286 TTS version 2.10 or later.

* 3 com 3 plus share version 1.3.1

* Ungermann Bass Net one PC version 16.0

* IBM Token Ring Network with IBM PC LAN program version 1.2 or later.

* Any other Network configuration that is completely NET BIOS compatible with. DOS 3.1 or later and with the Network listed above.

Glossary Symbols & Conventions

1. All commands - are printed in uppercase, although you can enter them in either upper or lower case letters.

2. All parameters of the command are listed in Italics.

3. Any part of a command or parameters, that is surrounded by is optional.

4. When a slash separates two choices in a command as in **ON/OFF,** you specify one choice not both.

5. **[(.....)]** Ellipses following a parameter or command menu that the parameter or command can be repeated 'infinitely' that is until you exhaust the memory of the computer.

6. The parameter scopes which is always an option, can have three different meanings depending upon the command.

ALL   :   for all records

NEXT N   :   for N. no. of records, beginning at the current position of the Record pointer

RECORD   :   for only one record beginning at the current position of the record pointer

New features of dBASE - IV :

    *   The control center

    *   Structured Query Languages (SQL)

    *   Query By Example (QBE)

    *   Improved Applications Generator

    *   Revised Report and Label Generation Techniques.

    *   Improved Forms Design Screen

    *   Windows

*   User Defined Functions

*   New Loop Introduced

*   New Financial Function

*   Introducing Key Stroke Macros

*   Float - a new data type.

*   Improved Memo Field Handling

*   Improved Data Field Handling

*   Automatic Compilation of Programs.

3.4 Quality Improvement - Data Dependent

"To improve the Quality - Get into the habit of discussing a problem on the basis of data and reporting the facts as shown by them".

- Dr. Kaoru Ishikawa.

Data - is the collection of facts in terms of figures, which gives a clear picture of any work situation and allows for comparison.

A critical part of problem solving is the accurate collection of data. If the Quality members lack of the necessary information to analyse the problem, or if they obtain data that are not correct, it will be difficult to analyse and to progress forward and to agree upon a solution.

At different stages in Quality Improvement Process, data may be used for the followings.

* Help to identify the problems.

* Differentiate important factors from unimportant ones.

* Understand a situation.

* Identify causes.

* Evaluate alternatives.

* Analyse a likely cause.

*   Evaluate acceptance / rejection criteria for possible solutions.

*   Reach agreement of best solution.

Any Data collected by Quality men are Generally of five types.

*   Measurement data   - length, time, weight

*   Countable data   - no.of defects

*   Data of relative merits   - softness, accepted.

*   Data of sequence   - In the order of occurrence.

*   Data of grade points   - Very good, excellent.

When we decide to collect data, it is important to have a clear understanding of their purpose. Data collection requires the co-operation and support of others in the company. Being able to explain to others, will make the quality members work more effectively and will generate concern and involvement among those whom they consult.

Once the reasons for data collection have been clearly established, they should examine the task ahead of them and ask themselves the following questions.

*   How will the data be collected & measured?

*   How will the resulting information be displayed?

- We should remember to get everything into data.

The key to the solution is based on how one can collect data skillfully. The difference between good and poor group leader becomes evident here. The good leader takes pains to obtain data and often come up with unique methods.

From above we can easily understand the power of data. So through data, we can easily understand the most problematic area, which is the focus of this thesis.

CHART NO.: 9

WAYS TO QUALITY IMPROVEMENT

CONSERVATION OF

-MATERIAL
-ENERGY
- TIME
- POWER

INCREASE OF

-YIELD
-UTILITY
-REVENEW SOURCE
-SALE OF PRODUCT

RATIONALISATION OF

-WORK
-MATERIAL
-METHOD

SIMPLIFICATION OF

-PRACTICES
-PROCEDURES
-PROCESSES

QUALITY IMPROVEMENT

ECONOMY OF

-STATIONARY
-OFFICE
-FACILITIES
-ADMINISTRATION

REDUCTION OF

-COST
-WASTE
-SPILLAGE
-MAINTENANCE
-HEALTH HAZARD
-ACCIDENT INCIDENCE
-MATERIAL
-CONSUMPTION

ELIMINATION OF

-INEFFECTIVE TIME
-DELAYS
-INEFFECTIVE
 MOVEMENTS
-DUPLICATION

IMPROVEMENT OF

-PRODUCT\DESIGN
-MATERIAL HANDLING
-PUBLICITY
-WORKING CONDITION
-SYSTEM\PROCEDURE
-FACILITIES
-COMMUNICATION

4.1. Quality System under Focus (Quality data - Present Scenario)

The quality system which is commonly used in large manufacturing systems was discussed previously. But here the quality system based on product life cycle is focused for this study in the view of reducing defects.

Commonly in all manufacturing systems, the work starts with design, and proceeding with material, procurement, production, assembling, testing and packaging and servicing. Nowadays all the manufacturing systems are so particular about the customer's satisfaction. So they manufacture the product, keeping in mind the contractual requirements, functional aspects and serviceability to the satisfaction of the customers. Some of the products are assembled at workshop itself and some of the products are assembled at site depending on transportation constraints.

Products are manufactured in accordance with above specifications laid out by Engineering department and as per the relevant plots. Wherever deviations from these specifications occur at the workshop, they are recorded as Non Conformances Report (NCR). After despatch to the site, the deviations encountered during erection of the assemblies are recorded as Site Action Request (SAR). While commissioning the boiler, any discrepancies that occur are recorded as Commissioning Action Request (CAR) and the complaints directly obtained from the customers are accorded as Customer Complaints. (C.C.)

These are all the four types of data which are recorded in the Quality system under focus. Let us see the records in detail.

4.1.1. Non Conformance Report (NCR)

Any non conformance of the product components after production at the workshop are recorded as Non conformance Report (NCR). This record is made in a standard approved format.

This NCR is raised by the execution group who are called as initiators. Actually the Quality Assurance people called as planners and the workshop people are called as execution group.

In the non conformances, there are chances for two types of deviations. The dimensional deviations, for which, the NCR should get clearance from Quality Assurance Department. The second one is process deviations which they should get clearance from Engineering department. The process deviations are due to mistakes in production or due to bypassing the production sequence.

For each and every deviation, the execution group should give some suggestions as they are only working at workshop and they actually knows about the further use of product. Their suggestions help QA department to easily pick up the reason, otherwise they have to go and see through the process to pick up the reason. So initiator's suggestions are crucial.

The disposition must be accepted or accepted after reworking. Here they are not mostly going for 'rejection' because it is related with 'cost effective'. The rework comprises.

1. Make some changes in the component

2. Use the component in various parts.

3. Keeping the component as it is, and make changes in the connecting pieces.

By using the either one of above three ways, they are trying to use the defective component. The disposition should indicate the action of reworking and also in which procedure. Then it is sent to workshop and at the same time it is recorded for record purpose. If any contract requirements are there, then the dispositions should get third party clearance.

Thus the NCR comprises :

1. Identification details

2. Specification details

3. Basic requirements

4. Deviations

5. Initiator's recommendations.

6. Disposition details

7. Action completed.

These are all the details about Non Conformance report (NCR).

4.1.2. Site Action Request (SAR)

After despatching the components to the site, they are assembled. The components may be within the tolerance limit, but the assembled product may exceed the limit.

Let us the component of a shaft of length 2 meter with the tolerance limit of 0.5 mm. It is made of 5 components of 40 cm.

40.02cm   40.02.cm   40.02.cm   40.02cm   40.02 cm
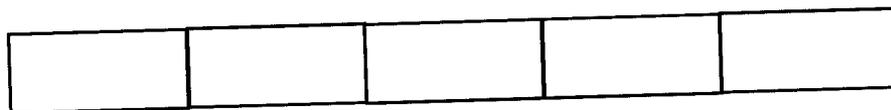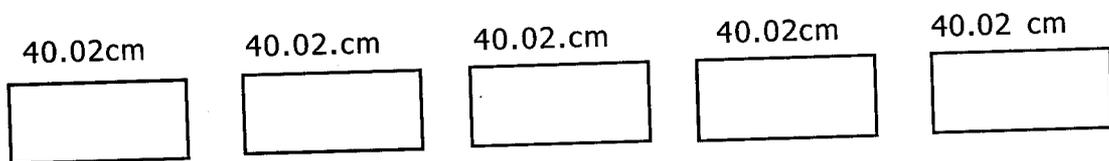
200.10.cm

obtained piece
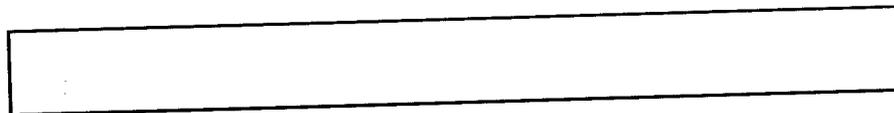
200.05 cm

required piece

In the above component the 5 components are within the tolerance limit. But when they assembled as a shaft it exceeded it's limit. If it is the case of small component, it is really a tough concept in complex parts. And also boiler is a huge product, which is of thousands of components. So the components are made separately at workshop and sent to site. There only they assembled and are erected. So packaging, transporting, distance, time duration weather, environment all are taking importants of being reasons of site errors.

Due to the above reasons, number of deviations occur at the site. For these deviations, they are raised as a format and the site people request the QA department to make an opt conclusion for that deviation. Since it is called as Site Action Request (SAR).

Here also the site engineers may give their own suggestions as they only know more about the site and use of that product. All the SAR are raised by site people to QA department for design problems, the SAR is sent to engineering department to manufacturing problem from QA. That is, the SARs are sent to QC, and for commercial issues. They are sent to commercial department and corresponding conclusions are made as per the site people's suggestion.

This record is also having an approved format which comprises of

1. Identification details

2. Specifications

3. Effect of problem on the activity.

4. Site Engineers suggestions

5. Disposition details

6. Action completed details

Due to more changes of defects, here numbers of defects are more. They are having around 2000 SAR records per year. The defects are separated into many groups under defect codes.

* C for Commercial problems

*   D for Design/engineering problems

*   M for Manufacturing problems

*   E for Executional problems

Another group under Agency

BH   -   Manufacturing

CM   -   Commercial

EE   -   for erection

PE   -   Engineering

SC   -   Sub contracting

SD   -   Sub delivery

SH   -   Shipping

and another group under Product Group code.

Product Group Directory

Product Group	Description
04.	Boiler Drum
05.	Waterwall Headers
06.	Waterwall Panels
07.	Circulation System Components
08.	Buckstays and Framing
09.	Seal Boxes

10.	Superheater Headers
11.	Superheater Coils and Walls
12.	Superheater Components
15.	Reheater Headers
16.	Reheater Coils and Walls
17.	Reheater Components
18.	Roof Skin Casing
19.	Economiser Headers, Coils and Components
20.	Soot Blowers
21.	Soot Bower and Soot Blowing system
22.	HP/LP Bypass System
24.	Boiler Integral Piping and Fittings
28.	Manholes and Furnace Openings
30.	Fixing Components for Main Boiler Lining and Insulation
31.	Boiler Skin Casing
32.	Fixing Components for Boiler Auxiliaries Insulation
33.	Lining and Insulation Materials
34.	Coal bunker structures
35.	Boiler Supporting Structure
36.	Galleries and Stairways
37.	Boiler Outer Casing
38.	Inter-Connecting Walkways

64.	Beater Mill
65.	Coal Feeders
66.	Coal Burners
67.	Mill Plant Auxiliaries
69.	Mech. Dust Collector
70.	EP with 2 Working Fields
71.	EP with 3 Working Fields
72.	EP with 3 Working Fields & a Dummy
73.	EP with 4 Working Fields
74.	EP with 4 Working Fields & a Dummy
75.	EP with 5 Working Fields
76.	EP with 5 Working Fields & a Dummy
77.	EP with 6 Working Fields
78.	EP with 7 Working Fields
79.	EP with 8 Working Fields
80.	External Pipelines
81.	Tanks & Vessels
85.	DIPC
87.	Chimney
88.	Misc. Jobbing Orders
89.	Galleries and Stairways for Dust Collector
95.	Boiler Fuel Firing Controls
96.	Boiler House Auxiliaries Control

| 97. | Boiler Instruments and Misc. Controls |
| 99. | Lifting Tackles |

NUCLEAR

90.	Pressurised Light Water System
91.	Boiler Water System
92.	Fast Breeder System
93.	Pressurised heavy Water System

NEW PRODUCTS

PV.	Pressure Vessels
HE	Heal Exchangers
ST.	Studed tubes & pipes

Thus SAR details are kept as record.

4.1.3. Commissioning Action Request (CAR)

Being customer oriented market, all manufacturing concerns are so particular about customers opinion and they made attempts to prove their product performance. So they are at customer's place at the trial round. [Commissioning is nothing but making the product to run at/work at maximum load]. If they are finding any functional or non functional defects they immediately make the record. These defects are of two types. Some defects are simple and the site engineers are having the power to take immediate measures to correct the defect. Some are in need of concern's help. Whatever may be the defect the record is sent to the quality department.

After commissioning, if found any defects, the site engineers request the Field Engineering Service Department people to make corresponding disposition. So that it is named as Commissioning Action Request.

This consists of :

*   Identification details

*   Defect details

*   Site Engineers Suggestions

*   Disposition details

*   CAR action completion details

This record is kept with FES dept.

This is the third stage of Quality recording.

4.1.4. Customer Complaints (CC)

This is made by the consumers at everywhere of product service life. If they find any inconvenience with the product, they can very well sent their requests in any format. That is kept as a record. It may be of any type that, requires

* Only clarification

* Needs of Engineering Analysis

* Needs of material supply

* Needs of component replacement

* Needs of some repairing work

For the first three records, each concern is having their own standard name and format and the fourth one can be at any form of letters, calls, far or e-mail to the quality department according to the problem. It is analysed and corresponding conclusion is made by the corresponding engineers like design, production, material through quality engineer.

The important detail to be furnished here is Activity code. It is nothing but the activity indication to which the complaints focus for. There are 5 codes. EA, SW, MS, GP, CL.

EA : Engineering Analysis

Sometimes the function of boiler is interrupted or disturbed or function of various components are failed. But the reason of the failure cannot be traced out. And also the site engineers are having the doubt of fixing the problem region. For that kind of problem, all the Branch engineers all called for analysis and discussion held with them and the reply is made.

SW : Site Work

After receiving the customer complaints, the FES people analyse it and send disposition to the customers to do corrective action by the site Engineers or as per their dispositions. Only miner faults that can be corrected by site engineers.

MS : Material Supply

The customer complaints about the faults due to fault material, design and manufacturing methods. So for this type of complaints the company has to bear the loss due to that fault. For this type of complaints, they supply the material/components and erect it and make it to function at free cost.

GP : Generic problems

Complaints of some common defects. For the same type of products, a defect comes more than three times, means it is coming under genetic problems.

CL : Clarification

These types of complaints requires only replies i.e., and only 'Yes' or 'No' answers. Sometimes "an explanation".

Nothing more than that.

This is the fourth stage of Quality recording.

Of course the quality improvement or quality system comprises on the whole Management action, to improve the product quality, only the quality system of a product life cycle which covers the four above data is focussed.

4.2 Need for Integration

The quality journey of BHEL, Tiruchirappalli, now continues with Six Sigma Quality Programme.

In today's competitive business environment, focusing on the customer is absolutely essential for the business growth and prosperity. If we are not able to satisfy all the stated and implied needs of the customers with respect to quality, price and delivery, we will not be able to survive in the market. Closely inked to the idea of customer satisfaction is the concept of operational excellence which means embracing change and reaching out for new and higher standards of performance. This has become a fundamental requirement in any field of business.

Six sigma Quality Programme is defined as a customer-oriented, structured, systematic, pro-active and quantitative company-wide approach for continuous improvement of manufacturing services, engineering, suppliers and other business processes. It measures the degree to which the process deviates from the goals and then takes efforts to improve the process to achieve total customer satisfaction.

The goal of a six sigma programme is two-fold :

1. To improve the customer (internal as well as external) satisfaction by reducing and eliminating gaps/defects.

2. To continuously improve processes throughout the organisation, thereby reducing sources of variation and improving quality and productivity.

For this, they first should know about the number of defects and the defect trends. But at present the defects are recorded as data at four various stages in various four department.

In a large manufacturing concern :

* Product Non Conformance record is kept with Quality Control Department.

* Assembly action report is kept with Quality Assurance Department.

* Trial round record is kept with Field Engineering Department.

* Customer's complaints are kept with commercial department.

All the four data are currently processed at different data base and they are not integrated. So to know about the defect trend of product at various stage the four data should be integrated.

4.3 Scope of Integration

The four type of data and their purpose are discussed above. The records are made and kept in various departments for their own purpose. If they are having the integration of above four records.

* They can know about the defect trends productwise.

* They can be able to know the critical areas for improvement. (i.e. the Product area when most discrepancies occur)

* They can identify crucial defects and eliminate them.

* They can be able to know the product which is having

    - More number of defects

    - More area of defects.

* They can be able to pick up the defect that come into customer's knowledge and its relative defects in various area to priorities their preventive measures.

These are all the scopes which are having impact on continuous product quality improvement program.

* Easy processing

* Easy Analysis

are the immediate expected scope of data integration.

Chapter - 5

Quality Data Integration

QUALITY DATA INTEGRATION (QDI)

5.1 Data base creation

To integrate the four types of data, at first one should have a common type of data base structure. For creating a database first we should give the name as field name and we have to specify the corresponding field type, width decimal and index also.

Field name

A field name can be up to 10 character in length, must start with an alphabetical character, and may contain numbers or underscores. No spaces are permitted within a field name. The field name should identify the contents as clearly as possible to make it easy to remember.

Field type : The type can be

C - Character   M - Name

D - Date   F/N - Numeric

L - Logical

N for Binary coded decimal type numeric field. F to floating point numerical field.

Width

The width of field are

character	-	upto 254 character
Date	-	8
Logical	-	1
Memo	-	Upto 512,000 (the database file only indicates 10 bytes)
Number	-	Upto 20 (including the decimal point and sign).

Dec

We can specify the number of decimal places contained in a numeric type field.

Index

This setting is either Yes or No. Y creates a 'tag' used by a multiple index file.

The CREATE command is the first command which automatically puts new database in use. With it we can assign a file name and the structure of a new database.

Operation

1. Type "CREATE MEMBERS" and press RETURN

2. Create the database structure by typing the field, type, width, decimal and index details.

3. Press 'RETURN' twice to confirm your entries.

4. Type Y in response to the 'Input data records now ? "Prompt and enter the data. To enter text into a memo field position the cursor, press control home, type text and press control end to redisplay the entry - mask.

5. Press control - End.

6. Close the database file by typing 'CLOSE ALL' and Return.

Thus different database are created for the four data in such a way that having same type of structure. According to the data and its details the number of fields will differ.

The database are created not only the purpose of integration and for other office uses also. So the database should contained with all the details. The field details are given below for four various data.

No of records

NCR -> 1440 records

SAR 92, 93, 94, 95 96, 97, 98, 99 -> 8000 records

CAR -> 750 records
(96-99)

CC -> 100 records

58

Available fields & Needed fields for integration :

Non Conformance Report :

Fields :

1.	NAME	-	Name of the concern officer
2.	SHOP	-	Shop number
3.	SLNO	-	Serial number
4.	YEARS	-	Year of Complaint
5.	PCMNO	-	Product committee meeting number
6.	RECDT	-	Receiving date
7.	FWDT	-	Forwarding date
8.	FWTO	-	Department to which the record is forwarding
9.	**WO**	-	**Work order number**
10.	PGMA	-	Product group and manufacturing assembly
11.	DU-PART	-	Dispatchable unit parts
12.	**PRODUCT**	-	**Name of the Product**
13.	**ITEM**	-	**Defective item of the product**
14.	**CHARECTER**	-	**Defective charecter / Parameter**
15.	**DEVIATION**	-	**Deviation in terms of more / less**
16.	PROCESS	-	Machining / Fabrication
17.	TYPE	-	Type of defect (sporadic / chronic)
18.	DEFCODE	-	Defect code
19.	STATUS	-	Acceptable / Rejectable
20.	DISPDT	-	Disposition date
21.	REMARK	-	Remark about the defect
22.	INDNAME	-	Intendor name
23.	COUNT	-	One
24.	AREA	-	Area concern with defective part
25.	DELAY	-	Delay in terms of days

Site action request :

Fields :

1.	SCNO	-	Serial Number of the record
2.	**PROJ**	-	**Name of the project**
3.	SRNO	-	SAR number
4.	SRDT	-	SAR date
5.	BAND	-	Duration code
6.	CUSTNO	-	Customer Identification Number
7.	PCM AREA	-	Product manufacturing area
8.	RECDT	-	Sar receiving date
9.	**PGMA**	-	**Product group and manufacturing assembly**
10.	DISPDT	-	Disposition date
11.	DU	-	Dispatchable unit
12.	**AGENCY**	-	**Name of agency**
13.	AGCODE	-	Agency Code
14.	PCMNO	-	Product number
15.	COST	-	Cost of the product
16.	**DEFCODE**	-	**Defect code**
17.	**DISCRP**	-	**Description**
18.	**DISPOS**	-	**Disposition**
19.	SENDT	-	SAR sending date
20.	SENTO	-	The department to which the SAR send to
21.	GOTBACK	-	The date of receiving back
22.	REGULARISE	-	Receiving back or not
23.	COUNT	-	One
24.	MBAND	-	Code of manufacturing duration
25.	DELAY	-	Number of days of delay
26.	PG	-	Product group
27.	SARDT	-	Date of record

Commissioning action request :

Fields :

1. SLNO   -   Serial number if records

2. FESNO   -   Fes Number

3. FESDT   -   Fes date

4. CARNO   -   CAR number

5. CARDT   -   CAR date

6. CARNAT   -   CAR nature

7. **PROB-REP**   -   **Problem reported**

8. CO-ORDR   -   Co-ordinator

9. **PROJ-UNIT**   -   **Name of the project unit**

10. **PGMA**   -   **Product group and manufacturing assembly**

11. **DISPDET**   -   **Disposition details**

12. DISPDEPT   -   Disposition department

13. DISPDT   -   Disposition date

14. CATERGORY -   CAR category

15. STATUS   -   C/C1 (Partial / Fully completed)

Customer complaint :

Fields :

1.	**NO**	- **Serial number of customer complaints**
2.	COMP-NO	- Component Number
3.	**CUSTOMER**	- **Name of the customer or Project**
4.	DATE	- Date of CC
5.	REG	- Date of Registration
6.	**NATURE-OF**	- **Nature of complaints**
7.	CD	- Code
8.	**INVESTIGATION**	- **Analysis of the problems**
9.	**CORRECTIVE**	- **Disposition details**
10.	PH1-CLOSED	- Date of Phase 1 Closed
11.	PH2-CLOSED	- Date of Phase 2 Closed
12.	REMARKS	- Remarks about problem

5.2 Report Formation

Actually the data base is created with all the details which are all not needed for our further work. We are going to integrate all the four type of data in the view of defect analysis, ie, in the view of reduction of defects. So to have the project name, Identification no, (ie, customer no or work order no) defect details and disposition details is enough for our integration. To get this particular field details in a particular manner, we can design a report format for each type of data.

Report form files are created and modified with the CREATE or MODIFY REPORT command. Reports display or print selected database fields which and where we want them they also place information on numbered pages and performs arithmetic and statistical calculations.

The MODIFY REPORT command is a fast way to create standard reports. The quick layout option is extremely powerful, in that it gives you an instant report in either horizontal or vertical format. The design work surface shows you precisely where descriptive lables and fields are positioned. The editing features let you move labels and fields, draw lines and boxes and vary headings page numbers and booters.

Once a report is designed, the control file is saved and can be used as often as necessary. Remember that you can use reports in conjunction with view files, which select the database fields and the order in which they are displayed.

The REPORT FORM command is used to access report form files. The optional forms of the command let us add information to out heading, print selective records or output the report to either the printer or a file on demand.

There are 5 bands in the work surface.

Band 1: Page header - shows what appear at the top of each page such as column headings.

Band 2: Report Intro - Information that appears once at the beginning of the report.

Band 3: Detail - Information displayed in the body of the report ; generally titles, database fields and calculated values.

Band 4: Report Summary - Information displayed at the bottom of the report.

Band 5: Page Footer - Information that appears at the bottom of each page.

Operation

1. Type USE (FILE NAME) and press RETURN.

2. Type MODIFY REPORT <NAME>. and press RETURN (the work surface will be displayed).

3. Press Alt-L and select the form layout.

4. Press Alt-F and go and select the field and fix the details like template, description, operations and vertically stretched format and press Ctrl - END to save the above details.

5. Continue the step 4 for the needed fields.

6. Press Alt - E to save this report form.

Thus report is created for four various data. This case easily be understood by the flow chart.

CHART NO.: 7.a.

FLOW CHART FOR REPORT FORMATING

```
┌─────────────────────────────┐
│     USE A PARTICULAR FILE    │
└─────────────────────────────┘
               │
               ▼
┌─────────────────────────────┐
│  OPEN A EMPTY REPORT FORM\FILE │
└─────────────────────────────┘
               │
               ▼
┌─────────────────────────────┐
│       ENTER INTO PAGE        │
│        HEADER BAND           │
└─────────────────────────────┘
```

```
┌──────────────┐    ┌──────────────┐    ┌────────────────────┐
│  SET PAGE    │    │   SET DATE   │    │ SELECT ONLY NEEDED │
│  NUMBER      │    │              │    │  FIELDS & TYPE IT  │
└──────────────┘    └──────────────┘    └────────────────────┘
       │                    │                      │
       └────────────┐       ▼       ┌──────────────┘
                    ▼               ▼
          ┌─────────────────────────────┐
          │      ENTER INTO REPORT       │
          │     INTRODUCTION FORM        │
          └─────────────────────────────┘
                         │
                         ▼
          ┌─────────────────────────────┐
          │  TYPE THE INTRODUCTION PART  │
          │       OF THE REPORT          │
          └─────────────────────────────┘
                         │
                         ▼
          ┌─────────────────────────────┐
          │      ENTER INTO REPORT       │
          │        DETAIL BAND           │
          └─────────────────────────────┘
                         │
                         ▼
          ┌─────────────────────────────┐
          │     FIX FIELD DETAILS WITH   │
          │  REQUIRED LENGTH & STRETCH   │
          └─────────────────────────────┘
                         │
                         ▼
                       ■■■
```
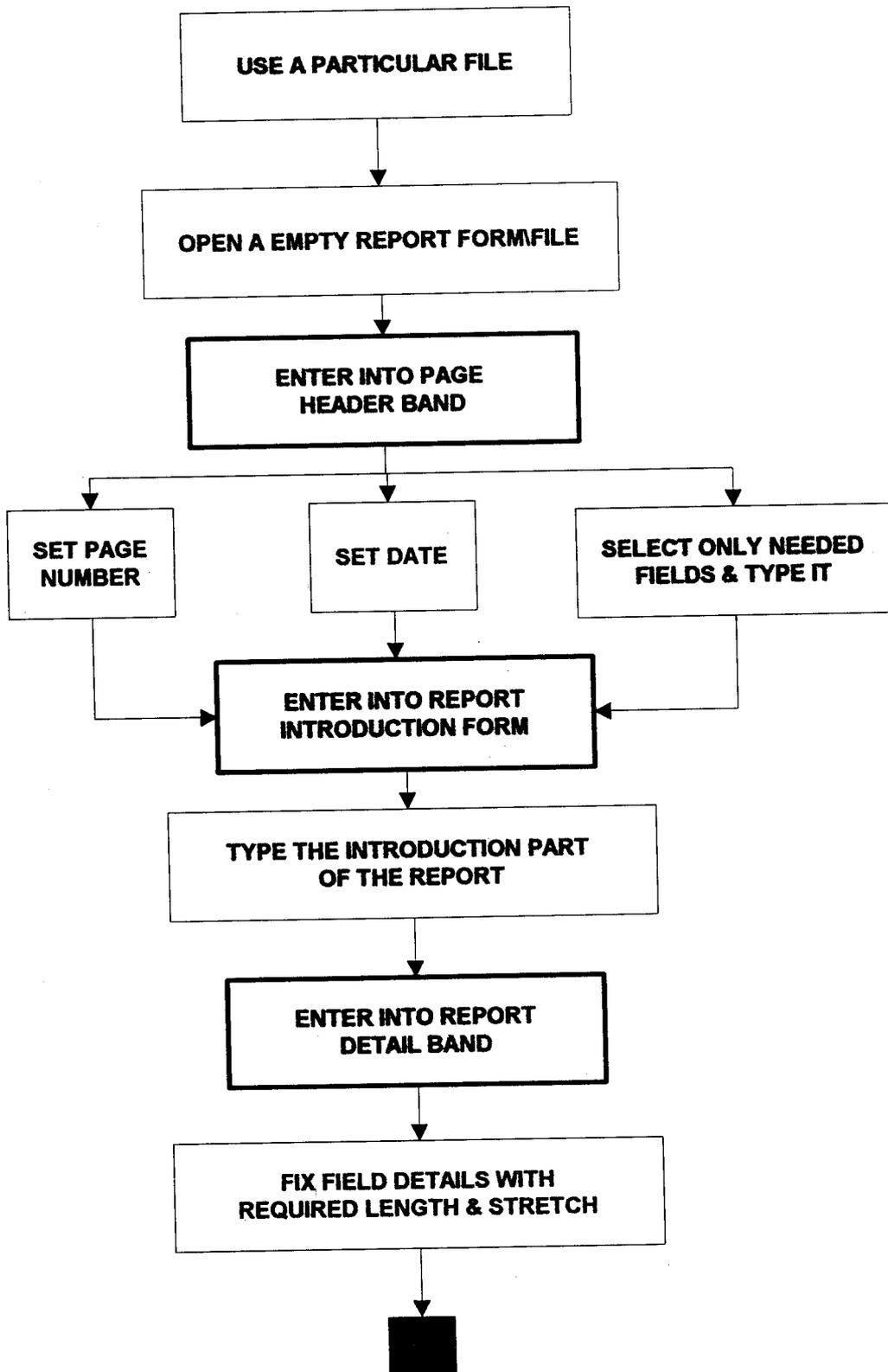
CHART NO.: 7.b.

FLOW CHART FOR REPORT FORMATING

```
        ┌────┐
        │████│
        └────┘
          │
          ▼
  ┌──────────────────┐
  │ ENTER INTO REPORT│
  │   SUMMARY BAND   │
  └──────────────────┘
          │
          ▼
  ┌──────────────────────┐
  │ TYPE THE SUMMARY PART│
  │    WHICH SHOULD BE    │
  │   AFTER THE REPORT    │
  └──────────────────────┘
          │
          ▼
  ┌──────────────────┐
  │  ENTER INTO PAGE │
  │   FOOTER BAND    │
  └──────────────────┘
          │
          ▼
  ┌──────────────────────┐
  │ DESIGN THE PAGE FOOTER│
  └──────────────────────┘
          │
          ▼
  ┌──────────────────┐
  │ GIVE NAME TO THE │
  │   REPORT FORM    │
  └──────────────────┘
          │
          ▼
  ┌──────────────────────┐
  │ SAVE THE REPORT FORM │
  └──────────────────────┘
```
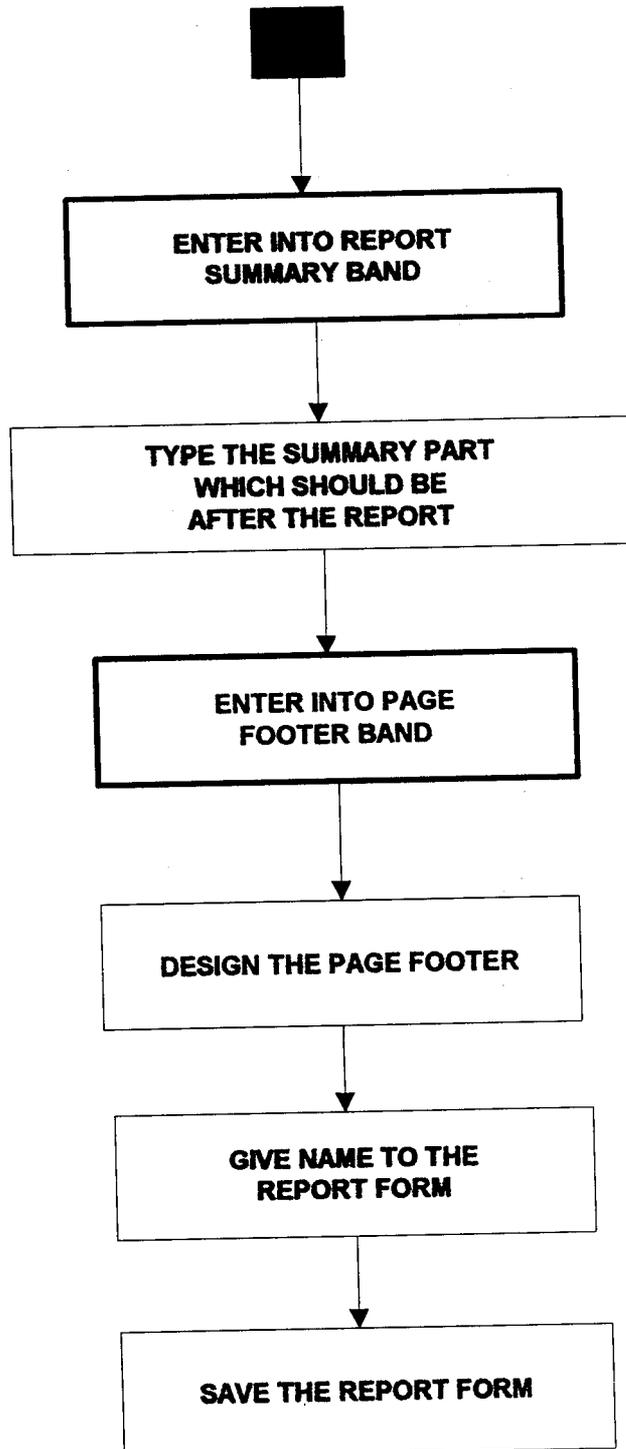
5.3 Programming

The data base and the report formats are designed and created for the said types of quality data. The programs are to be written to analyse the various data to have an idea about the quality problems. The flowcharts and programs are self explanatory.

Algorithm

1. Set all the needed facilities.

2. Open the source file.

3. Create a new file and copy the source file structure on it.

4. Get the input

    *   Work order no

    *   Project name

5. Collect all the data form various files according to the input and store them into a new file.

6. Connect the corresponding report form to the new file and to display it or to print.

7. Repeat stop 2 to 6 for four various data. The thing is the input of NCR data is work order no and for other data such as project.

These are the programming steps for integration. It will give the four various records with needed details only for the given input serially.

CHART NO.: 2

FLOW CHART FOR NCR PROGRAMMING

```
         ┌─────────────────────┐
         │   SELECT ONE FILE    │
         └─────────────────────┘
                    │
                    ▼
         ┌─────────────────────┐
         │  WRITE REPORT FORM   │
         └─────────────────────┘
                    │
                    ▼
         ┌─────────────────────┐
         │  COPY THE SELECTED FILE │
         │  STRUCTURE TO A NEW FILE │
         └─────────────────────┘
                    │
                    ▼
  ┌──────────────────────────────────────────────┐
  │ GATHER ALL THE RECORDS FROM THE SOURCE FILE TO THE │
  │   NEW FILE FOR THE GIVEN PARTICULAR WORK ORDER │
  │                    NUMBER                      │
  └──────────────────────────────────────────────┘
                    │
                    ▼
         ┌─────────────────────┐
         │  SAVE THE NEW FILE   │
         └─────────────────────┘
                    │
                    ▼
         ┌─────────────────────┐
         │   USE REPORT FORM    │
         └─────────────────────┘
                    │
                    ▼
         ┌─────────────────────┐
         │ GIVE PRINT COMMAND   │
         └─────────────────────┘
```
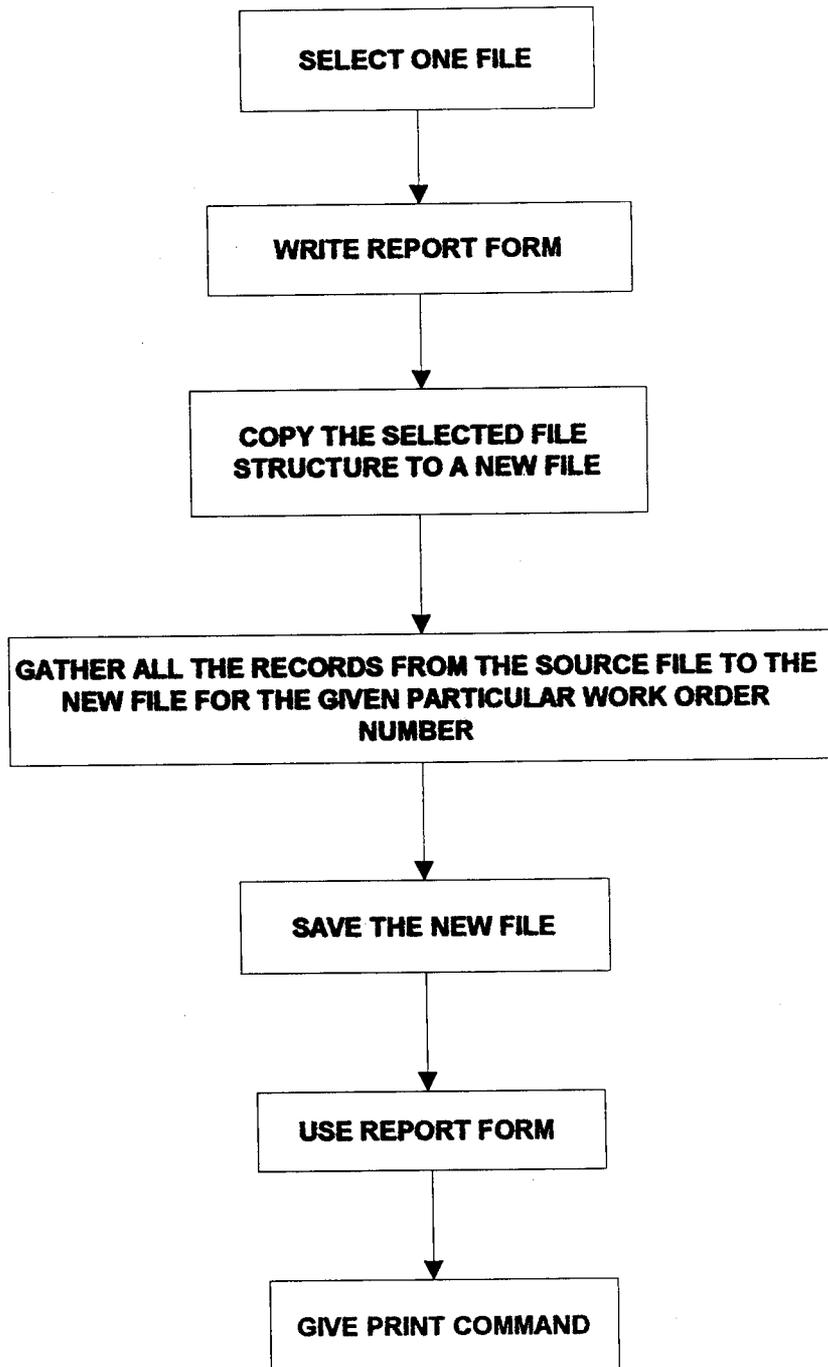
CHART NO.: 3

FLOW CHART FOR SAR PROGRAMMING

```
           ┌─────────────────────────┐
           │     SELECT ONE FILE      │
           └────────────┬────────────┘
                        │
                        ▼
           ┌─────────────────────────┐
           │    WRITE REPORT FORM     │
           └────────────┬────────────┘
                        │
                        ▼
           ┌─────────────────────────┐
           │   COPY THE SELECTED FILE │
           │  STRUCTURE TO A NEW FILE │
           └────────────┬────────────┘
                        │
                        ▼
   ┌─────────────────────────────────────────────┐
   │ GATHER ALL THE RECORDS FROM  VARIOUS FILES TO THE │
   │  NEW FILE FOR THE GIVEN PARTICULAR PROJECT NAME   │
   └────────────────────┬────────────────────────┘
                        │
                        ▼
           ┌─────────────────────────┐
           │    SAVE THE NEW FILE     │
           └────────────┬────────────┘
                        │
                        ▼
           ┌─────────────────────────┐
           │     USE REPORT FORM      │
           └────────────┬────────────┘
                        │
                        ▼
           ┌─────────────────────────┐
           │    GIVE PRINT COMMAND    │
           └─────────────────────────┘
```
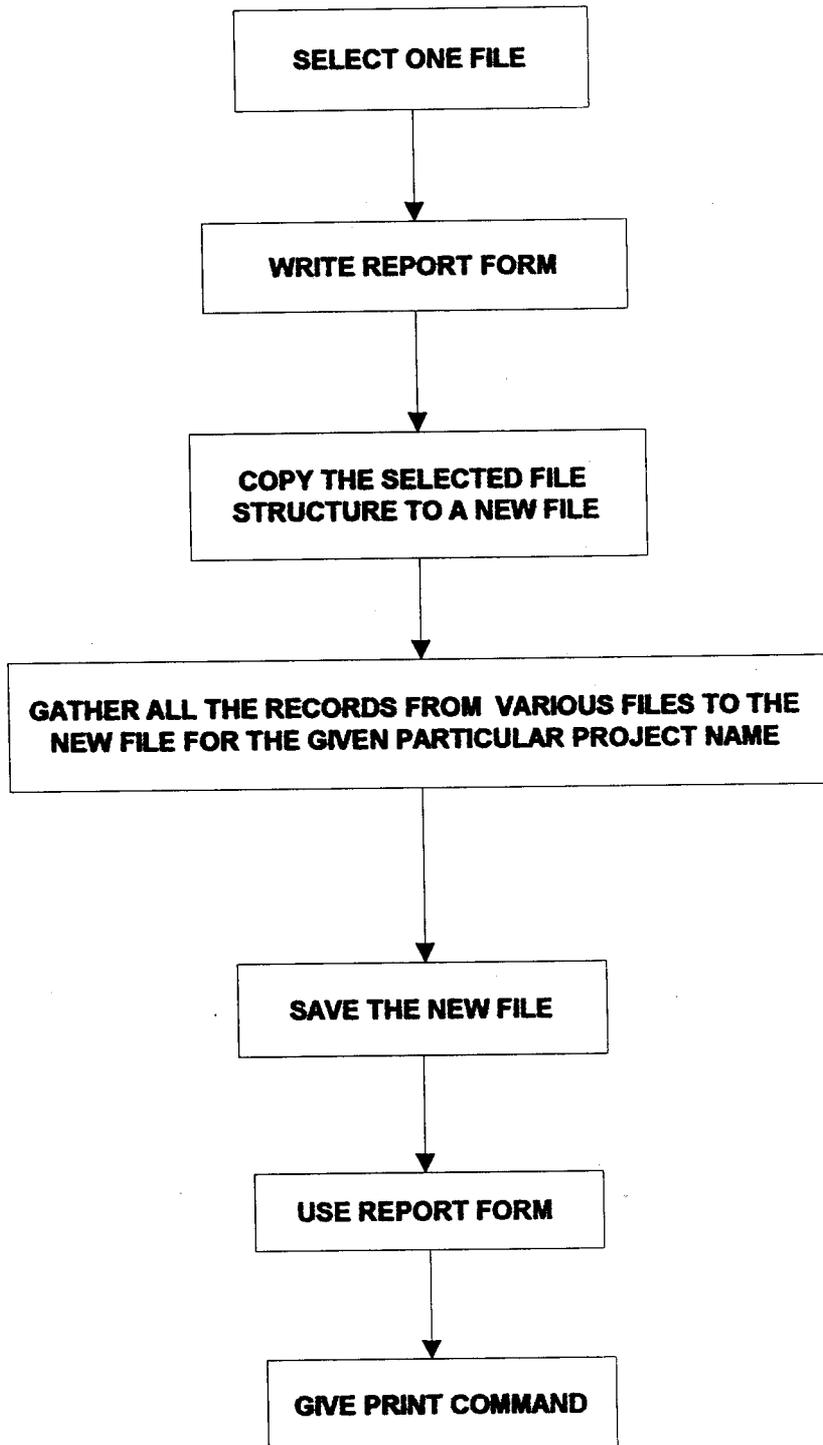
CHART NO.: 4

FLOW CHART FOR CAR PROGRAMMING

```
┌─────────────────────────┐
│     SELECT ONE FILE      │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│    WRITE REPORT FORM     │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│   COPY THE SELECTED FILE │
│  STRUCTURE TO A NEW FILE │
└─────────────────────────┘
             │
             ▼
┌────────────────────────────────────────────────────┐
│ GATHER ALL THE RECORDS FROM VARIOUS FILES TO THE     │
│ NEW FILE FOR THE GIVEN PARTICULAR PROJECT NAME       │
└────────────────────────────────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│    SAVE THE NEW FILE     │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│     USE REPORT FORM      │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│    GIVE PRINT COMMAND    │
└─────────────────────────┘
```
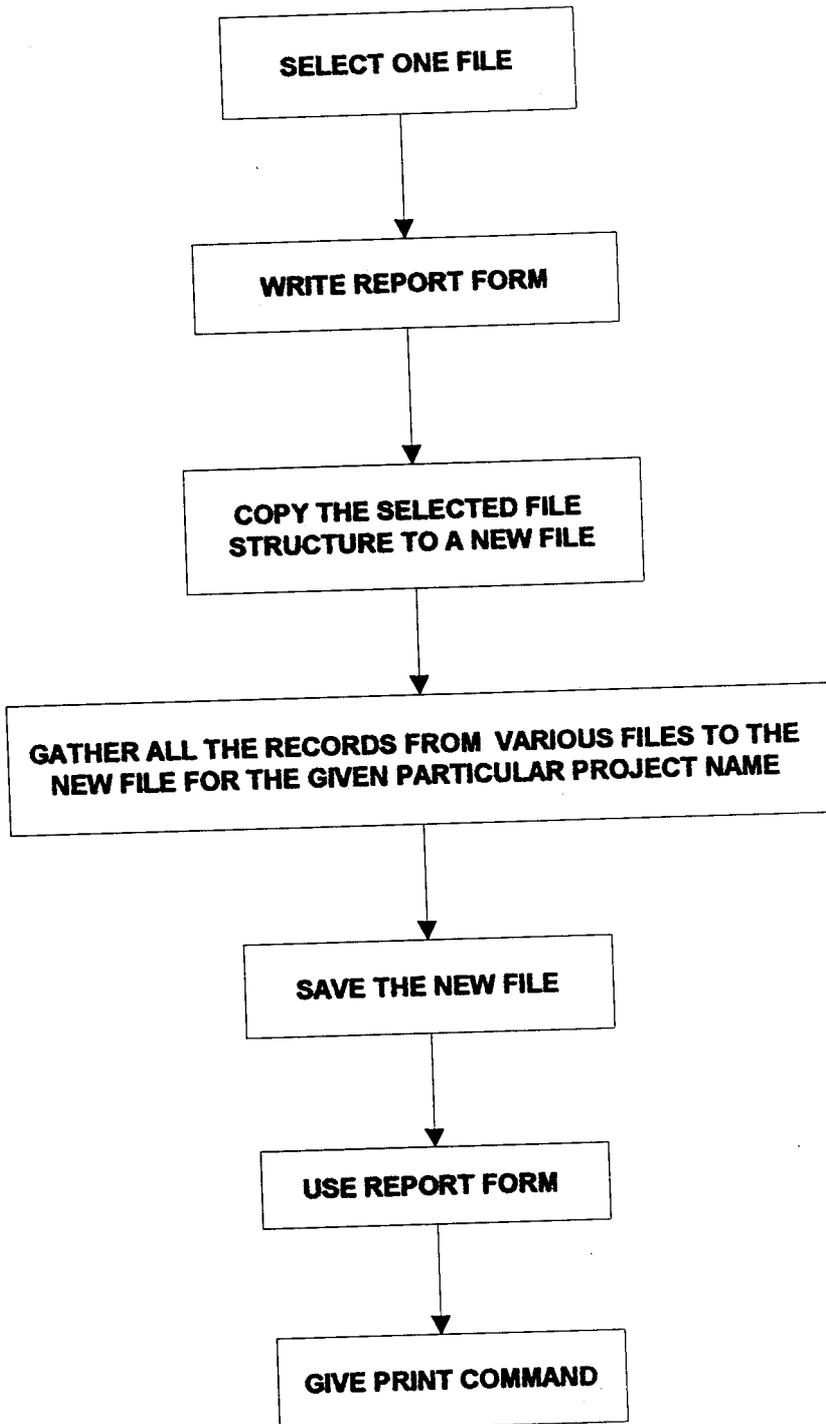
CHART NO.: 5

FLOW CHART FOR CC PROGRAMMING

```
┌─────────────────────────┐
│     SELECT ONE FILE      │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│    WRITE REPORT FORM     │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│   COPY THE SELECTED FILE │
│  STRUCTURE TO A NEW FILE │
└─────────────────────────┘
             │
             ▼
┌──────────────────────────────────────────────────┐
│ GATHER ALL THE RECORDS FROM VARIOUS FILES TO THE   │
│ NEW FILE FOR THE GIVEN PARTICULAR PROJECT NAME     │
└──────────────────────────────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│     SAVE THE NEW FILE    │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│     USE REPORT FORM      │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│    GIVE PRINT COMMAND    │
└─────────────────────────┘
```
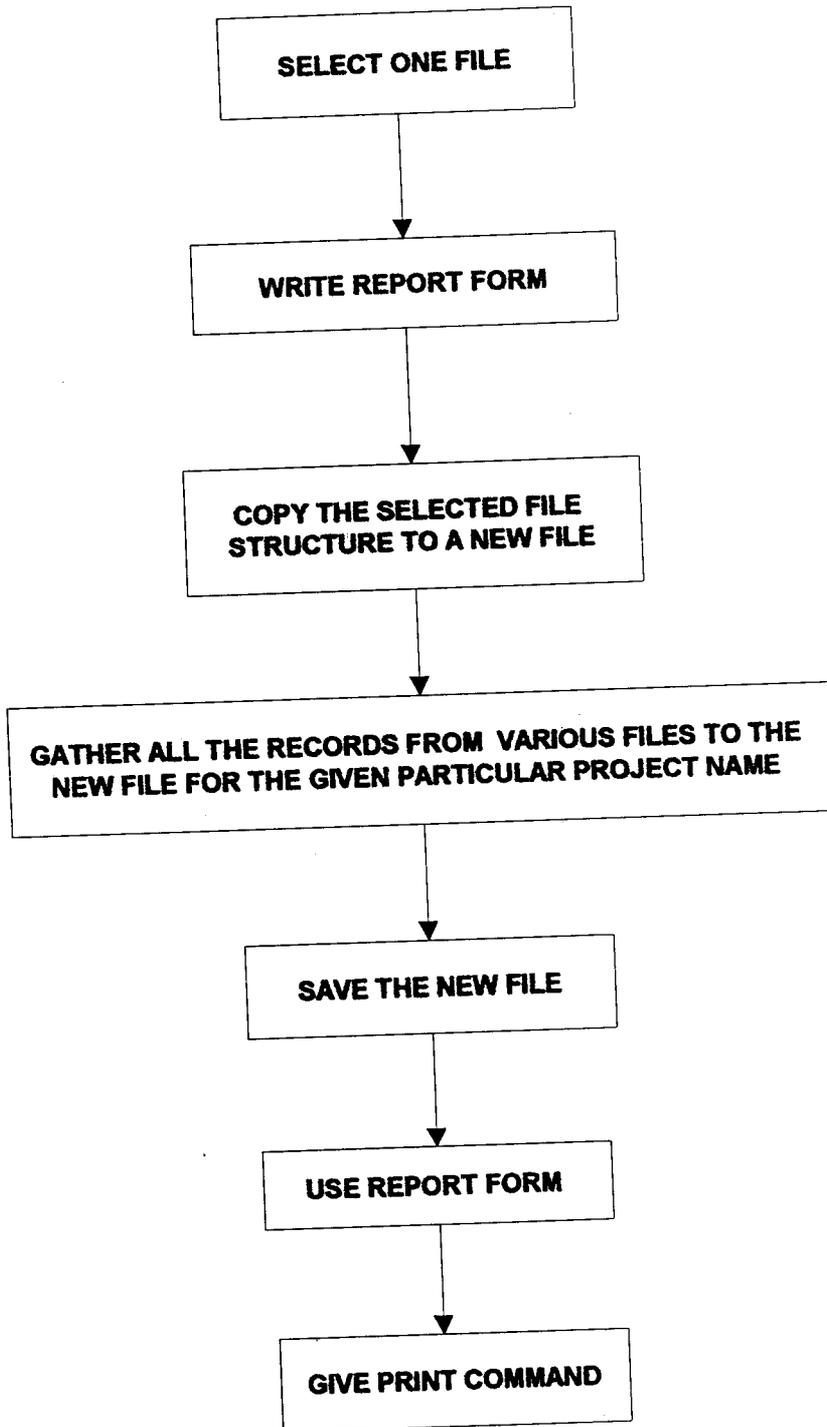
CHART NO.: 6

FLOW CHART FOR QUALITY DATA INTEGRATION

```
GET DATA FROM VARIOUS DEPARTMENT
```
↓
```
CHANGE DATA TO D-BASE FORM
```
↓
```
WRITE SEPARATE REPORT FORMS
TO VARIOUS DATA
FOR NEEDED FIELDS
```
↓

| NCR | SAR | CAR | CC |

↓
```
WRITE PROGRAM TO GATHER DETAILS FROM
VARIOUS FILES AS PER....
( BY ADDING REPORT FORMS ALSO )
```
↓

| (FOR NCR)
WORK
ORDER NO. | (FOR SAR)
PROJECT
NAME | (FOR CAR)
PROJECT
NAME | (FOR CC)
PROJECT
NAME |

↓
```
CONNECTING ALL PROGRAMS TO ONE
PROGRAM
```
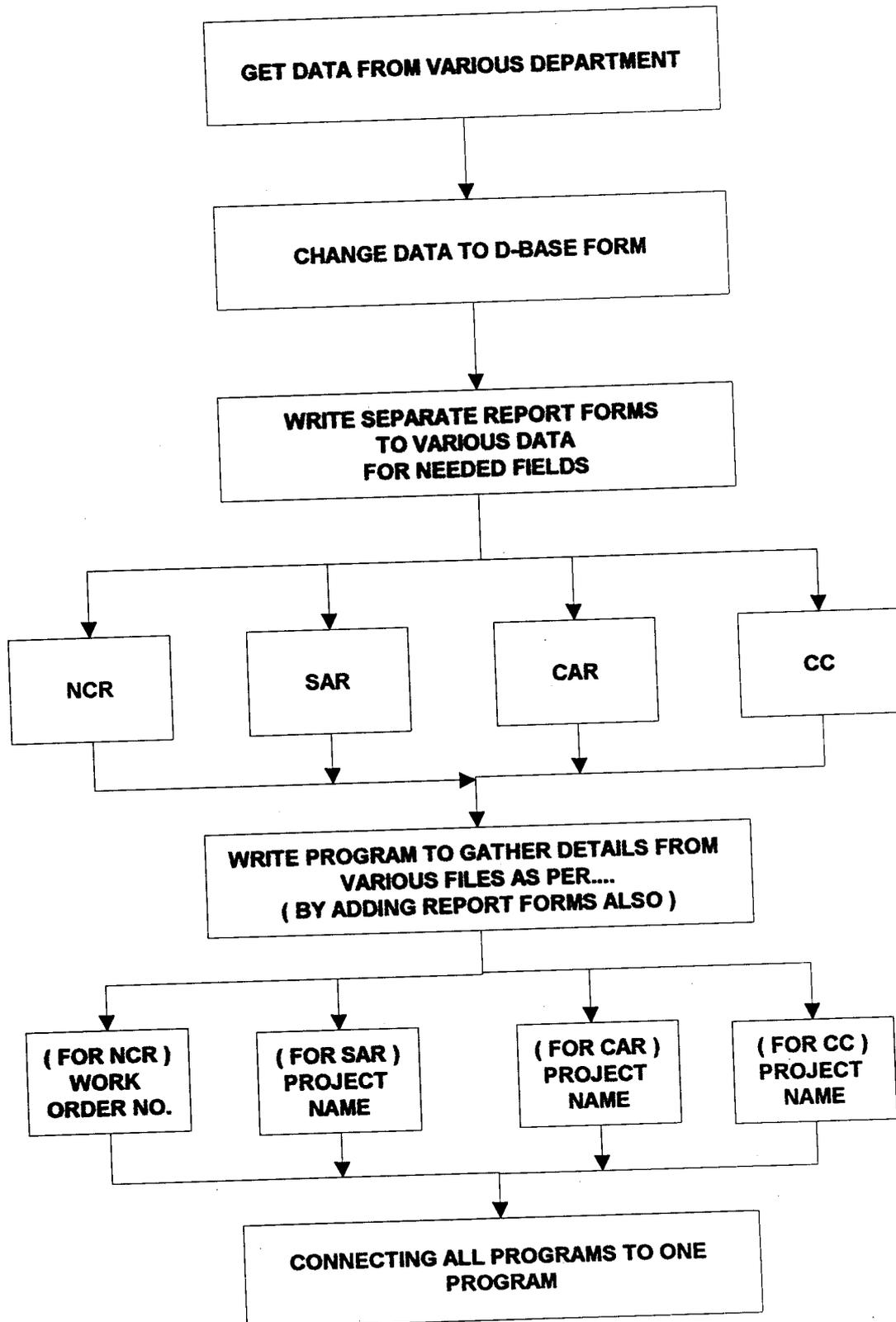
4.3.2   Prioritising the problem area

This will come under defect analysis part. Defect analysis once done in the SAR records because the no of records are much in this field.

Here we are going to pick up problem area under three different categories.

1. Defect code wise

2. Agency wise

3. PGMA wise

Defect wise we are having 4 defect codes. C, D, E, F. C for Commercially buying materials or parts from suppliers, D for Design, E for Engineering, F for Fabrication. Here the segregation is performed in such away that which defect is due to which cause.

Agency wise we are having 7 agencies

Agency	Agency code
Manufacturing	BH
Commercial	CM
Erection	EE
Engineering	PE
Sub contracting	SC
Sub delivery	SD
Shipping	SH

Here the count is taken in such away that how many defects under each agency.

PGMA is nothing but product group and manufacturing assembly code. This is of 5 digits from 00000 to 99999. So we have made is to ten different segregations like

1. $00000 <x< 10000$

2. $10000 <x< 20000$

3. $20000 <x< 30000$

4. $30000 <x< 40000$

5. $40000 <x< 50000$

6. $50000 <x< 60000$

7. $60000 <x< 70000$

8. $70000 <x< 80000$

9. $80000 <x< 90000$

10. $90000 <x< 99999$

Here we are going to priorities the problem area under three categories. So we have to write 3 programs. The algorithm is same, but the category under segregation differs.

Algorithm :

1. Set details

2. Create a new file

3. Open a source file and copy the structure to new one.

4. Get the input is project name.

CHART NO. : 8.a.

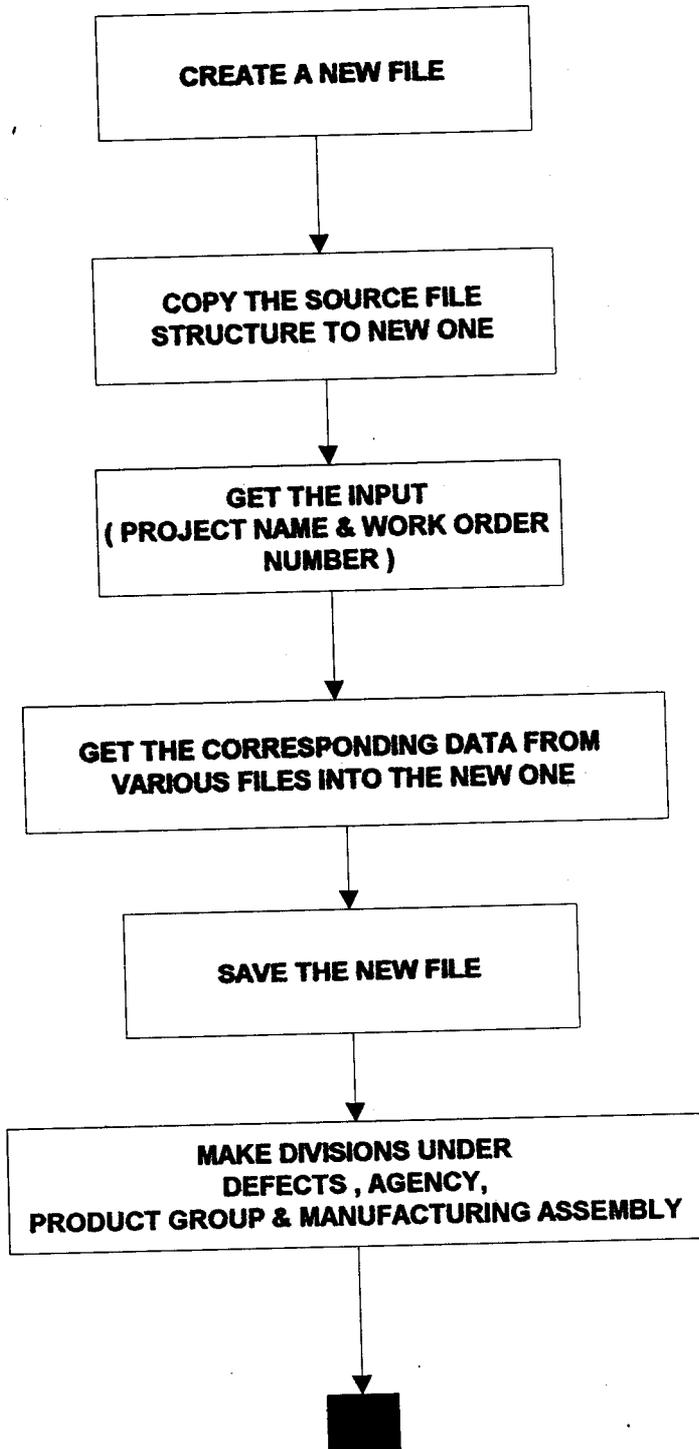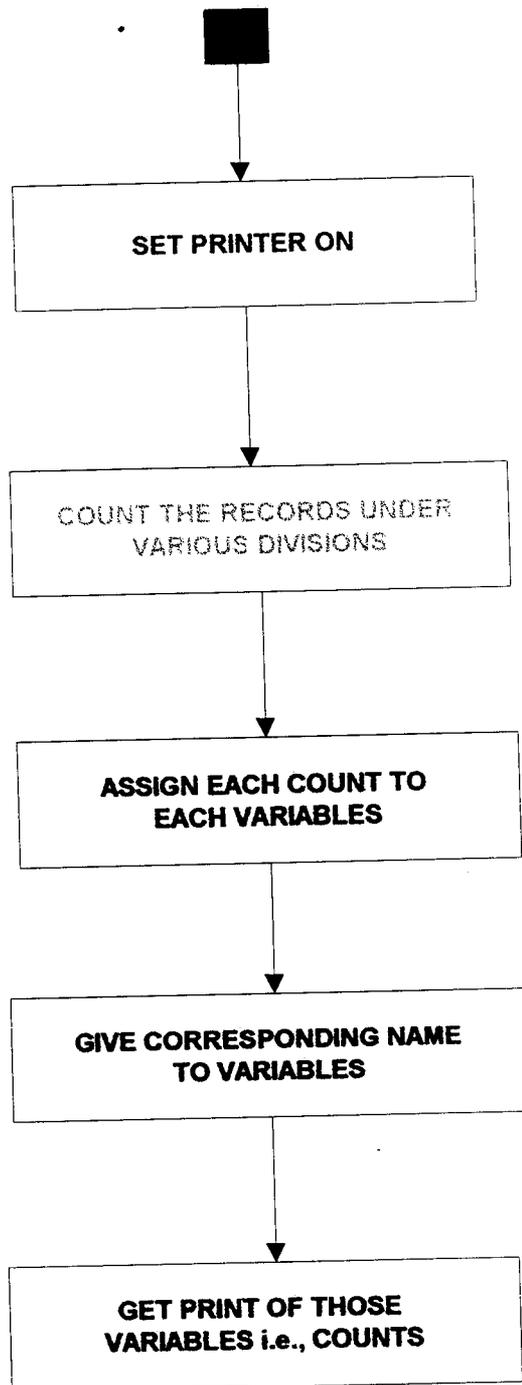## FLOW CHART FOR PROBLEM PRIORITISING.

```
┌─────────────────────────────┐
│      CREATE A NEW FILE       │
└─────────────────────────────┘
               │
               ▼
┌─────────────────────────────┐
│     COPY THE SOURCE FILE     │
│     STRUCTURE TO NEW ONE     │
└─────────────────────────────┘
               │
               ▼
┌─────────────────────────────┐
│        GET THE INPUT         │
│ ( PROJECT NAME & WORK ORDER  │
│           NUMBER )           │
└─────────────────────────────┘
               │
               ▼
┌─────────────────────────────────┐
│  GET THE CORRESPONDING DATA FROM │
│   VARIOUS FILES INTO THE NEW ONE │
└─────────────────────────────────┘
               │
               ▼
┌─────────────────────────────┐
│       SAVE THE NEW FILE      │
└─────────────────────────────┘
               │
               ▼
┌──────────────────────────────────────┐
│        MAKE DIVISIONS UNDER          │
│          DEFECTS , AGENCY,           │
│ PRODUCT GROUP & MANUFACTURING ASSEMBLY│
└──────────────────────────────────────┘
               │
               ▼
             ████
```

CHART NO.: 8.b.

FLOW CHART FOR PROBLEM PRIORITISING.

```
        ┌───┐
        │ ■ │
        └─┬─┘
          │
          ▼
┌─────────────────────────┐
│                         │
│      SET PRINTER ON     │
│                         │
└────────────┬────────────┘
             │
             ▼
┌─────────────────────────┐
│ COUNT THE RECORDS UNDER │
│     VARIOUS DIVISIONS   │
│                         │
└────────────┬────────────┘
             │
             ▼
┌─────────────────────────┐
│   ASSIGN EACH COUNT TO  │
│      EACH VARIABLES     │
│                         │
└────────────┬────────────┘
             │
             ▼
┌─────────────────────────┐
│  GIVE CORRESPONDING NAME│
│        TO VARIABLES     │
│                         │
└────────────┬────────────┘
             │
             ▼
┌─────────────────────────┐
│     GET PRINT OF THOSE  │
│  VARIABLES i.e., COUNTS │
│                         │
└─────────────────────────┘
```

5. Collect the corresponding records form various files to new one.

6. Save the new file.

7. Make separation

8. Count the total records

9. Count the records under various separations under given category.

10. Se the each count to each variable.

11. Print the variable.

Thus programming for prioritising the problems area is done.

4.3.3   Finding defect trends

Program is made for collecting the said data under stated segregation for a boiler only not for the project. Hence the project name and customer number are the inputs. The defect trend of a boiler and comparison of two boiler with same capacity can be analysed by this program.

We can easily see the defect trends.

* The 4.3.2 & 4.3.3 gives the numerical details. The statistical experiments are under to identify the defect trends the graphs are enclosed for reference.

* Apart from that programs are written for office use. That is nothing but another report form is created with field details and two programs are written to collect data form various SAR FILES and to display it in a need format for a project and for a boiler respectively.

II. List of Programs

a. Quality data integration

   QDI - Program

b. Program for problem prioritising (project wise)

   - Defect code wise

   - Agency wise

   - PGMA wise

c. Program for finding defect trend (product wise)

   - Defect code wise

   - Agency wise

   - PGMA wise

d. Program for SAR details.

Separate programs are written to view the results and to print the results respectively. Separate programs are written to get SAR details in various report forms for various departments according to their need. The programs can be transferred to on-line use and can be updated for future use also. The updation steps are enclosed in Appendix A for reference.

5.4. Menu Creation

A menu is created for easy working of programming. Here menu is the total display of screen. The heading in the menu is called as pad. Here 5 pads created are P-Result, P-Print, off-res, off-print EXIT. The dragged item is called as popup. Each and every pad is having one popup. Each line in the popup is called as bar. Here.

*   Integration

*   Prioritise / Defcode

*   Prioritise / Agency

*   Prioritise / PGMA

*   Capacity / Defcode

*   Capacity / Agency

*   Capacity / PGMA

Are the 7 bars under pop-up 1 is for viewing results and under popup 2 is for printing details.

*   SAR details for project.

*   SAR details for boiler.

The above menu is created by proper programming and also programs are written to make actions of difference previous programs for corresponding selection of bar.

The menu is created in such a way that it can be able to give the extract of the whole project.

Algorithm

1. Define menu

2. Define pads

3. Define popup

4. Define bar

5. Define backup program

6. Make roops to 'do programs' for selecting one bar

7. Repeat step for each bar

8. Activate menu

Chapter - 6

QDJ Results & Discussions

Results Obtained

*   Integration - program creates NCR records, SAR records, CAR records and CC records one by one with prepared report forms. While viewing programs results, we can see the number of records.

*   Prioritise / Defcode programs gives the total number of records under the project and the number of records under the defect codes C, D, E, F respectively.

*   Prioritise / Agency program gives the total number of records under the project and the counts under various agencies BH, EE, CM, DE, SC, SD, SH repectively.

*   Prioritise / PGMA - program gives the total number of records under the project and the number of records under the 10 segregations.

    The last above 3 programs give the counts with the project name also.

*   Capacity / Defcode - program gives the total number of records under the boiler and counts under C, D, E, F respectively.

*   Capacity / Agency - program gives the total number of records under one boiler and the counts under various agencies BH, EE, CM, DE, SC, SD, SH respectively.

*   Capacity / PGMA gives the total number of records under a boiler and the counts under 10 various partitions of PGMA code.

    The above 3 programs give the count with project name of the boiler and its customer number.

*   SAR records for a boiler project gives there SAR details in required report form.

-     Having the above numeric details and with Excel package, the various graphs are drawn.

Effect of Integration

The integration programs give the defect details which leads to the analysis of

*   Which project is having a lengthy series of defects.

*   Which project is having customer complaints.

*   For which item in a project, the defects are more.

*   The item which is having repeated / Generic problems.

*   The product / item which is having all types of defects.

This above analysis gives the series at which the number of data records can be reduced / eliminated at the defects series. The customers satisfaction could be improved by intiating actions against the defect series.

The other programs gives the defect trend of a project as well as product. This will help to compare various projects, various products of same or various capacity.

The overall picture of their quality improvement from 1992 to upto dates obtained on product / project wise. This will give the area of immediate development.

This QDI results with which types of defects occur at which stage. Where the defects are more and the defect trend of a particular product / project. This helps to reduce the defect in a particular order so that it establishes better quality improvement in future.

One big reason found in the results and discussions is that there is a gap exists between the customers requirements and designers. The designers may not have the knowledge about the requirements (exactly) at the customers use. The design errors could be down free 40 - 60% by narrowing down this gab using proper educative programmes to the designers about what the customers requirements apart from specifications.

Chapter - 7

Conclusions

CONCLUSION

This thesis study is an integrated approach to the problem of quality improvement for a large manufacturing concern. Under this study, the various quality data Captured at daily management of a concern, are integrated through programming in D-Base - IV. The defect details and the defect trend of a project / a product are the results obtained from the programs. This thesis enables each and every department to have access to all data. The users in all the department can get the overall picture of the defect details in product wise and as well as project wise. This study helps to know which types of discrepancies occur at which stage. It highlights the exact area of the product cycle for development. Thus being the initial steps of Six Sigma Quality Programme, this thesis study leads the quality improvement journey to continue.

APPENDIX A

It comprises QDI Programmes and corresponding sample results.

Here programming is done by dBase IV and the database is made from the data collection record of various departments in BHEL, Tiruchy. Programming steps and flowcharts are previously explained. The actual programmes and corresponding sample results are herewith enclosed for further understanding purpose.

PROGRAM TO INTEGRATE THE VARIOUS QUALITY DATA.

```
CLEAR
SET TALK OFF
STORE SPACE (15) TO DCD,CDC,ASD
@ 10,10 SAY "ENTER YOUR WORK ORDER NO. :" GET DCD
READ
@ 12,10 SAY "ENTER YOUR PROJECT NAME :" GET CDC
READ
@ 14,10 SAY "ENTER YOUR CAR-PROJECT NAME :" GET ASD
READ
USE NCR34
COPY STRUCTURE TO NNN
USE NNN
APPEND FROM NCR34 FOR WO = TRIM(DCD)
SAVE TO NNN
USE NNN EXCL
REPO FORM NCS.FRM TO PRINT

USE SANG92
COPY STRUCTURE TO SSS
USE SSS
APPEND FROM SANG92 FOR PROJ = TRIM(CDC)
APPEND FROM SANG93 FOR PROJ = TRIM(CDC)
APPEND FROM SANG94 FOR PROJ = TRIM(CDC)
APPEND FROM SANG95 FOR PROJ = TRIM(CDC)
APPEND FROM SANG96 FOR PROJ = TRIM(CDC)
```

```
APPEND FROM SANG97 FOR PROJ = TRIM(CDC)
APPEND FROM SANG98 FOR PROJ = TRIM(CDC)
APPEND FROM SANG99 FOR PROJ = TRIM(CDC)
SAVE TO SSS
USE SSS EXCL
REPO FORM SAS.FRM TO PRINT


USE CCSEN2
COPY STRUCTURE TO BHU
USE BHU
APPEND FROM CCSEN2 FOR CUSTOMER = TRIM(CDC)
SAVE TO BHU
USE BHU EXCL
REPO FORM CCSEN.FRM TO PRINT


USE SCAR96
COPY STRUCTURE TO ZEN
USE ZEN
APPEND FROM SCAR96 FOR PROJECT = TRIM(ASD)
APPEND FROM SCAR99 FOR PROJECT = TRIM(ASD)
SAVE TO ZEN
USE ZEN EXCL
REPO FORM CAR.FRM TO PRINT
CLEAR
RETURN
```

****

NO	WO	PRODUCT	ITEM	DEVIATION	CHARECTER
1	8036	SG235	BAFFLE-1 HOLE	WRONG	LOCATION
2	8036	SG235	P.H.DRAIN HOLE	MORE	DIAMETER
3	8036	SG235	INST.NOZZLE	DAMAGED	EP.
4	8036	SG235	SHROUD ASSY	MORE	RADIUS
5	8036	SG235	MG.FLAT 4 SLOT	MORE	PITCH
6	8036	SG235	SHROUD SHELL	LESS & MORE	RADIUS
7	8036	SG235	VERTICAL STRIPS	LESS WELD JOINT	LENGTH
8	8036	SG235	MPBR WITH FEED NOZZLE	INTRODUCED 5MM DEVIATION	CONCENTRICITY
9	8036	SG235	MAN HOLE NOZZLE+BRACKET	DEVIATION 4MM	OFFSET
10	8036	SG235	INNER NOZZLE ASSEMBLY	0.6 DEVIATION	GAP
11	8036	SG235	BAFFLE -2	MORE BY 2MM MAX	LIGAMENT
12	8036	SG235	AR LUG & GUIDE	EXCESS BY 0.6-1.1	GAP 5.0MM
13	8036	SG235	SA23+SA24	BETWEEN TS TO SA24 FLANGE12061	GAP 12071
14	8036	SG235	PRY.HEAD ASSEMBLY NOZZLE	VARIES FROM 335.3 - 336.15	ID335 +0.5/-0.8
15	8036	SG235	TIE ROD	LESS BY 31.0 MM	LENGTH
16	8036	SG235	RCT ASSEMBLY	9MM SHIFT FROM HH NOZZLE LINE	RCT MATCH HHN
17	8036	SG235	FDP ASSY	HOTLEG&FDP/EXCESS 4.6 & 2.8	GAP & THICKNESS
18	8036	SG235	BAFFLE BUNDLE+SEAL RING	EXCESS BY 2.0MM	GAP
19	8036	SG 235	SR ELBOW	SHIFT BY 5MM	FREE END SHIFT
20	8036	SG235	TIE ROD ON BUNDLE ASSY	WRONGLY INSERTED IN TUBE HOLE	TIE ROD HOLE
21	8036	SG235	TUBE EXPANSION	LESS BY 1%	3-6%

SCNO	PROJ	B A N D	CUST NO	PGMA	DU	AG EN CY	DE FE CT	ATT RIB UTE CODE	DISCREPANCY	DISPOSITION
0213	TUTIC ORIN	Y	0295	45221		EE	91	FD	MODIFN. ON SCANNER AIR HDR	SITE MODIFN.NOT REQD.COST NOT ACCEPTABLE
0258	TUTIC ORIN	W	0295	48203	02	AA	70	FD	ACTUATOR HANDWHEEL FOUL WITTH DAMPER LINKS	SITE PRVD SHIM PL. IS ACCEPTED
0259	TUTIC ORIN	W	0295	48160	01	FF	50	FD	MOUNTING PL. DRILLING WRONG.ACTUATOR BORE IS LESS & NOT MOVING	SITE MODIFN IS ACCEPTABLE
0260	TUTIC ORIN	W	0295	07231	01- -24	EE	52	ND	LCT EXCESS LGTHS REPORTED	CLARIFIED TO SITE
0319	TUTIC ORIN	W	02950 296	43005		EE	91	ND	LONG HDR WILL COMPLETELY OCCUPY SPACE REQD FOR MILL MTCE	DRG. SENT FOR SEAL AIR ROUTING
0326	TUTIC ORIN	W	0596	45221		XX		ND	MODIFN. AS PER SAR BRV349/19.2.92 TO BE ACCEPTED	EARLIER DISPN. IS OK.COST NOT DEBITABLE TO TRY.
0333	TUTIC ORIN	W	0296	43004		CH	50	FD	MISMATCH OF FILTER & DRAWER	SITE RECTFN/REWORK IS ACCEPTABLE
0334	TUTIC ORIN	W	0296	42150		CH	50	FD	THREADED LGTH IS SHORT	SITE RECTFN/REWORK IS ACCEPTABLE
0335	TUTIC ORIN	W	0296	48212		XX	53	ND	WIDTH IN DUCTWALL FOR FIXING EXPN.JT. IS LESS & FOULS WTH STIFFNER	WDTH IS AS PER OUR DRG.
0336	TUTIC ORIN	W	02950 296	36391		AA	70	FD	ACCESS DOORS FOUL WITH POST P2	SITE MODIFN IS ACCEPTABLE
0337	TUTIC ORIN	W	02950 296	48143		XX	45	ND	DAMPER ROTATING 360 DEG. NO STOPPER,OPEN-CLOSE MARKING WRONG.SEALING ARRGT. LOOSE	NO STOPPER REQD.NO PROBLEM WITH OPEN CLOSE MARKING.NO WLDG IN SHAFT SEALING
0361	TUTIC ORIN	Y	02950 296	48663	01	XX	20	ND	SITE WANTS CLARIFN. REG. ROTATION OF ACTUATORS	SITE TO ARRANGE AS PER SKETCH
0362	TUTIC ORIN	W	02950 296	47203		DD	26	FD	HEX SCREW PLUGS NOT SUPLD	SITE LOCAL ARGT/PRCRMT.IS ACCEPTABLE
0425	TUTIC ORIN	Y	02950	95085		AA	03	FD	NO LIMIT SWITCH RLSD	SITE LOCAL

FOR THIS GATE   ARGT/PRCRMT.IS
                   ACCEPTABLE

SCNO	PROJ	B A N D	CUST NO	PGMA	DU	AG EN CY	DE FE CT	ATT RIB UTE CODE	DISCREPANCY	DISPOSITION
0426	TUTIC ORIN	Y	0295	95485	01	VH	05	ND	DOOR LOCKS OF REMOTE CABINET OF FEEDER GOT BROKEN	VENDOR RECTIFIED AT SITE.
0450	TUTIC ORIN	Y	0295	48143	02	XX	20	ND	STOPPER NOT PRVD OPENCLOSE MARKING NOT THERE	OPNG IS ANTICLOCKWISE.STOPPER NOT REQD
0471	TUTIC ORIN	W	0296	12184	02	XX	43	ND	ORIENTN. OF BEND DOES NOT SUIT & HOR.LGTH SHORT BY 1530MM	NOT ACCEPTED.
0472	TUTIC ORIN	W	0296	43005		XX		ND	PROBLEM IN SEAL AIR LINE DRG. ERECN.	ENGG.ANALYSE PROBLEM.
0515	TUTIC ORIN	W	0303	97291	12	XX	53	ND	HOLE IN THERMOWELL SMALL &NOT SUITING BULB	MORE DETAILS REQD
0516	TUTIC ORIN	W	0296	80906	05	CH	45	FD	R.SRINIVASAN,VALVES/ SER.WENT WITH MATL.& ASSEMBLD GEAR BOXES AFTER M/CG STUM NUTS	SITE ACTION IS ACCEPTABLE
0517	TUTIC ORIN	W	0296	36610	133 7'	XX		ND	MODIFN. IN COL.CENTRE DIST. DUE TO ERECN.AS PER NEW TCE DRG.	SITE ACTION IS ACCEPTABLE
0518	TUTIC ORIN	W	0296	36610	42	AA		FD	4 HGRS RECD AGST 8 HGRS.	SITE FABRCN IS ACCEPTABLE
0597	TUTIC ORIN	W	02950 296	20511		DD	86	FD	AIR FILTERS HAVE NOT BEEN SUPLD -8NOS.FILTERS PROCURED	SITE ACTION IS ACCEPTABLE
0737	TUTIC ORIN	Y	0295	95		VH	05	ND	AFR,VOL.BOOSTERS ,IP/CONVERTORS SOLINOID VALVES DEFECTIVE	VOL. BOOSTRS DAMAGED DUE EXCESS AIR SUPPLY-RECTIFIED.OTHERS PUR. TO ARRANGE FOR REPLCMT.
0909	TUTIC ORIN	Y	02950 296	65736		AA		FD	MISMATCH OF HOSE & CONNECTORS	SITE ACTION IS .ACCEPTABLE

PROGRAM TO PRIORITISE THE DEFECTIVE AREA
W.R.T. DEFECT CODES.

```
CLEAR
SET TALK ON
STORE SPACE (15) TO DEF.RTT
@ 12,10 SAY "ENTER YOUR PROJECT NAME :" GET DEF
READ
USE SANG92 EXCL
COPY STRUCTURE TO DEFCO
USE DEFCO EXCL
APPEND FROM SANG92 FOR PROJ = TRIM(DEF)
APPEND FROM SANG93 FOR PROJ = TRIM(DEF)
APPEND FROM SANG94 FOR PROJ = TRIM(DEF)
APPEND FROM SANG95 FOR PROJ = TRIM(DEF)
APPEND FROM SANG96 FOR PROJ = TRIM(DEF)
APPEND FROM SANG97 FOR PROJ = TRIM(DEF)
APPEND FROM SANG98 FOR PROJ = TRIM(DEF)
APPEND FROM SANG99 FOR PROJ = TRIM(DEF)
USE DEFCO EXCL
INDEX ON DEFCODE TAG FGH
WAIT" "
CLEAR
SET PRINTER ON
?"THE NAME OF THE PROJECT:-    "
?DEF
?"TOTAL RECORDS"
COUNT TO TOT
?TOT
SET FILTER TO DEFCODE = "C"
?"C"
COUNT TO CD
?CD
```

```
SET FILTER TO DEFCODE = "D"
?"D"
COUNT TO DD
?DD
SET FILTER TO DEFCODE = "E"
?"E"
COUNT TO ED
?ED
SET FILTER TO DEFCODE = "M"
?"M"
COUNT TO MD
?MD
?" "
SET PRINTER OFF
```

PROGRAM TO PRIORITISE THE DEFECTIVE AREA
W.R.T. THE AGENCY CODES

```
CLEAR
SET TALK ON
STORE SPACE (15) TO BAR
@ 10,10 SAY "ENTER YOUR PROJECT NAME :" GET BAR
READ
USE SANG92 EXCL
COPY STRUCTURE TO BARCH
USE BARCH
APPEND FROM SANG92 FOR PROJ = TRIM(BAR)
APPEND FROM SANG93 FOR PROJ = TRIM(BAR)
APPEND FROM SANG94 FOR PROJ = TRIM(BAR)
APPEND FROM SANG95 FOR PROJ = TRIM(BAR)
APPEND FROM SANG96 FOR PROJ = TRIM(BAR)
APPEND FROM SANG97 FOR PROJ = TRIM(BAR)
APPEND FROM SANG98 FOR PROJ = TRIM(BAR)
APPEND FROM SANG99 FOR PROJ = TRIM(BAR)
USE BARCH EXCL
INDEX ON AGENCY TAG CDE
WAIT" "
SET PRINTER ON
CLEAR
?"THE PROJECT NAME IS:- "
?BAR
?"TOTAL RECORDS"
COUNT TO TOT
?TOT
SET FILTER TO AGENCY = "BH"
?"BH"
COUNT TO BHA
```

```
?BHA
SET FILTER TO AGENCY = "CM"
?"CM"
COUNT TO CMA
?CMA
SET FILTER TO AGENCY = "EE"
?"EE"
COUNT TO EEA
?EEA
SET FILTER TO AGENCY = "PE"
?"PE"
COUNT TO PEA
?PEA
SET FILTER TO AGENCY = "SC"
?"SC"
COUNT TO SCA
?SCA
SET FILTER TO AGENCY = "SD"
?"SD"
COUNT TO SDA
?SDA
SET FILTER TO AGENCY = "SH"
?"SH"
COUNT TO SHA
?SHA
SET PRINTER OFF
**************************************************************************
```

THE NAME OF THE PROJECT:-
VINDHYA
TOTAL RECORDS
        377
C
        98
D
        167
E
        70
M
        33

THE PROJECT NAME IS:-
VINDHYA
TOTAL RECORDS
        377
BH
        19
CM
        3
EE
        72
PE
        252
SC
        13
SD
        6
SH

PROGRAM TO PRIORITISE THE DEFECTIVE AREA W.R.T THE PGMA (PRODUCT GROUP & MANUFACTURING ASSEMBLY) CODE.

```
CLEAR
SET TALK ON
SET BELL ON
STORE SPACE (15) TO PLM
@ 10,10 SAY "ENTER YOUR PROJECT NAME   :" GET PLM
READ
USE SANG92 EXCL
COPY STRUCTURE TO PGMAL
USE PGMAL
APPEND FROM SANG92 FOR PROJ = TRIM(PLM)
APPEND FROM SANG93 FOR PROJ = TRIM(PLM)
APPEND FROM SANG94 FOR PROJ = TRIM(PLM)
APPEND FROM SANG95 FOR PROJ = TRIM(PLM)
APPEND FROM SANG96 FOR PROJ = TRIM(PLM)
APPEND FROM SANG97 FOR PROJ = TRIM(PLM)
APPEND FROM SANG98 FOR PROJ = TRIM(PLM)
APPEND FROM SANG99 FOR PROJ = TRIM(PLM)
USE PGMAL EXCL
INDEX ON PGMA TAG DFR
WAIT" "
SET PRINTER ON
CLEAR
?" THE NAME OF THE PROJECT "
?PLM
?" TOTAL RECORDS"
COUNT TO TOT
?TOT
SET FILTER TO PGMA ="0"
?
```

```
?"PGMA<10000"
COUNT TO A
?A
SET FILTER TO PGMA = "1"
?
?"10000<=PGMA<20000"
COUNT TO B
?B
SET FILTER TO PGMA = "2"
?
?"20000<=PGMA<30000"
COUNT TO C
?C
SET FILTER TO PGMA = "3"
?
?"30000<=PGMA<40000"
COUNT TO D
?D
SET FILTER TO PGMA = "4"
?
?" 40000<= PGMA<50000"
COUNT TO E
?E
SET FILTER TO PGMA = "5"
?
?" 50000<=PGMA<60000"
COUNT TO F
?F
SET FILTER TO PGMA = "6"
?
?" 60000<= PGMA< 70000"
COUNT TO G
?G
```

```
SET FILTER TO PGMA = "7"
?
?"70000<=PGMA<80000"
COUNT TO H
?H
SET FILTER TO PGMA = "8"
?
?"80000<=PGMA<90000"
COUNT TO I
?I
SET FILTER TO PGMA = "9"
?
?"PGMA>=90000"
COUNT TO J
?J
SET PRINTER OFF
```

****

****

THE PROJECT NAME :-
VINDHYA
  TOTAL RECORDS
        377

PGMA<10000
        51

10000<=PGMA<20000
        50

20000<=PGMA<30000
        20

30000<=PGMA<40000
        134

  40000<= PGMA<50000
        78

  50000<=PGMA<60000
        0

  60000<= PGMA< 70000
        0

70000<=PGMA<80000
        1

80000<=PGMA<90000
        9

PGMA>=90000
        18

PROGRAM TO COMPARE SAME CAPACITY BOILERS W.R.T THE DEFECT CODES.

```
CLEAR
SET TALK ON
STORE SPACE (15) TO DEF,RTT
@ 10,10 SAY "ENTER YOUR CUSTOMER NO :" GET RTT
READ
@ 12,10 SAY "ENTER YOUR PROJECT NAME :" GET DEF
READ
USE SANG92 EXCL
COPY STRUCTURE TO DEFCO
USE DEFCO EXCL
APPEND FROM SANG92 FOR PROJ = TRIM(DEF) .AND. CUSTNO = TRIM(RTT)
APPEND FROM SANG93 FOR PROJ = TRIM(DEF) .AND. CUSTNO = TRIM(RTT)
APPEND FROM SANG94 FOR PROJ = TRIM(DEF) .AND. CUSTNO = TRIM(RTT)
APPEND FROM SANG95 FOR PROJ = TRIM(DEF) .AND. CUSTNO = TRIM(RTT)
APPEND FROM SANG96 FOR PROJ = TRIM(DEF) .AND. CUSTNO = TRIM(RTT)
APPEND FROM SANG97 FOR PROJ = TRIM(DEF) .AND. CUSTNO = TRIM(RTT)
APPEND FROM SANG98 FOR PROJ = TRIM(DEF) .AND. CUSTNO = TRIM(RTT)
APPEND FROM SANG99 FOR PROJ = TRIM(DEF) .AND. CUSTNO = TRIM(RTT)
USE DEFCO EXCL
INDEX ON DEFCODE TAG FGH
WAIT" "
CLEAR
SET PRINTER ON
?"THE NAME OF THE PROJECT:-
?DEF
?" CUSTOMER NO. :-    "
?RTT
?"TOTAL RECORDS"
COUNT TO TOT
?TOT
```

```
SET FILTER TO DEFCODE = "C"
?"C"
COUNT TO CD
?CD
SET FILTER TO DEFCODE = "D"
?"D"
COUNT TO DD
?DD
SET FILTER TO DEFCODE = "E"
?"E"
COUNT TO ED
?ED
SET FILTER TO DEFCODE = "M"
?"M"
COUNT TO MD
?MD
?" "
SET PRINTER OFF
```

****

PROGRAM TO COMPARE THE SAME CAPACITY BOILERS W.R.T. THE AGENCY CODES.

```
CLEAR
SET TALK ON
STORE SPACE (15) TO BAR,CXX
@ 8,10 SAY "ENTER YOUR CUSTOMER NO. :" GET CXX
READ
@ 10,10 SAY "ENTER YOUR PROJECT NAME :" GET BAR
READ
USE SANG92 EXCL
COPY STRUCTURE TO BARCH
USE BARCH
APPEND FROM SANG92 FOR PROJ = TRIM(BAR) .AND. CUSTNO = TRIM(CXX)
APPEND FROM SANG93 FOR PROJ = TRIM(BAR) .AND. CUSTNO = TRIM(CXX)
APPEND FROM SANG94 FOR PROJ = TRIM(BAR) .AND. CUSTNO = TRIM(CXX)
APPEND FROM SANG95 FOR PROJ = TRIM(BAR) .AND. CUSTNO = TRIM(CXX)
APPEND FROM SANG96 FOR PROJ = TRIM(BAR) .AND. CUSTNO = TRIM(CXX)
APPEND FROM SANG97 FOR PROJ = TRIM(BAR) .AND. CUSTNO = TRIM(CXX)
APPEND FROM SANG98 FOR PROJ = TRIM(BAR) .AND. CUSTNO = TRIM(CXX)
APPEND FROM SANG99 FOR PROJ = TRIM(BAR) .AND. CUSTNO = TRIM(CXX)
USE BARCH EXCL
INDEX ON AGENCY TAG CDE
WAIT" "
CLEAR
SET PRINTER ON
?"THE PROJECT NAME IS:-    "
?BAR
?" CUSTOMER NO. :-     "
?CXX
?"TOTAL RECORDS"
COUNT TO TOT
?TOT
```

```
SET FILTER TO AGENCY = "BH"
?"BH"
COUNT TO BHA
?BHA
SET FILTER TO AGENCY = "CM"
?"CM"
COUNT TO CMA
?CMA
SET FILTER TO AGENCY = "EE"
?"EE"
COUNT TO EEA
?EEA
SET FILTER TO AGENCY = "PE"
?"PE"
COUNT TO PEA
?PEA
SET FILTER TO AGENCY = "SC"
?"SC"
COUNT TO SCA
?SCA
SET FILTER TO AGENCY = "SD"
?"SD"
COUNT TO SDA
?SDA
SET FILTER TO AGENCY = "SH"
?"SH"
COUNT TO SHA
?SHA
?" "
SET PRINTER OFF
*******************************************************************************
*******************************************************************************
```

```
THE NAME OF THE PROJECT:-
VINDHYA
 CUSTOMER NO.  :-
0612
TOTAL RECORDS
         327
C
          85
D
         141
E
          68
M
          24




THE PROJECT NAME IS:-
VINDHYA
 CUSTOMER NO.   :-
0612
TOTAL RECORDS
         327
BH
          16
CM
           2
EE
          63
PE
         221
SC
           9
SD
           4
SH
           4
```

PROGRAM TO COMPARE SAME CAPACITY BOILERS W.R.T. PGMA (PRODUCT GROUP & MANUFACTURING ASSEMBLY) CODES.

```
CLEAR
SET TALK ON
SET BELL ON
STORE SPACE (15) TO PLM,BNN
@ 8,10 SAY " ENTER YOUR CUSTOMER NO :" GET BNN
READ
@ 10,10 SAY "ENTER YOUR PROJECT NAME  :" GET PLM
READ
USE SANG92 EXCL
COPY STRUCTURE TO PGMAL
USE PGMAL
APPEND FROM SANG92 FOR PROJ = TRIM(PLM) .AND. CUSTNO = TRIM(BNN)
APPEND FROM SANG93 FOR PROJ = TRIM(PLM) .AND. CUSTNO = TRIM(BNN)
APPEND FROM SANG94 FOR PROJ = TRIM(PLM) .AND. CUSTNO = TRIM(BNN)
APPEND FROM SANG95 FOR PROJ = TRIM(PLM) .AND. CUSTNO = TRIM(BNN)
APPEND FROM SANG96 FOR PROJ = TRIM(PLM) .AND. CUSTNO = TRIM(BNN)
APPEND FROM SANG97 FOR PROJ = TRIM(PLM) .AND. CUSTNO = TRIM(BNN)
APPEND FROM SANG98 FOR PROJ = TRIM(PLM) .AND. CUSTNO = TRIM(BNN)
APPEND FROM SANG99 FOR PROJ = TRIM(PLM) .AND. CUSTNO = TRIM(BNN)
USE PGMAL EXCL
INDEX ON PGMA TAG DFR
WAIT" "
CLEAR
SET PRINTER ON
?"THE PROJECT NAME :-    "
?PLM
?" THE CUSTOMER NO. :-    "
?BNN
?" TOTAL RECORDS"
```

```
COUNT TO TOT
?TOT
SET FILTER TO PGMA ="0"
?
?"PGMA<10000"
COUNT TO A
?A
SET FILTER TO PGMA = "1"
?
?"10000<=PGMA<20000"
COUNT TO B
?B
SET FILTER TO PGMA = "2"
?
?"20000<=PGMA<30000"
COUNT TO C
?C
SET FILTER TO PGMA = "3"
?
?"30000<=PGMA<40000"
COUNT TO D
?D
SET FILTER TO PGMA = "4"
?
?" 40000<= PGMA<50000"
COUNT TO E
?E
SET FILTER TO PGMA = "5"
?
?" 50000<=PGMA<60000"
COUNT TO F
?F
SET FILTER TO PGMA = "6"
```

```
?
?" 60000<= PGMA< 70000"
COUNT TO G
?G
SET FILTER TO PGMA = "7"
?
?"70000<=PGMA<80000"
COUNT TO H
?H
SET FILTER TO PGMA = "8"
?
?"80000<=PGMA<90000"
COUNT TO I
?I
SET FILTER TO PGMA = "9"
?
?"PGMA>=90000"
COUNT TO J
?J
?" "
SET PRINTER OFF
```

****
****

THE PROJECT NAME :-
VINDHYA
 THE CUSTOMER NO. :-
0612
 TOTAL RECORDS
         327

PGMA<10000
         41

10000<=PGMA<20000
         40

20000<=PGMA<30000
         13

30000<=PGMA<40000
         127

 40000<= PGMA<50000
         72

 50000<=PGMA<60000
         0

 60000<= PGMA< 70000
         0

70000<=PGMA<80000
         0

80000<=PGMA<90000
         3

PGMA>=90000
         18

```
SET TALK OFF
SET SCOREBOARD OFF
SET ESCA ON
STORE 0 TO CHOICE
CLEAR

DEFINE MENU SANG

DEFINE PAD S1 OF SANG PROMPT "P-RESULT"
DEFINE PAD S2 OF SANG PROMPT "P-PRINT"
DEFINE PAD S3 OF SANG PROMPT "OFF-USE"
DEFINE PAD S4 OF SANG PROMPT "OFF-RES"
DEFINE PAD S5 OF SANG PROMPT "EXIT"

ON PAD S1 OF SANG ACTIVATE POPUP P1
ON PAD S2 OF SANG ACTIVATE POPUP P2
ON PAD S3 OF SANG ACTIVATE POPUP P3
ON PAD S4 OF SANG ACTIVATE POPUP P4
ON PAD S5 OF SANG ACTIVATE POPUP P5

DEFINE POPUP P1 FROM 1,1 TO 10,25
DEFINE BAR 1 OF P1 PROMPT "INTEGRATION"
DEFINE BAR 2 OF P1 PROMPT "PRIORITISE/DEFCODE"
DEFINE BAR 3 OF P1 PROMPT "PRIORITISE/AGENCY"
DEFINE BAR 4 OF P1 PROMPT "PRIORITISE/PGMA"
DEFINE BAR 5 OF P1 PROMPT "CAPACITY/DEFCODE"
DEFINE BAR 6 OF P1 PROMPT "CAPACITY/AGENCY"
DEFINE BAR 7 OF P1 PROMPT "CAPACITY/PGMA"
ON SELECTION POPUP P1 DO D1

DEFINE POPUP P2 FROM 1,11 TO 10,35
DEFINE BAR 1 OF P2 PROMPT "INTEGRATION"
DEFINE BAR 2 OF P2 PROMPT "PRIORITISE/DEFCODE"
DEFINE BAR 3 OF P2 PROMPT "PRIORITISE/AGENCY"
DEFINE BAR 4 OF P2 PROMPT "PRIORITISE/PGMA"
DEFINE BAR 5 OF P2 PROMPT "CAPACITY/DEFCODE"
DEFINE BAR 6 OF P2 PROMPT "CAPACITY/AGENCY"
DEFINE BAR 7 OF P2 PROMPT "CAPACITY/PGMA"
ON SELECTION POPUP P2 DO D2

DEFINE POPUP P3 FROM 1,21 TO 5,60
DEFINE BAR 1 OF P3 PROMPT "PRINT SAR FOR A PROJECT"
DEFINE BAR 2 OF P3 PROMPT "PRINT SAR FOR A BOILER"
ON SELECTION POPUP P3 DO D3

DEFINE POPUP P4 FROM 1,31 TO 5,70
DEFINE BAR 1 OF P4 PROMPT "SEE SAR FOR A PROJECT"
DEFINE BAR 2 OF P4 PROMPT "SEE SAR FOR A BOILER"
ON SELECTION POPUP P4 DO D3

DEFINE POPUP P5 FROM 1,41 TO 5,49
DEFINE BAR 1 OF P5 PROMPT "YES"
ON SELECTION POPUP P5 DO D3

ACTIVATE MENU SANG
```

```
SET TALK OFF
SET ESCA ON

IF PROMPT() = "INTEGRATION"
CLEAR
DO NCSI
ENDIF

IF PROMPT() = "PRIORITISE/DEFCODE"
CLEAR
DO DEFCODE
ENDIF

IF PROMPT() = "PRIORITISE/AGENCY"
CLEAR
DO BAR1
ENDIF

IF PROMPT() = "PRIORITISE/PGMA"
CLEAR
DO PGMA
ENDIF

IF PROMPT() = "CAPACITY/DEFCODE"
CLEAR
DO DEFCODE1
ENDIF

IF PROMPT() = "CAPACITY/AGENCY"
CLEAR
DO BAR
ENDIF

IF PROMPT() = "CAPACITY/PGMA"
CLEAR
DO PGMA1
ENDIF
```

```
SET TALK OFF
SET ESCA ON

IF PROMPT() = "INTEGRATION"
CLEAR
DO NCS
ENDIF

IF PROMPT() = "PRIORITISE/DEFCODE"
CLEAR
DO DEFCODE4
ENDIF

IF PROMPT() = "PRIORITISE/AGENCY"
CLEAR
DO BAR4
ENDIF

IF PROMPT() = "PRIORITISE/PGMA"
CLEAR
DO PGMA3
ENDIF

IF PROMPT() = "CAPACITY/DEFCODE"
CLEAR
DO DEFCODE2
ENDIF

IF PROMPT() = "CAPACITY/AGENCY"
CLEAR
DO BAR2
ENDIF

IF PROMPT() = "CAPACITY/PGMA"
CLEAR
DO PGMA2
ENDIF
```

```
SET TALK OFF
SET ESCA ON

IF PROMPT() = "PRINT SAR FOR A PROJECT"
CLEAR
DO SEN2
ENDIF

IF PROMPT() = "PRINT SAR FOR A BOILER"
CLEAR
DO SEN4
ENDIF

IF PROMPT() = "SEE SAR FOR A PROJECT"
CLEAR
DO SEN20
ENDIF

IF PROMPT() = "SEE SAR FOR A BOILER"
CLEAR
DO SEN40
ENDIF

IF PROMPT() = "YES"
CLEAR
SET SCOREBOARD ON
ENDIF
```

NO	SCNO	PROJ	BAND	CUST NO	PGMA	DISCREPANCY	DISPOSITION
1	0723	SURAT GARH	W	0327	35010	FOUNDATION BOLT & CHANNEL ASSY. HAVE BEEN PAINTED WITH RED OXIDE GREY PAING. CUSTOMER HAS BEEN ASKED TO REMOVE THE PAINT BEFORE EMBEDD.	SITE REWORK IS ACCEPTED.
2	0995	SURAT GARH	W	0327	35521	BRACING BEAM FOULING WITH COLUMN S7L&S8L	SITE RECTIFICATION ACCEPTED
3	0996	SURAT GARH	W	0327	36380	BEAM 200 IS FOULING WITH PLATFORM.	SITE NEED NOT SHIFT ITEM NOS.36,37,38 & 41.SURPLUS FLOOR GRILLS CAN BE USED.
4	0999	SURAT GARH	R	0327	35521	T-SECTION 2NOS. ONLY SUPPLIED INSTEAD OF 4 NOS.	SITE IS REQUESTED TO FABRICATE USING MATL. FROM PGMA 35-993,DU.025.
5	1203	SURAT GARH	R	0327	36250	ITEM NOS NOT IDENTIFIED.HENCE MATERIALS ARE NOT SUPPLIED	SITE IS REQUESTED TO USE THE ERECTION MATERIALS
6	1206	SURAT GARH	R	0327	35443	THE BEAM LENGTH IS SHORT BY 200 MM.	SUITABLE JOINT MADE WITH SPLICE PLATE IS ACCEPTABLE.MATL. WILL BE SENT ALONG WITH PGMA 36-993.
7	1207	SURAT GARH	W	0327	35521	THE QTY OF PLATES SUPPLIED IS LESS	SITE ACTION ACCEPTED.MATL CAN BE TAKEN FROM PGMA35-993OF DU.NO:022
8	1331	SURAT GARH	R	0327	36300	ITEM NO 18,ISMB QUANTITY SUPPLIED IS LESS BY 2 NOS	THE MATL. WILL BE SENT IN PGMA 36-393 SHORTLY.COST DEBIT NOT ACCEPTED.
9	1354	SURAT GARH	R	0327	36260	DUE TO SHIFTING OF ITEM 01 & 03,SITE HAS TO USE 1000MM FLOOR GRILL INSTEAD OF 900MM.	SITE ACTION ACCEPTED.EXTRA FLOOR GRILL AVAILABLE IN PGMA 36-811 CAN BE USED.
10	1355	SURAT GARH	R	0327	36820	WHILE CLIMBING THE STAIRS HEAD IS HITTING AGAINST THE TOP STAIRS.	STAIR CASE REARRANGED TO HAVE A REQUIRED HEAD ROOM BY SITE IS ACCEPTED.

SCNO	PROJ	B A N D	CUST NO	PGMA	DU	AG EN CY	DE FE CT CODE	ATT RIB UTE	DISCREPANCY	DISPOSITION
0638	SURAT GARH	W	0332	35110		PE	D1	AU	IN COL S7L & S7R, IT IS OBSERVED THAT THE DRILL HOLE SIZE IS 29 MM INSTEAD OF DIA 25.5 MM IN COL JOINT DETAILS A,B,C & D.	SITE ACTION ACCEPTED.
0839	SURAT GARH	W	0332	39140		PE	D2	AU	IN DRG 0-00-291-02509 THE BOTTOM BASE PL IS SHOWN AS -0.300 M, WHERE AS IN ERECTION DRG IT IS SHOWN AS -0.500 M.	CUTTING OF ALL THE COLUMNS IS NOT ACCEPTED. IF THERE IS ANY SPECIFIC PROBLEM OF INTERFERENCE, IT CAN BE REFERRED TO ENGG. CUTTING IS NOT REQUIRED. COPY OF FAX DT 31/10/98 IS ENCLOSED FOR INFN.
0874	SURAT GARH	W	0332	08101		PE	D1	AU	FORMED V GROOVES FOR WELDING BECOME PARALLEL TO EACH OTHER:THAT IS SINGLE V EDGE PREPARATION DONE AT WEBS.IN FIELD JOINT SPLICER PLATES SHOWN.BUT PL NOT RELEASED.	SITE ACTION ACCEPTED.
0916	SURAT GARH	W	0332	35110	032 010	SC	M1	AU	TWIST OBSERVED IN COLUMN PIECES & RECTIFIED AT SITE.	SITE ACTION ACCEPTED.
0042	SURAT GARH	W	0332	35531	004 020	PE	D1	AU	BOXES SUPPLIED ARE NOT AS PER THE DETAILS GIVEN AGAINST WELDED BOX-04, INSTEAD AT BOTH ENDS OF BRACINGS LONG GROOVES HAVE BEEN PROVIDED.	SITE ACTION ACCEPTED.
0043	SURAT GARH	W	0332	35521	001 005 010	PE	D1	AU	AS PER WELDED BOX FABRICATIONS DETAILS GUSSET PLATE FIXING GROOVE L1 HAS BEEN MADE EXTRA LONG RESULTING IN STRENGTH REDUCTION OF BRACING.	SITE ACTION ACCEPTED.
0095	SURAT GARH	W	0332	08104	013	EE	C5	NU	FURNACE INTERBUCKSTAY BEAMS ARE WB TYPE AND	AS PER DRG 0-08-104-00735 VAR 01 RELD ANGLES TO

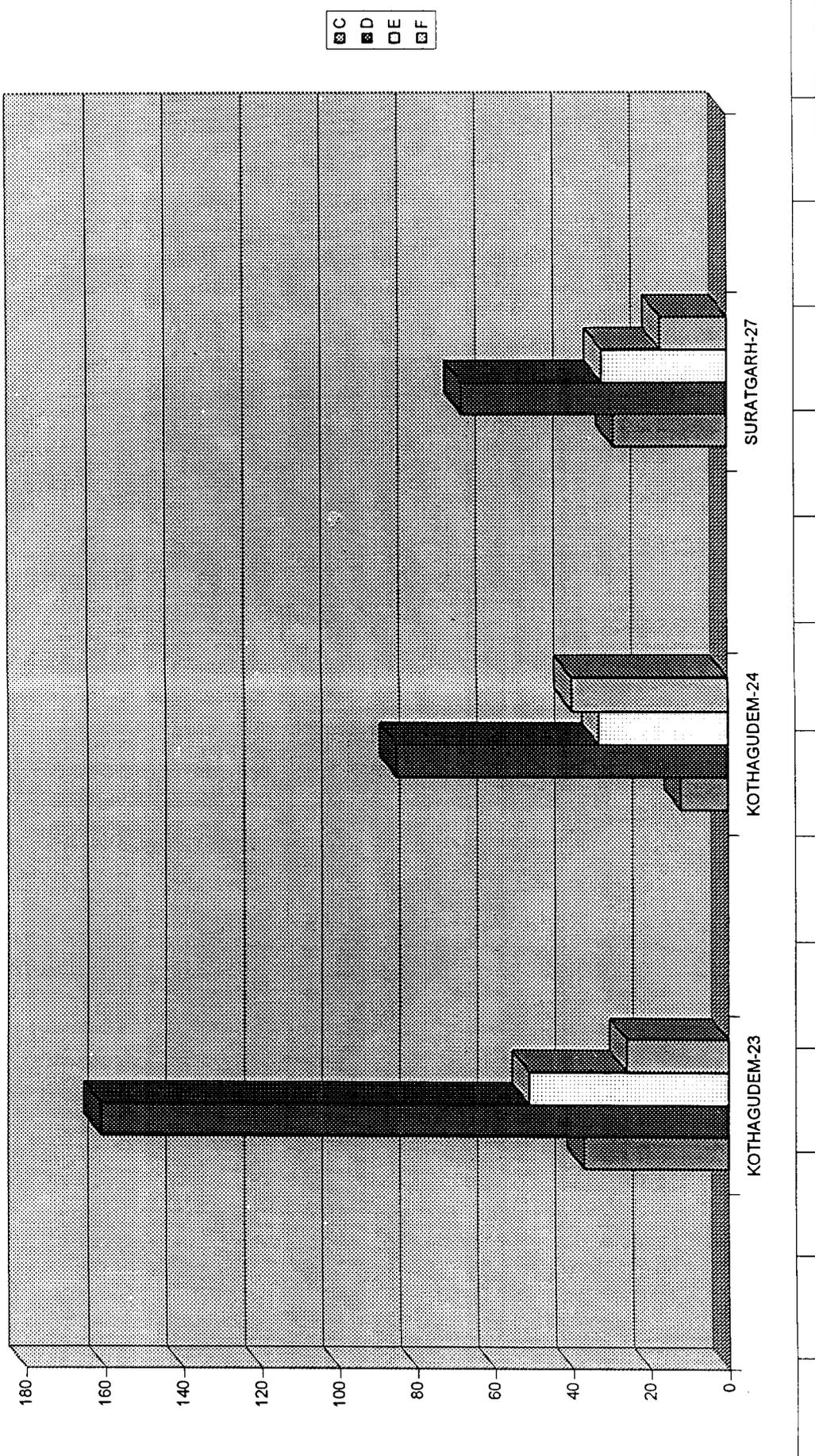| SCNO	PROJ	B A N D	CUST NO	PGMA	DU	AG EN CY	DE FE CT CODE	ATT RIB UTE	DISCREPANCY	DISPOSITION
0723	SURAT GARH	W	0327	35010	004 --- 006	FF	83	AU	FOUNDATION BOLT & CHANNEL ASSY. HAVE BEEN PAINTED WITH RED OXIDE GREY PAING. CUSTOMER HAS BEEN ASKED TO REMOVE THE PAINT BEFORE EMBEDD.	SITE REWORK IS ACCEPTED.
0995	SURAT GARH	W	0327	35521	002 037	AA	70	AU	BRACING BEAM FOULING WITH COLUMN S7L&S8L	SITE RECTIFICATION ACCEPTED
0996	SURAT GARH	W	0327	36380	028	AA	70	AU	BEAM 200 IS FOULING WITH PLATFORM.	SITE NEED NOT SHIFT ITEM NOS.36,37,38 & 41.SURPLUS FLOOR GRILLS CAN BE USED.
0999	SURAT GARH	R	0327	35521	064	AA	01	AU	T-SECTION 2NOS. ONLY SUPPLIED INSTEAD OF 4 NOS.	SITE IS REQUESTED TO FABRICATE USING MATL. FROM PGMA 35-993,DU.025.
1203	SURAT GARH	R	0327	36250		AA	20	PU	ITEM NOS NOT IDENTIFIED.HENCE MATERIALS ARE NOT SUPPLIED	SITE IS REQUESTED TO USE THE ERECTION MATERIALS
1206	SURAT GARH	R	0327	35443	052	AA	51	AU	THE BEAM LENGTH IS SHORT BY 200 MM.	SUITABLE JOINT MADE WITH SPLICE PLATE IS ACCEPTABLE.MATL. WILL BE SENT ALONG WITH PGMA 36-993.
1207	SURAT GARH	W	0327	35521	031	AA	01	AU	THE QTY OF PLATES SUPPLIED IS LESS	SITE ACTION ACCEPTED.MATL CAN BE TAKEN FROM PGMA35-9930F DU.NO:022
1331	SURAT GARH	R	0327	36300	019	AA	01	NU	ITEM NO 18,ISMB QUANTITY SUPPLIED IS LESS BY 2 NOS	THE MATL. WILL BE SENT IN PGMA 36-393 SHORTLY.COST DEBIT NOT ACCEPTED.
1354	SURAT GARH	R	0327	36260	001 003	AA	42	NU	DUE TO SHIFTING OF ITEM 01 & 03,SITE HAS TO USE 1000MM FLOOR GRILL INSTEAD OF 900MM.	SITE ACTION ACCEPTED.EXTRA FLOOR GRILL AVAILABLE IN PGMA 36-811 CAN BE USED.
1355	SURAT GARH	R	0327	36820	--	AA	45	AU	WHILE CLIMBING THE STAIRS HEAD IS HITTING AGAINST THE TOP STAIRS.	STAIR CASE REARRANGED TO HAVE A REQUIRED HEAD ROOM BY SITE IS ACCEPTED.

APPENDIX B

The various charts of defect analysis are presented here. The charts give the exact defect trends of products as well as projects. The charts are drawn by using Excel package and the numerical values are obtained by proper programmes, which are given in Appendix A.

The charts provided the details of

*   Which defect code

*   Which agency

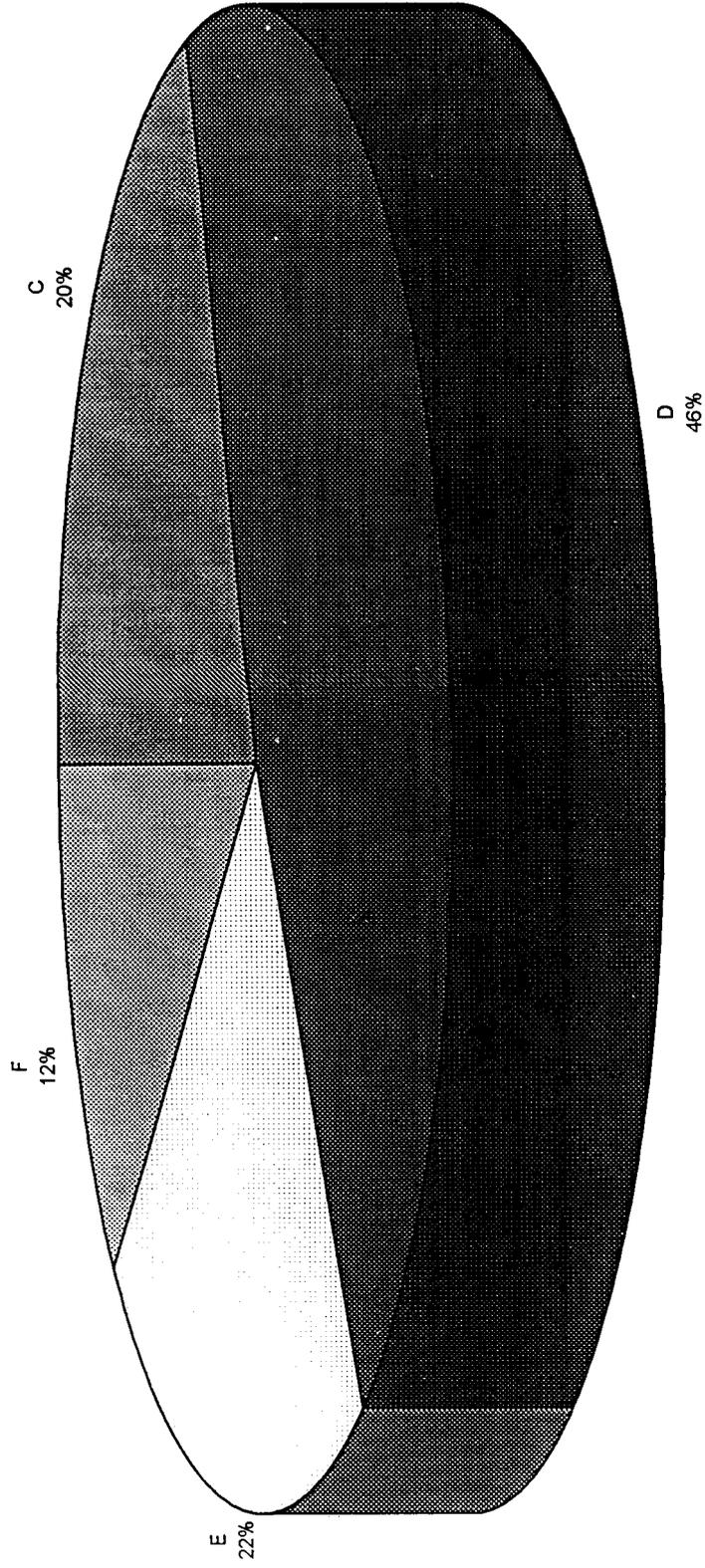*   Which PGMA

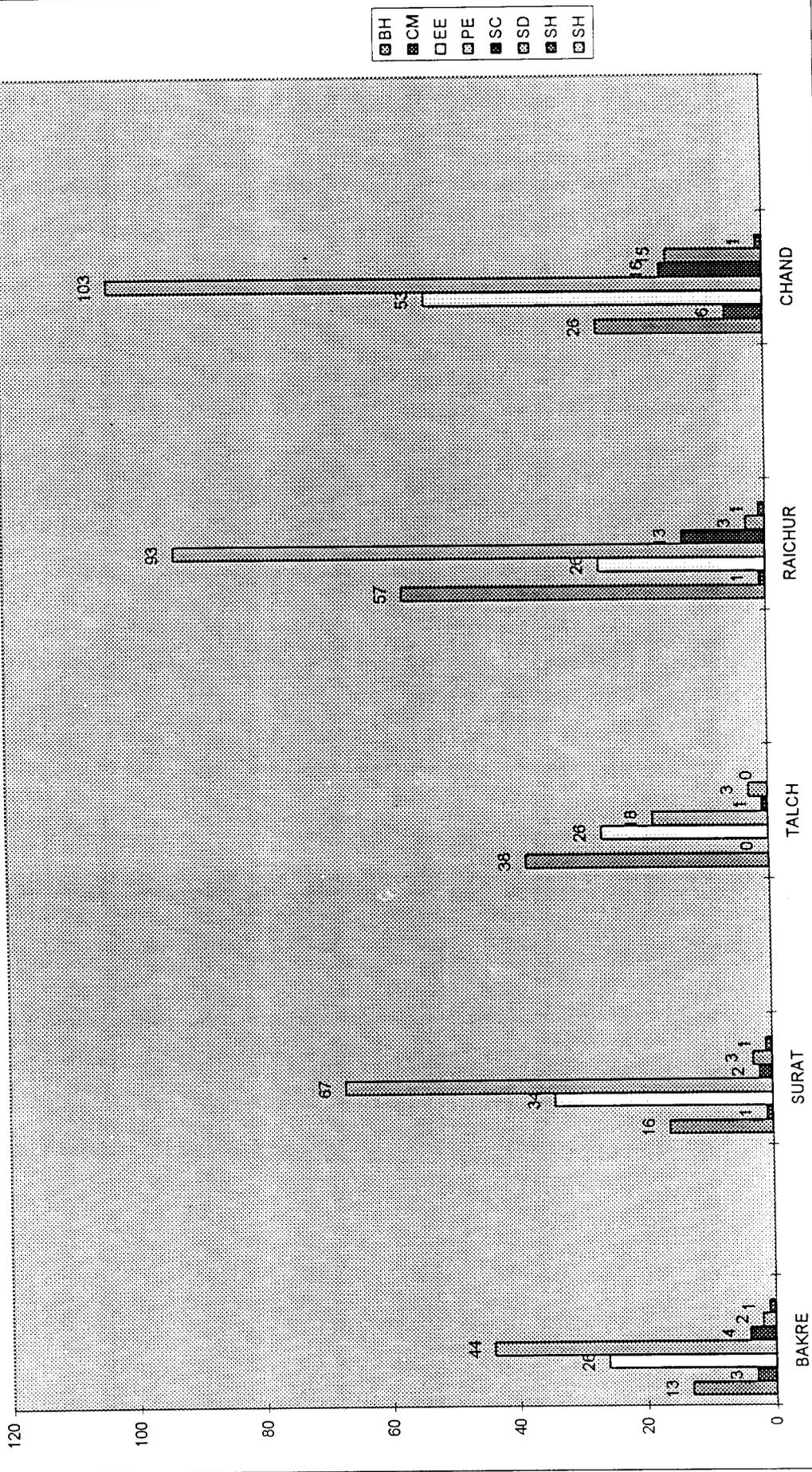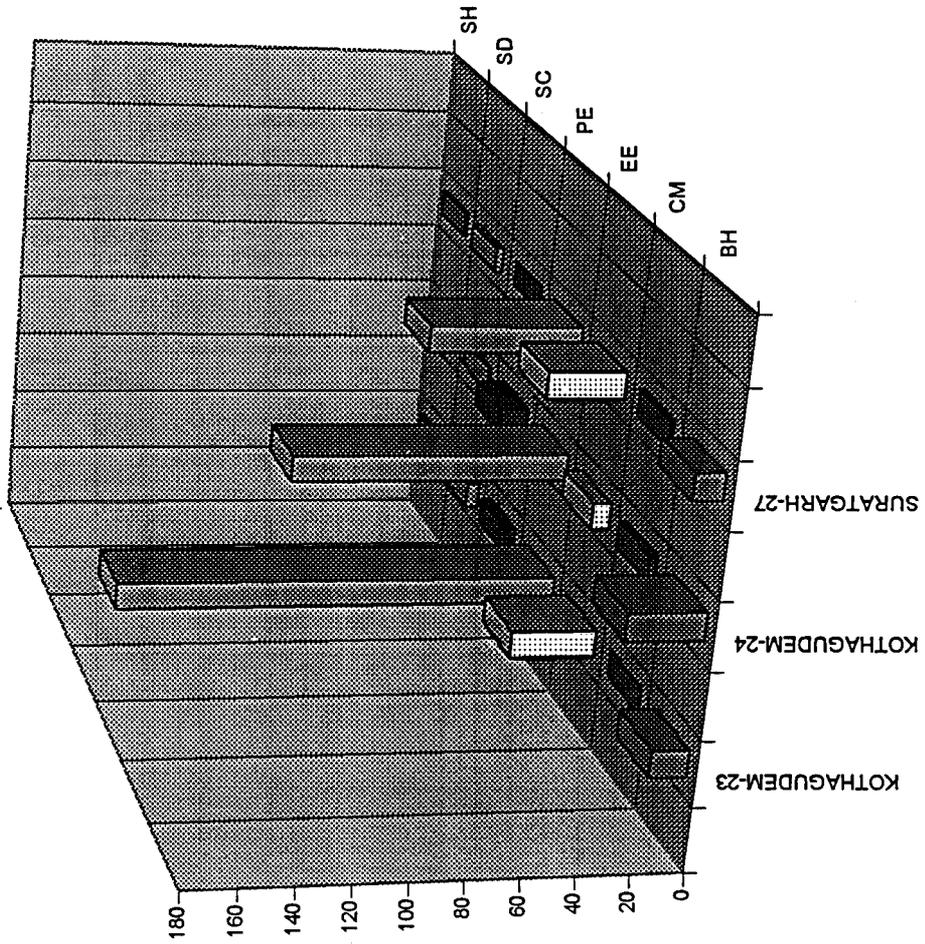- is having more number of defects, thus indirectly gave the exact area of further development.

BOILERS-250MW

Legend: C, D, E, F

Categories: KOTHAGUDEM-23, KOTHAGUDEM-24, SURATGARH-27

Y-axis: 0, 20, 40, 60, 80, 100, 120, 140, 160, 180

SURATGARH-27   TOTAL-146

C
20%

D
46%

F
12%

E
22%

C
D
E
F

BAR CHART ; COMBINATION

Legend: BH, CM, EE, PE, SC, SD, SH, SH

BAKRE: 44, 26, 13, 4, 3, 2, 1

SURAT: 67, 34, 16, 2, 3, 1, 1

TALCH: 38, 28, 18, 3, 1, 0, 0

RAICHUR: 93, 57, 26, 3, 3, 1, 1

CHAND: 103, 53, 26, 6, 6, 5, 1

BOILERS-250MW

Legend:
- BH
- CM
- EE
- PE
- SC
- SD
- SH

Y-axis: 0, 20, 40, 60, 80, 100, 120, 140, 160, 180

Categories: KOTHAGUDEM-23, KOTHAGUDEM-24, SURATGARH-27

Series: BH, CM, EE, PE, SC, SD, SH

BOILERS-250MW
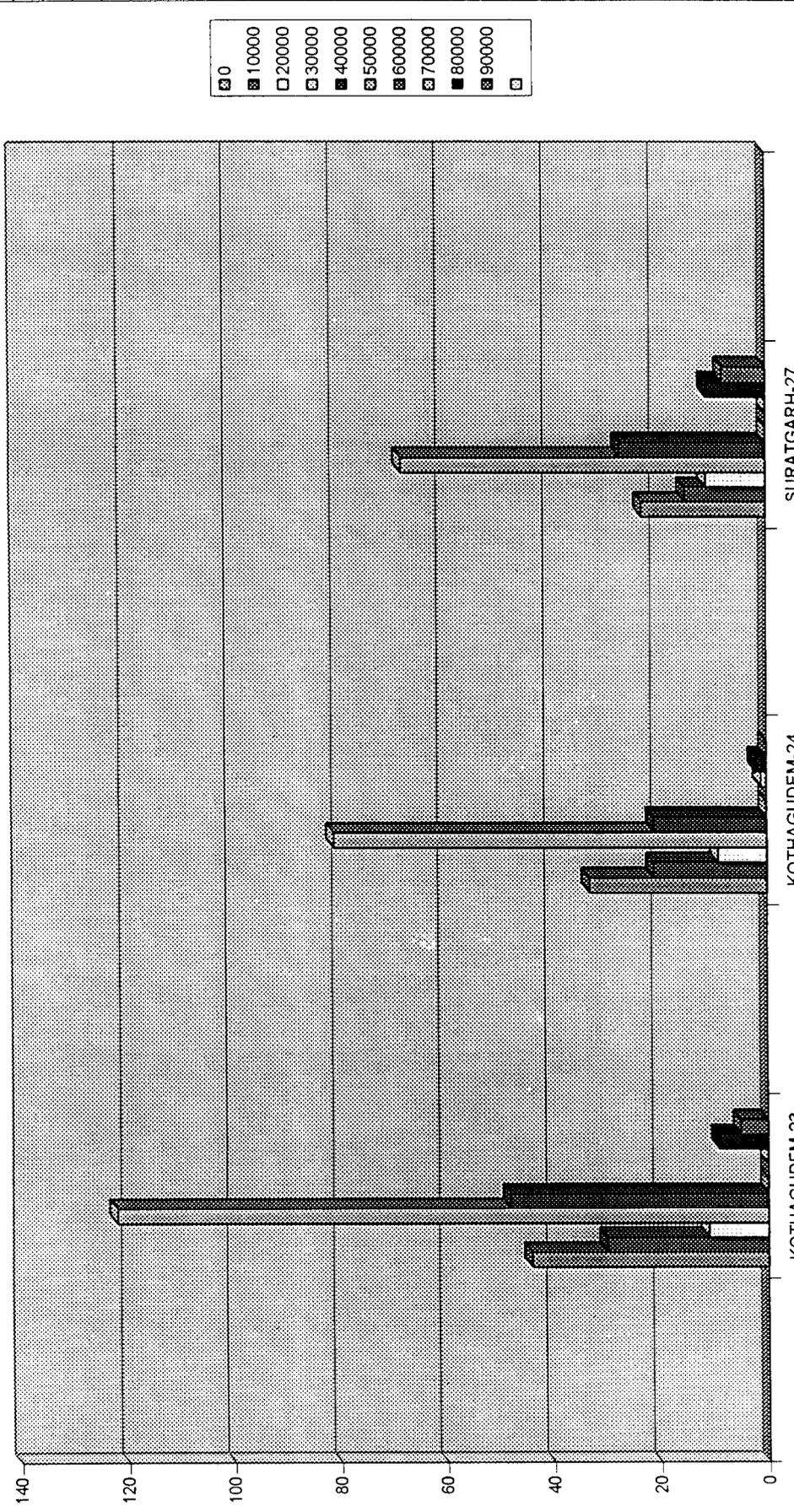
Legend: 0, 10000, 20000, 30000, 40000, 50000, 60000, 70000, 80000, 90000

X-axis categories: KOTHAGUDEM-23, KOTHAGUDEM-24, SURATGARH-27

Y-axis: 0, 20, 40, 60, 80, 100, 120, 140

DEFECTS ANALYSIS
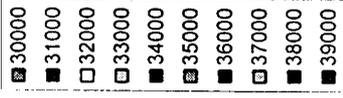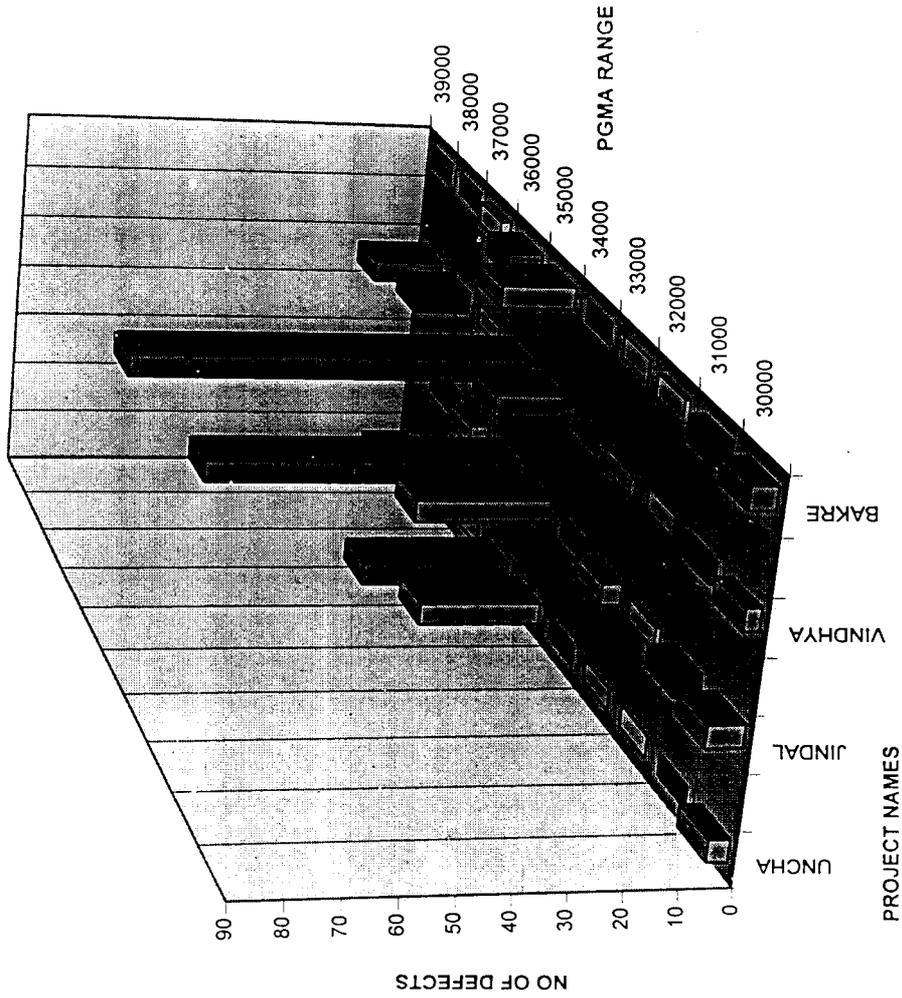
PGMA RANGE	UNCHA	JINDAL	VINDHYA	BAKRE
30000	4	7	3	5
31000	0	5	1	3
32000	0	1	0	1
33000	0	4	1	0
34000	0	0	0	0
35000	25	28	14	15
36000	31	66	83	7
37000	0	4	0	2
38000	0	2	12	0
39000	10	55	15	0

Legend: 30000, 31000, 32000, 33000, 34000, 35000, 36000, 37000, 38000, 39000

DEFECTS ANALYSIS

NO OF DEFECTS — PROJECT NAMES (UNCHA, JINDAL, VINDHYA, BAKRE) — PGMA RANGE (30000–39000)

APPENDIX C

Updation steps of the project application is herewith enclosed in Appendix C. Basically this thesis work related with some software work under Quality Engineering. This thesis is the step of contionous quality improvement. The appendix gives the steps how the programming could be used for the furture records of company's daily management activities.

STEPS TO UPDATE THE PROJECT APPLICATION

1, COPY THE NEW FILE TO - l/sang DIRECTORY

   (say file name new)

2, OPEN THE PRGRAM FILE WHICH ARE GIVEN BELOW FOR THEIR OWN

PURPOSE BY USING

   - modi comm (file name) COMMAND.

   > NCS & NCSI (for INTEGRATION)

   > DEFCODE4 & DEFCODE (for PRIORITISING / DEFCODE)

   > DEFCODE & DEFCODE1 (for CAPACITY / DEFCODE)

   > BAR4 & BAR1 (for PRIORITISING / AGENCY)

   > BAR2 & BAR (for CAPACITY / AGENCY)

   > PGMA3 & PGMA (for PRIORITSING / PGMA)

   > PGMA2 & PGMA1 (for CAPACITY / PGMA)

   > SEN2 & SEN20 (for SAR - PROJECT)

   > SEN4 & SEN40 (for SAR - BOILER)

3, ADD A STATEMENT IN THE PROGRAM TO INCLUDE THE NEW FILE TO

PROGRAM ACTION

   -- the statement is

      -append from (file name i.e., new) for proj = trim (xxx)

   -- THUS WE CAN UPDATE THE MENU FOR FUTURE USE.

INDEX

BIBLIOGRAPHY

Papers

1. **DAVID BAINES,** "Delighting the customers".

2. **DAVID PROCTER,** "Training for Total Quality".

3. **DR. HENRY R. NEAVE,** "Deming - a new dimention in quality".

4. **KEN SANDERS,** "Training for Total Quality".

5. **S. SRINIVASAN, S.K. VERMA,** "Problem Solving Techniques for Quality Circles".

Books

1. **BARRIE DALE & CARY COOPER,** *"Human Resources & Total Quality - An executive's hand book",* Beacon Books, A blackwell Asia Imprint, New Delhi.

2. **CHARLES.P.COVINO & ANGELO .W. MECHRI,** *"QA Manual - Procedures and forms for the establishment of a plant wide quality assurance system",* The Indl. press, 93 worth street, Newyork - 13.

3. **DARCY.E. HITCH COCK & MARK GRAHAM BROWN & MARSHA.L. WILLARD,** *"Why TQM fails & what to do about it",* Irwin, Professional publishing, Newyork.

4. **DAHLGAARD.J.J. & KRISTENSEN.K. & KANJI.G.K.,** *" The Quality Journey - A Journey without an end",* Productivity press (India PVT. Ltd.,) Madras.

Handbooks

1. *Quality Management Hand Book* - CIMA, published in association with the
    Chartered Institute of Management Accounts.

2. *TQM Hand Book* - A Peratec Executive Briefing, Chapman & Hall, Second
    Edition.