REDUCTION OF REJECTION PARTS IN AUTOMOBILE COMPONENTS MANUFACTURING INDUSTRY

A PROJECT REPORT p.2338

Submitted By

BALAGANESH.G.K - 71206409001

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COIMBATORE – 641 006

ANNA UNIVERSITY :: CHENNAI 600 025

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ANNA UNIVERSITY :: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report entitled **"Reduction of Rejection Parts in Automobile Components Manufacturing Industry"** is the bonafide work of

Mr.BALAGANESH.G.K. - **Register No. 71206409001**

Who carried out the project work under my supervision.

Signature of the HOD

Signature of the Supervisor

Internal Examiner

External Examiner

Department of Mechanical Engineering

KUMARAGURU COLLEGE OF TECHNOLOGY

COIMBATORE - 641 006

CERTIFICATE

SAKTHI AUTO COMPONENT LIMITED

Mukasi Pallagoundenpalayam, Erode - 638 056.

CERTIFICATE OF PROJECT WORK

This is to Certify that

Mr. / ~~Mrs.~~ / ~~Ms.~~ / .....B.A.BHAGAN, M.E., (Industrial Engineering).....
FROM: KUMARAGURU COLLEGE OF TECHNOLOGY, COIMBATORE.

Has done project work in our industry

from .....31/08/2007..... *to* .....22/02/2008.....

for a period of .....6 Months.....

.....TITLE: ANIMATION OF ARCASTION PARTS IN AUTOMOBILE COMPONENTS MANUFACTURING INDUSTRY.

His / ~~Her~~ conduct and behaviour were .....Good.....

Date : 22/02/2008

For ~~*By.*~~ *General Manager (Admn.)*

Erode Sengunthar Engineering College

Thudupathi, Erode - 638 057. Tamilnadu

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on

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February 7 & 8, 2008

CERTIFICATE

This is to certify that Dr. / Mr. / Ms. G. K. BALAGANESH

of Kumaraguru College of Technology *has participated and presented a paper in the National Conference on " Advances and Contemporaries in Mechanical Engineering - ACME 2008" organized by the Mechanical Engineering Department of our College .*

Title of the Paper : Reducing Rejection part using Qc Tools in Automobile Components Manufacturing Industries

Author (s) : S. NARAYANA MOORTHY

P.S. SIVA SAKTHIVEL

P. Swaminathan
Head of the Department

Principal

Correspondent

KUMARAGURU COLLEGE OF TECHNOLOGY

COIMBATORE , TAMILNADU

DEPARTMENT OF MECHANICAL ENGINEERING & KCT-TIFAC CORE

ADVANCES IN MECHANICAL SCIENCES

CERTIFICATE

This is to certify that Mr/Ms/Mrs G.K.BALAGANESH

has participated and presented a paper titled Reduction of rejection parts in automobile components mfg. industry

in the 2nd National Conference on "ADVANCES IN MECHANICAL SCIENCES" during 27- 28, March 2008.

Dr.P.PALANISAMY
CO-ORDINATOR

C Sivanandan
Dr.C.SIVANANDAN
CONVENOR & DEAN

Dr.JOSEPH V.THANIKAL
PRINCIPAL

ABSTRACT

ABSTRACT

More number of rejections happens in the critical automobile components in the production line.Brakedrum is one of such component which plays vital role in improving fuel economy, vehicle emissions and performance. In This paper some of the quality tools such as cause and effect diagram, parato diagram, control charts are used to determine the factor which contributes the most towards the rejection of components. Then a study is made on the capability of the resources (men, machine, etc) available in the plant so as to determine the resource which is most influential in causing the rejection. The study revels that human factor is the most influential factor. So the theory concepts of HR management are used for effectively utilizing of human resource to reduce the rejection parts and there by increasing the productivity.

ஆய்வு சுருக்கம்

செயல் தடத்தில் உய்யத் தானியங்கி உதிரிபாகங்ள் அதிக எண்ணிக்கையில் தவறாக உற்பத்தி செய்யப்பட்டு ஒதுக்கப்படுகிறது. இதில் முக்கியமான ஒரு உதிரிபாகம் பிரேக் டிரம் ஆகும். இது வண்டியின் எரிபொருள் சிக்கனம், மாசுக்கட்டுப்பாடு, செயல்திறன் ஆகியவைகளை இது அதிகரிக்கிறது. அதிகான எண்ணிக்கையில் ஒதுக்கபட்ட உற்பத்தியாவதற்கான காரணிகளை காரணம் மற்றும் விளைவு வரைபடம், பேரட்டோ வரைபடம், கட்டுபாடு வரைவு ஆகிய தரக்கருவிகள் இத்திட்டத்தில் பயன்படுத்தப்பட்டுள்ளன. தவறான பிரேக் டிரம்கள் வருவதற்கான மிகவும் முக்கிய பங்கு வகிக்கக் கூடிய வளங்களை (மனித வளம், இயந்திரம்) ஆய்வு செய்பட்டுள்ளது. இதில் அதிகமாக உதிரிபாகங்கள் ஒதுக்கப்படுவதற்கான காரணம் மனித வளம் என்று கண்டறியப்பட்டுள்ளது. ஆகையால் மனிதவள மேலாண்மை கோட்பாட்டை பயன்படுத்தி மனிதவளத்தின் பயன்திறன் அதிகரிக்கப்பட்டு தவறான பிரேக் டிரம் வருவதை தவிர்த்து, உற்பத்தி அதிகரிக்கப்பட்டுள்ளது.

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BALAGANESH.G.K

CONTENTS

LIST OF CHARTS

INTRODUCTION

1. INTODUCTION

Every manufacturing organization is concerned with the quality of its product. While it is important that quantity requirement are satisfied and production schedules met. It is equally important that the finished product meet established specifications. Because customers satisfaction is derived from quality products and services. Stiff competition in the national and international level and consumers' awareness require production of quality goods and services for survival and growth of the company. Quality and productivity are more likely to bring prosperity into the company and improve quality of work life.

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

The quality depends on the perception of a person in a given situation. The situation can be user oriented. cost – oriented (or) supplier - oriented. Since item is manufactured for the use of the customer, the requirements of the customer dictates the quality of the product. Quality is to be planned, achieved controlled and improved continuously.

Hence the management has to identify and take preventive steps in order to achieve. total quality. The decision made should continuously improve the quality.

The quality control tools such as parato diagram. control charts and ishikawa diagram are used in this work to enhance the quality. This work is carried out at SACL limited, erode, tamilnadu.

COMPANY PROFILE

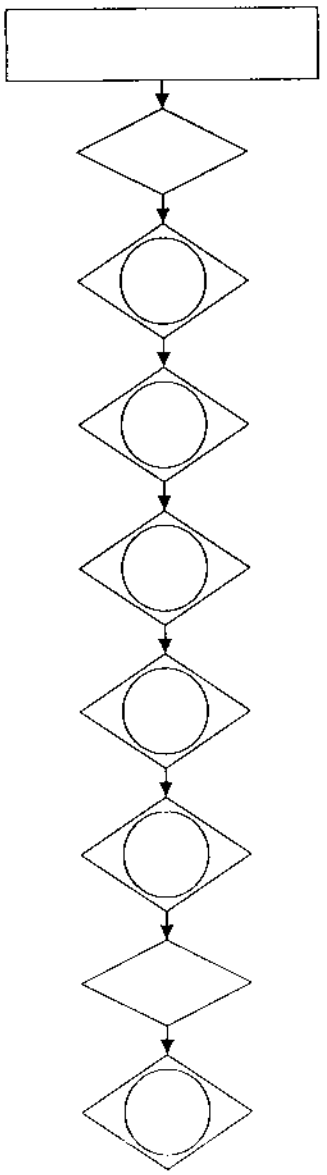
CHAPTER 2

COMPANY PROFILE

2.1 BRIEF OF SACL

- Sakthi Auto Component limited is one among the MULTI FACETED sakthi group situated at mukasi pallagoundenpalayam, erode district, tamilnadu state, India, established in the year 1983.
- Sakthi auto has a capacity to produce 24000 tones/annum of S.G.IRON castings on a 100 acre land.
- SACL is major supplier of critical components to passenger car manufacturers. The components are Steering knuckles, Brake drums, Brake dises, Hubs, Brake calipers, Carriers, Differential cases and Manifolds etc.
- Presently the suppliers of these components are made to Maruthi udyog ltd., Hyundai, Ind auto ltd., Ford, Honda siel cars and Tractors and farm Equipments ltd. Etc.,
- Sakthi Auto Components limited has been awarded the INDUSTRIAL SAFETY AWARDS for three consecutive years.
- It has also been recognized by Maruthi Udyog limited as a first class critical component vendor

2.2 Machining process: (Brake Drum)



OD & ID premachining received from suppliers

Receiving inspection

OD finishing

ID finishing

Drilling

Chamfering

Tapping

Final inspection

Honing

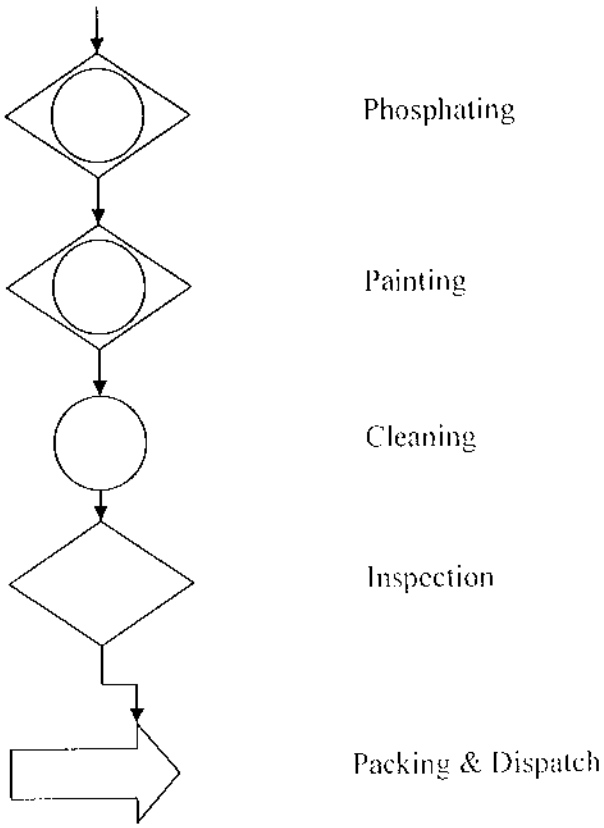

Phosphating
Painting
Cleaning
Inspection
Packing & Dispatch

FIG 1

LITERATURE REVIEW

CHAPTER 3

LITERATURE REVIEW

Following are the overview of the relevant work done earlier related to the problem identified and the methodology to be adopted from various research papers published in international and national journals, proceeding of various conferences and books.

Jiemin Wang, et al. [1], developed pattern. recognition system designed to detect and analyze various patterns that can occur on sqc charts. This system not only looks simple patterns, such as trend, shift and stratification, but also for superimposed patterns, such as trend + shift. The effect of noise associated with individual patterns is also amassed. The benefits of the approach compared with the alternatives are discussed.

M. A. Mannan, et al. [2], describes a method of checking the spindle Assembly by making vibration measurements. From these Measurements it is possible to determine which bearings (if any) are not at their design stiffness. This then allows appropriate Adjustments to be made to ensure the assembled spindle
Is close to the design specifications. These results, good machining.

Nandini das, [3], tells how statistical process Control technique is a well-known analytical technique, which is used to solve quality problems in industry and this technique was used to solve a quality problem through planned data collection and the use of statistical tool. Pareto analysis showed that a dragging problem was the most frequent problem. Coefficient of friction (cof) was identified as the root cause. Optimum conditions of the process Parameters were obtained using design of experiments via Taguchi's orthogonal array. Thus dragging problem reduced.

Fredrik Engelhardt presents an approach for solving design problems in existing designs. The design analysis is combined with a thorough investigation of possible problems within the design, utilizing the seven quality tools, noise factor analysis, and designed experiments to form an approach for quality improvements and problem solving. Thus, a combination of product modeling by Axiomatic Design and designed experiments overcomes shortcomings of the two methods. The benefits of performing a Design Object Analysis, as compared to other methods, become clear when it comes to evaluating the results from the designed experiment, and preventing the problem. Once the critical parameters are confirmed, and the design matrices are updated, suggested design improvements can then be checked against the design matrices, and the system effect of a design-change-order can be estimated.

Chih-chou chiu, et al, [4], describes the EPC and neural network scheme were integrated in identifying the assignable causes of the underlying disturbance. For finding the appropriate setup of the networks' parameters, such as the number of hidden nodes and the suitable input variables, the all-possible-regression selection procedure is applied. For comparison, two SPC charts, shewhart and cumulative sum (cusum) charts were also developed for the same data sets, as the results reveal, the proposed approaches outperform the other methods and the shift of disturbance can be identified successfully.

Michael I. Zeifman, et al, [2], showed various models for discrete manufacturing systems (parts industry) can be treated as bounded discrete-space markov chains, completely characterized by the original in-control state and a transition matrix for shifts to an out-of-control state. The present work extends these models by using a continuous-state markov-chain, incorporating non-random corrective actions. These actions are to be realized according to the SPC technique and should substantially affect the model. The developed stochastic model yields Laplace distribution of a process mean. Real-data tests confirm its applicability for the parts industry and show that the distribution parameter is mainly controlled by the SPC sample size.

Paul H.P. Yeow, et al [2], Ergonomics applied to MCI lines of the PCA factory was very effective as shown by the many improvements in P&Q, significant increase in revenue and profit, and huge reductions in rejection costs. The occupational health and safety of the workers also improved. The costs of the interventions were low as opposed to the numerous benefits attained.
Each year, factories are challenged with the daunting goals of increasing profit for the company owners, providing price reductions to the customers, and giving large bonus and annual increment to their employees. The present study has shown that investment in ergonomics can generate a very attractive ROI which will help factories to meet their goals. The methods and interventions in this research can be adopted to solve similar problems in the MCI lines of electronic industry. They can also be used in other industries which perform MCI of small parts such as toy assembly, games assembly, etc.

Murugappa (Murgie) Krishnan, et al [2], says a shop-floor supervisor or team leader can raise productivity either directly, by contributing on the line, or indirectly, by helping other team members via training and problem solving. The issue of how supervisors allocate their discretionary time between these two responsibilities. We model a simple sequential game under perfect information, designed to capture salient incentives of worker and supervisor. The degree of productivity increase depends on complementary inputs; in addition to the time a first-line supervisor contributes to indirect effort by helping the worker, the effort of the worker is also required. Implications of the model are tested using data on time allocations of supervisors from a Japanese automobile plant in the US. We find that the supervisory time allocations have a significant effect on productivity in this just-in-time production environment of a capital-intensive auto assembly plant. Empirical results provide evidence consistent with both selected premises and implications of the model.

Bodo Dencker, et al [4], says that the fast pace of change in both technical processes and the organization of work in the production and assembly Facilities of the automobile manufacturing industry continue to make new demands on both employees and training Schemes. The production-integrated video learning system is training programmed which attempts to tackle these tasks. Forms of work organization such as group work require on the one hand, whole understanding of the production process into which the operation is integrated, and on the other, of the product being made. Thus, in addition to the evaluation of the time-related quality data obtained from the particular section of the manufacturing process, the worker was provided with information on the quality relationships throughout the company and their consequences. The information coming from work preparation, the Workers knowledge should be especially involved. This was achieved by intense user participation in the PVI creation Process.

Sanjeev Kumar, et al [5], provide a definition for process
Control in CNC manufacturing and identify the challenges in achieving process control in current CNC manufacturing scenario. Then introduces a STEP-compliant framework that makes use of self-learning algorithms that enable the manufacturing system to learn from previous data and results in eliminating the errors and consistently producing quality products. The framework relies on knowledge discovery methods such as data mining encapsulated in a process analyzer to derive rules for corrective measures to control the manufacturing process. The design for the knowledge-based process analyzer and the various process control mechanisms conclude the paper.

DATA COLLECTION

CHAPTER 4

DATA COLLECTION

4. REJECTION DATA:

PRODUCT: BRAKE DRUM

S.NO.	DEFECTS	REJECTION QUANTITY	CUMULATIVE REJECTION QUANTITY
1.	DIA 52 OVERSIZE	154	154
2.	DIA 47 OVERSIZE	86	240
3.	OUTER DIA DENT	49	289
4.	DIA 52 UNDERSIZE	34	323
5.	DRILL SHIFT	21	344
6.	DIA 47 UNDERSIZE	17	361
7.	DENT	17	378
8.	RUST	16	394
9.	DIA 47 KNURLING	12	406
10.	44.2 UNDERSIZE	11	417
11.	FACE DENT	11	428

12.	DIA 47 CHAMBER OVER SIZE	10	438
13.	BRAKE SHOE AREA UNDERSIZE	10	448
14.	DIA 52 TAPER	9	457
15.	DIA 52 TOOLMARK	9	466
16.	DIA 52 UNDER CUT	8	474
17.	DIA 47 ACE DENT	8	482
18.	DIA 47 TOOL MARK	8	490
19.	44.2 OVERSIZE	8	498
20.	BRAKE SHOE AREA DENT	8	506
21.	BRAKE SHOE AREA KNURLING	7	513
22.	BRAKE SHOE AREA TOOL MARK	7	520
23.	BRAKE SHOE AREA CHAMPER DENT	5	525
24.	DIA 47 UNDER CUT	5	530
25.	2.2 OVERSIZE	5	535
26.	192 FACE DENT	4	539
27.	BRAKE SHOE AREA LINE	4	543
28.	BRAKE SHOE AREA UNDERCUT	4	547
29.	DIA 52 STEP	4	551
30.	OUTER DIA UNDER CUT	3	554
31.	SALT SPRAY RUST	3	557
32.	NOT QUALIFY	3	560
33.	DIA 52 UNWASH	3	563
34.	DIA 55 OVERSIZE	2	565

35.	DIA 52 DENT	2	567
36.	DIA 52 FACE DENT	2	569
37.	FACE LINE	2	571
38.	FACE TOOL MARK	2	573
39.	DIA 47 STEP	2	575
40.	BRAKE SHOE AREA DEPTH STEP	2	577
41.	BORE DENT	2	579
42.	47 CHAMBER DENT	2	581
43.	47.5 DEPTH UNDER CUT	1	582
44.	52 DEPTH UNDER CUT	1	583
45.	12 UNDERSIZE	1	584
46.	22 UNDERSIZE	1	585
47.	67 DENT	1	586
48.	9.5 DEPTH VARIATION	1	587
49.	DIA 47 TAPER	1	588
50.	DIA 47 LINE	1	589
51.	BRAKE SHOE AREA UNWASH	1	590
52.	BRAKE SHOE AREA DEPTH STEP1	1	591
53.	DIA 12 OVERSIZE	1	592
54.	DIA 192 UNDERSIZE	1	593
55.	GROOVING CHAMBER OVERSIZE	1	594
56.	GROOVING OUTER DIA STEP	1	595
57.	GROOVING OVERSIZE	1	596
58.	FACE OUT	1	597
59.	FACE STEP	1	598
60.	DIA 52 CHAMBER DENT	1	599
61.	OUTER DIA FACE DENT	1	600

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62.	OUTER DIA CHAMBER DENT	1	601
63.	OUTER DIA STEP	1	602
64.	OUTER DIA TOOL MARK	1	603
65.	SPOT FACE LINE	1	604
66.	SPOT FACEING DENT	1	605
67.	WALL THICKNESS OVERSIZE	1	606
68.	WALL THICKNESS UNDERSIZE	1	607
69.	OUTER DIA UNWASH	1	608
	TOTAL REJECTIONS=>	**608**	

TAB 1

4.1 STATEMENT OF BRAKE DRUM REJECTION:

Brake drum rejection particulars were collected for the years 2006 & 2007 and given in the following table:

SI.NO.	DEFECTS	YEAR 2006 (Nos)	YEAR 2007 (Nos)	AVERAGE (Nos)
1.	DIA 52 OVERSIZE	2030	2406	2218
2.	DIA 47 OVERSIZE	1037	1104	1070.5
3.	OUTER DIA DENT	656	712	684
4.	DIA 52 UNDERSIZE	478	520	499
5.	DRILL SHIFT	309	343	326
6.	RUST	210	244	227

TAB 2

PROBLEM DEFINITION

CHAPTER 5
PROBLEM DEFINITION

5.1 Classification of problems

Problems really worth solving (Type A)

Problem of this type are extremely difficult, since neither their causes nor their countermeasures are known.

Problems requiring a high level of technology (Type B)

A problem fells into this category if we have identified its causes from the existing conditions in the workplace but do not know how to solve it.

Simple problems (Type C)

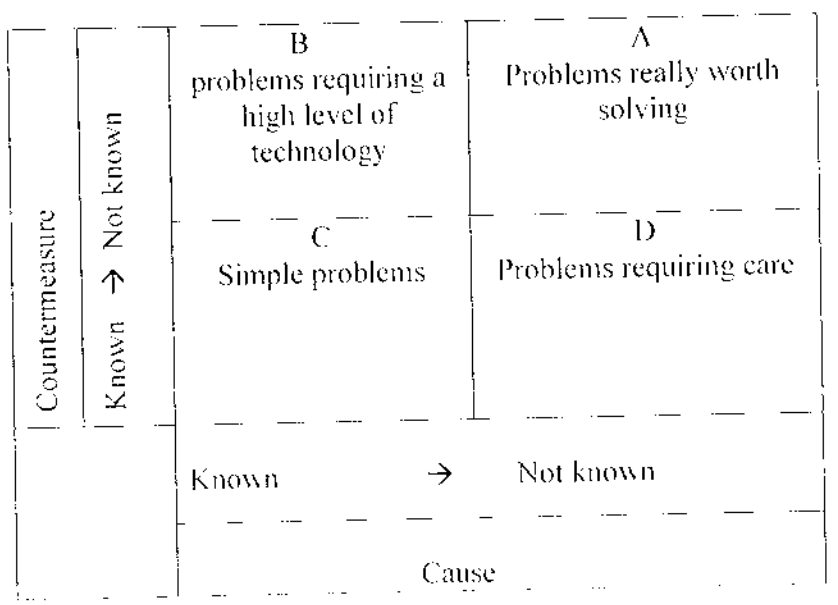
A problem has simple causes and the action needed to solve them is obvious. We can solve this type of problem by using our intelligence based on our existing knowledge experience and skills.

Problems where the necessary action is known but

Where care is required (Type D)

With problems of this type, we known what action to take but do not understand the causes. Such problems require great care. Acting in ignorance of the causes of a problem often means that we are acting against the presenting phenomenon but not eliminating the root causes.

Problem of this type cannot be solved without using QC tools and pooling the talents and abilities of the group to follow the accepted QC problem solving procedure. The benefits that accrue from solving such problems are proportional to their difficulty, and they are the best type for improving people's problem solving skills.



TAB 3

Fig. 5.1. Classification of problems

5.2 Methods of solving problems

There are two main approaches to solving problems.

1. Theoretical approach.

2. QC problem solving approach.

1. The Theoretical approach

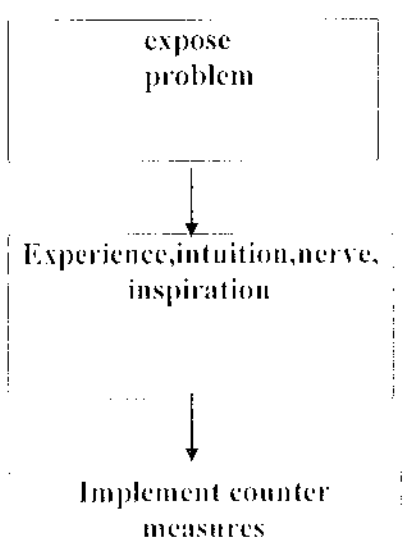
The approach also known as the deductive method is employed to solve problems by using relevant physical,chemical,economical (or) other scientific theories (or) by analog with similar past occurrences.

2. The QC problem solving approach

In this approach could be described as inductive. In this approach we trace the Causes of the phenomenon by repeatedly asking "why?" and identify the root Causes of the problem from the facts.

5.3 The problem solving process

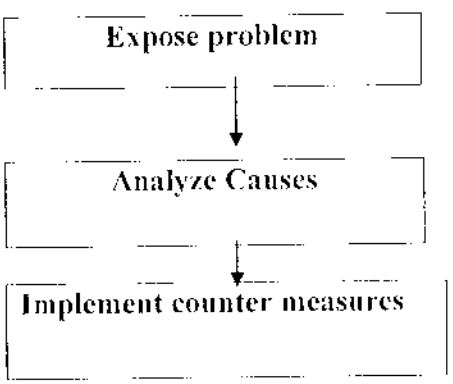
The conventional method of solving problems is based on trial and error. As illustrated in figure 5.1.It consists of examining problems in the light of experience intuition, nerve (or) random inspiration, planning and implementing countermeasures based on this, and starting over again if things do not go well. This approach, however does not work with matters in which we lack experience and fail to solve the problem if our intuition is off the mark.



CHA I

Fig 5.1. The conventional problem solving approach

Fig 5.2. Contrasts this with the QC approach. the QC approach to tacking problems can be split into three main stages and the differences between this and the conventional approach lie in stage 2 in the QC approach, we do not rely merely on experience and random inspiration. but analyze the process based on factual data and accurately identify the factors adversely affecting the results.



CHA 2

Fig 5.2. The QC problem solving – approach

5.4 The QC seven-step formula-solving process the QC way:

Step 1 : Selection of topic.

Step 2 : Understanding situation and setting targets.

Step 3 : Planning of activities.

Step 4 : Analyzing causes.

Step 5 : consider action and implement action of counter Measures.

Step 6 : checking of result.

Step 7 : standardize and establishment of control.

5.5 Benefits of QC problem solving approach:

1. It enables problems to be saved more rationally, scientifically, efficiently and effectively then any other method.
2. It lightens every person's problem – formulating and problem solving abilities and enables every body to fulfill an important role in the workplace.
3. It enables people to acquire the QC view point through solving problems.
4. It enables people to become component in applying the QC tools and allows them to master the scientific approach.
5. It gives tangible benefits, mainly in terms of quality, but also in terms of cost delivery safety, morale, sales and so on.
6. It improves work practices and raises management standards.
7. It boosts the leadership and management abilities of workplace leaders.
8. It promotes the personal growth of individual workplace members.
9. It improves workplace communication and moral and greats cheerful, effective workplaces.
10. It stimulates QC circle and QC term activities.

5.6 Identifying the facts:

In QC we try as far as possible to make our various judgments based on the facts, not on guesswork. Our slogan is "speck with facts".

If we are to take the correct action. It is essential to have a constant accurate grasp of the facts. When we go out and collect data. New facts come to light, and it often becomes clear that our vague guesses based on experience were way off the mark. Checking the facts enables us to devise effective countermeasures leading to good results. It is important to be constantly in command of the facts and to accept them for what they are.

Management by fact" means not making decisions based on experience and intuition alone but acting in accordance with the facts.

In order to base our decisions and actions on the facts, we most first quantity the situation in the form of data and convert our subjective judgments to important to follow the procedure described below.

Step 1 : Closely observe the actual location and actual objects.

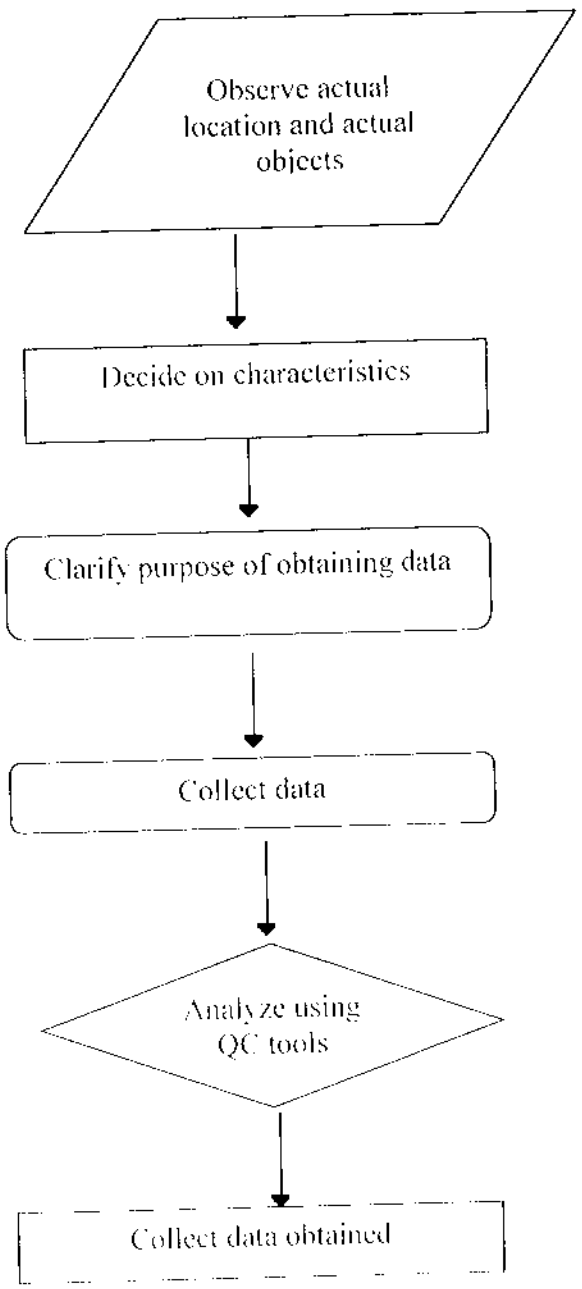
Step 2 : Decide on characteristics to be investigated.

Step 3 : Clarify the objectives of collecting the data.

Step 4 : Collect accurate data.

Step 5 : Carefully analyze the data using QC tools.

Step 6 : Consider the results and produce accurate information.



CHA 3

Fig. 5.6. Identifying the facts

5.7 The seven QC tools

1. Causes and effect diagrams.
2. Parato diagram.
3. Graphs.
4. Check sheets.
5. Histograms.
6. Scatter diagrams.
7. Control Charts.

5.8 QC tools used in this study

The following quality control tools are used in this study.

1. Cause and effect diagram.
2. Parato diagram.
3. Control chart.

The specific reason for selecting the above QC tools are shown in the below table. The cause and effect diagram and parato diagram are giving the effective result in quality and the control charts are giving the effective result in process control.

● Particularly effective

○ Effective

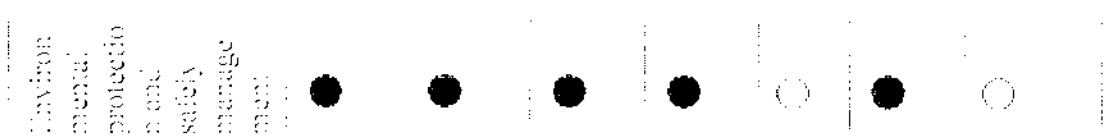


TABLE 1

Type of tool	Tool	Topic / Main use	New product and new technology development	Quality, cost and delivery improvement	Process control	Market surveys, information management	Administration	Sales management	Service management	Environmental protection and safety management
The 7 QC Tool	Cause and effect	Picking up and arranging all possible causes without any omission	○	●	○	○	●	●	●	●
	Parato Diagrams	Singling out the really serious problems from among all the lesser ones	○	●	○	○	●	●	●	●
	Graphs and charts	Making data visual	○	○	○	○	●	●	●	●
	Check sheets	Simplifying data collection and ensuring that no items are omitted when inspection	○	○	●	○	●	●	●	●
	Control charts	Checking whether or not a process is in control	○	○	●	○				○
	Histograms	Plotting the shape of the distribution and comparing it with specifications	○	●	●		●	●	●	●
	Scatter Diagrams	Finding correlation between paired sets of data	○	●	○		○	○	○	○

5.9 HRM USED IN THIS STUDY:

THEORY CONCEPT:

The principal resource of an organization is the people. Managing its people is the most important aspect of managing an organization. Scope of personnel management has also increased considerably in recent years. It is due to external influences, change in expectations from employers and employees, change in technology, production methods, working environment, intense competitions arisen out of globalization of economy and liberalization of trade.

Another major reason for the development of human resource management is gaining of additional knowledge in industrial psychology which gave better insight into the human behavior.

No longer is manpower just one of the resources in industries and business, it is the most important of all resources. This is because manpower is that resource through which management wants to direct and control all other resources like materials, machine, money and others. To keep the human power happy is the most important to reduce the rejection parts and it leads to increases in productivity.

SAMPLING TECHNIQUES:

Convenience sampling is adopted as sampling technique. It comes under category of probability sampling, where each and every item in the population has an equal chance of inclusion in the sample and each one of possible samples in case of finite universes, has the same probability of being selected.

METHODOLOGY

CHAPTER 6

METHODOLOGY:

The methodology adopted for this project work is enlisted below:

1. Collection of primary information regarding manufacturing process.
2. Critically examining factory records.
3. Discussing with departmental heads, shift in charges, operators, maintenance personal etc…
4. Analyzing previous rejection static's.
5. Physical inspection/survey of plants.
6. Identifying causes rejections. Checking the effectiveness of existing system.

DESIGN AND ANALYSIS

CHAPTER 7

DESIGN AND ANALYSIS

7.1 PARATO ANALYSIS:

A parato diagram is a graph that ranks data classifications in descending order from left to right.parato diagrams are used to identify the most important problems. Usually 80% of the total results from 20% of the items. Actually, the most important items could be identified by listing them in descending order. However the graph has the advantage of providing a visual impact. showing those vital few characteristics that need attention.

Construction of a parato diagram:

Step1: Determine the method of classifying the data by problem. cause non conformity Etc..

Step2: decide if dollars. frequency (or) both are to be used to rent the characteristics.

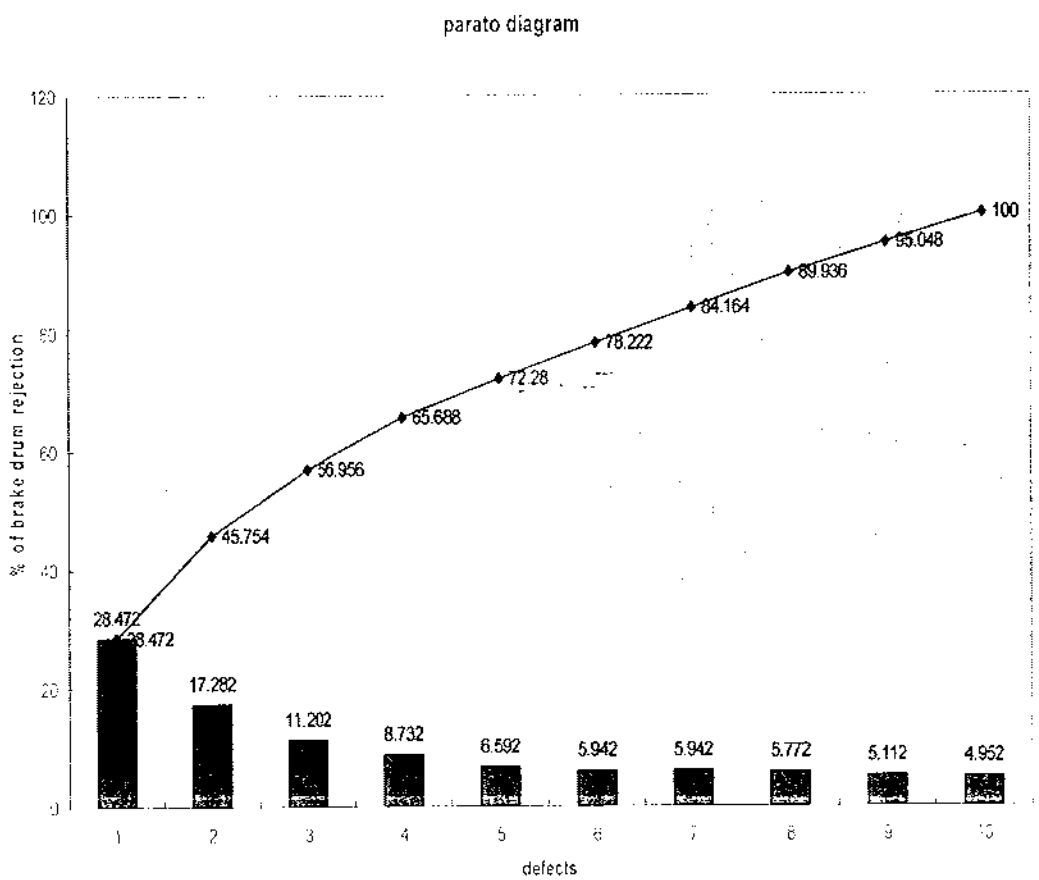
Step3: collect data for an appropriate time interval or use historical data.

Step4: summarize the data and rank order categories from largest to smallest.

Step5: construct the diagram and find the vital few.

The chart has helped in selecting the most important and critical items for improvement.

7.1 PARATO DIAGRAM FOR BRAKE DRUM REJECTION:



CHA-4

FIG: PARATO DIAGRAM FOR BRAKE DRUM REJECTION

7.2 statistical process control :(SPC)

It can be defined as the application of statistical method (or) tools (control charts).to measure, analysis, and control the variation in any process. Statistical process control technique is aimed to prevent the defective work (or) product producing process rather than final product.

7.3 control charts:

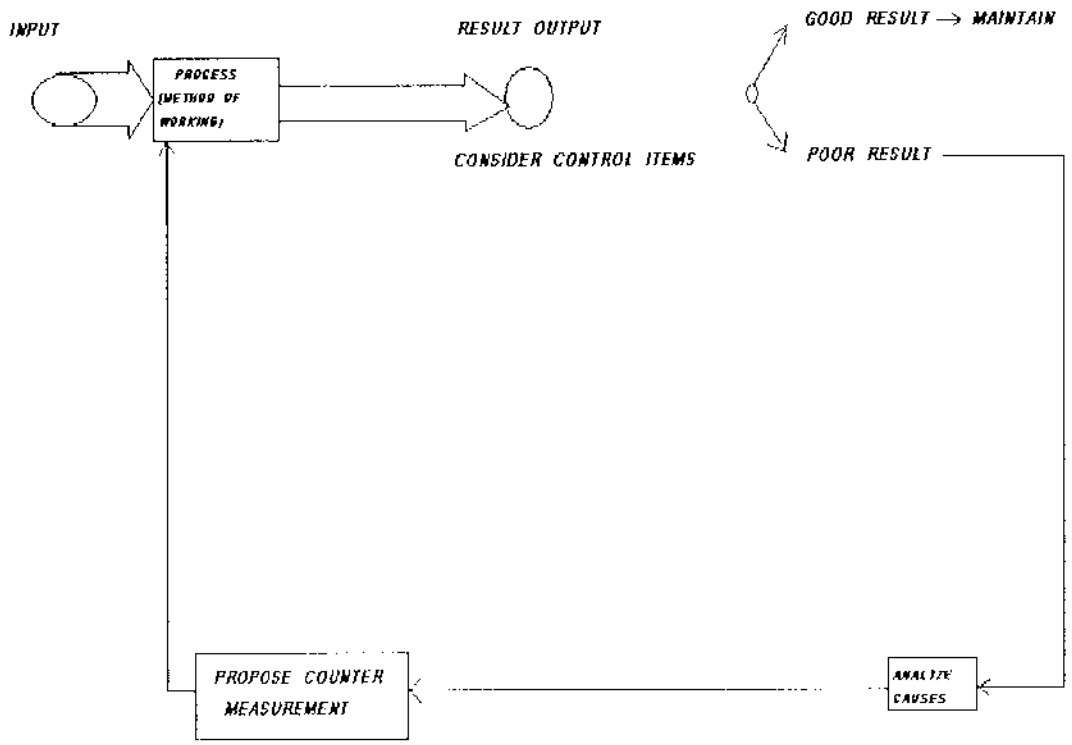
Control chats are a graphical representation of the collected information (or) data (or) quality characteristics.

Scope:

- To tell whether the process is in control or not.
- To secure (or) give information to be used is establishing (or) changing the production procedure.
- To secure (or) give information when it is necessary to widen the tolerance specifications.
- To secure (or) give information to be used in establishing (or) changing the inspection procedure.

SPC is a powerful problem identification method of limited generality. It is applicable to conformance problems in which a highly structured process yields well-specified outputs. Many manufacturing and some service activities fit. This description SPC is less useful of activities with high levels of natural variability (or) where characteristics of the process and its outputs are tailored to each situation.

The meaning of process control as shown in figure.



CHA 5

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X-Chart:

It shows the centering of the process. That is it shows the variation in the average of the sample.

R-chart:

It shows the uniformity (or) consistency of the process that is it shows the variation in the range of the process (or) sample.

FORMULAE:

$\bar{X}$-CHART:

$UCL=\bar{\bar{X}}+A2\,\bar{R}$

$CL=\bar{\bar{X}}$

$LCL=\bar{\bar{X}}-A2\,\bar{R}$

R-CHART:

$UCL=D4\,\bar{R}$

$CL=\bar{R}$

$LCL=D3\,\bar{R}$

POPULATION S.D.$=\bar{R}/d2=\sigma$

PROCESS CAPABILITY RATIO$=(USL-LSL)/6\sigma$

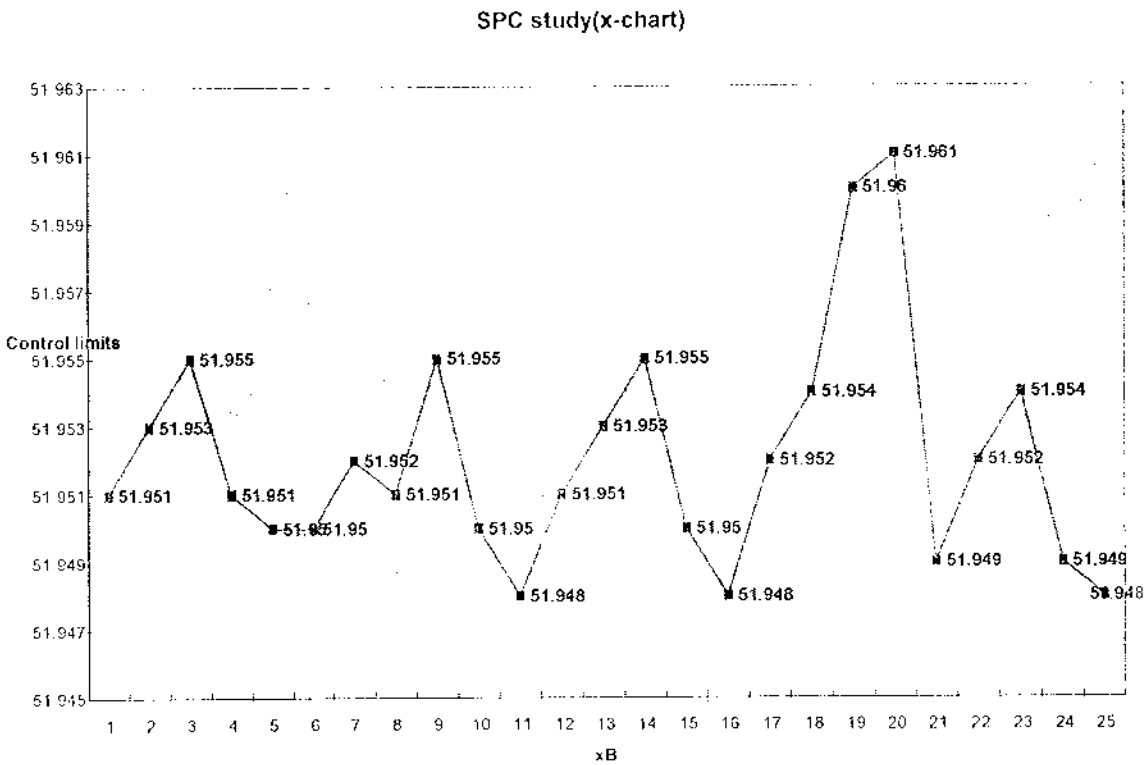
$\bar{\bar{X}}=\Sigma\bar{X}/N$

$\bar{\bar{X}}$=AVERAGE OF AVERAGE
N=TOTAL NUMBER OF SAMPLE

$\bar{R}=\Sigma R/N$

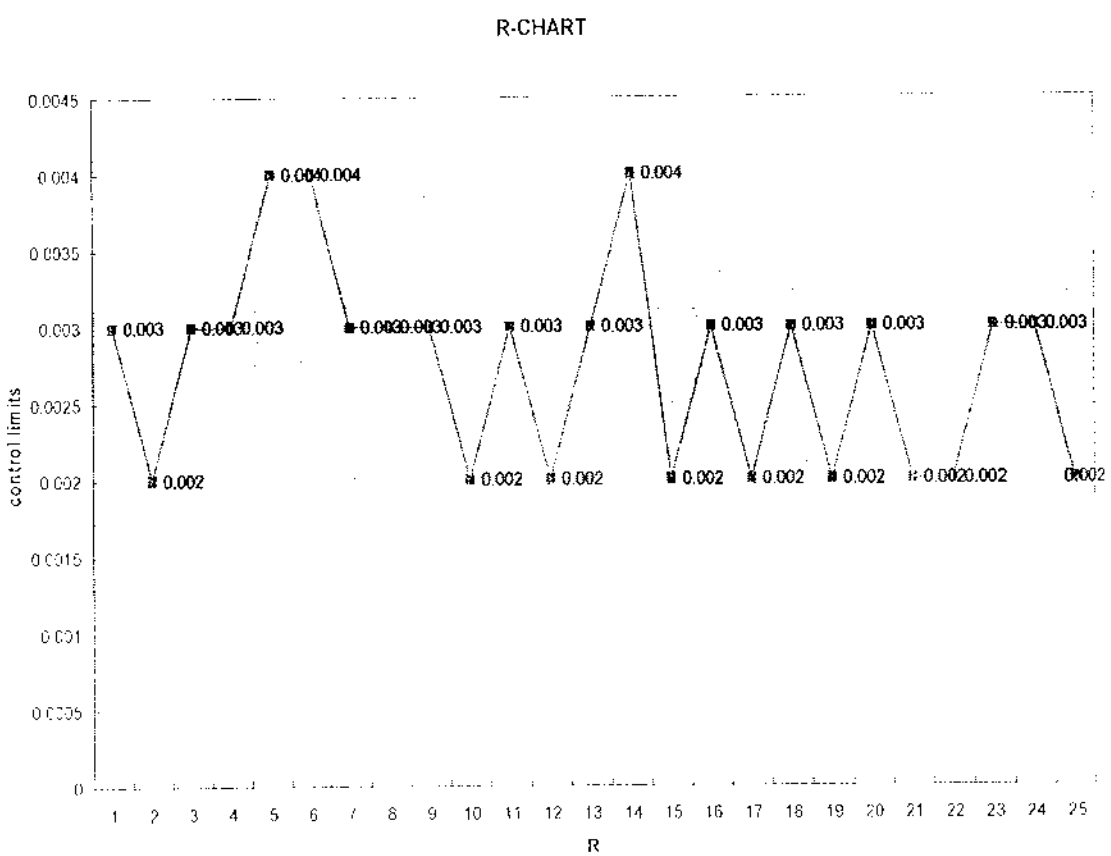
R=RANGE OF THE SAMPLE=HIGHEST VALUE- LOWEST VALUE
N=TOTAL NUMBER OF SAMPLE

SPC STUDY: (X-Chart)



CHA 6

SPC STUDY: (R-Chart)



CHA 7

7.4 CAUSE AND EFFECT DIAGRAM:

Construction of Cause and Effect Diagram:

Step 1 : The project team to identify the effect (or) quality problem.

Step 2 : The quality problem is placed on the right side of the large Piece of paper by the team leader.

Step 3 : The major causes are identified and placed on the diagram.

Step 4 : Determining all the major causes requires brainstorming by the project team.

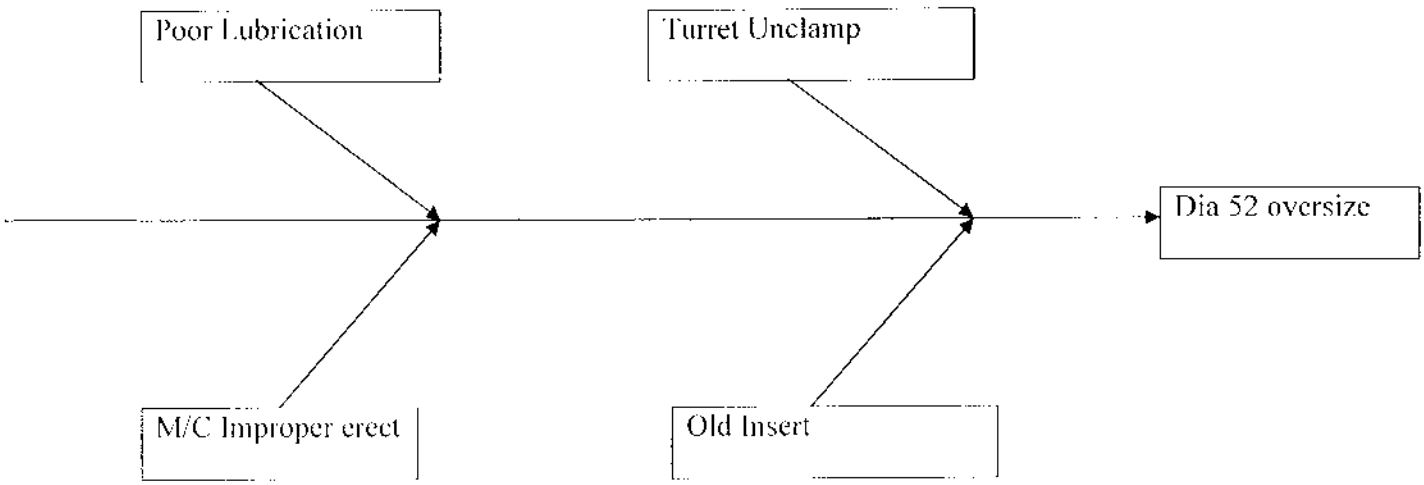
Step 5 : Attention to a few essential will provide a more accurate and Usable result.

Types of causes:

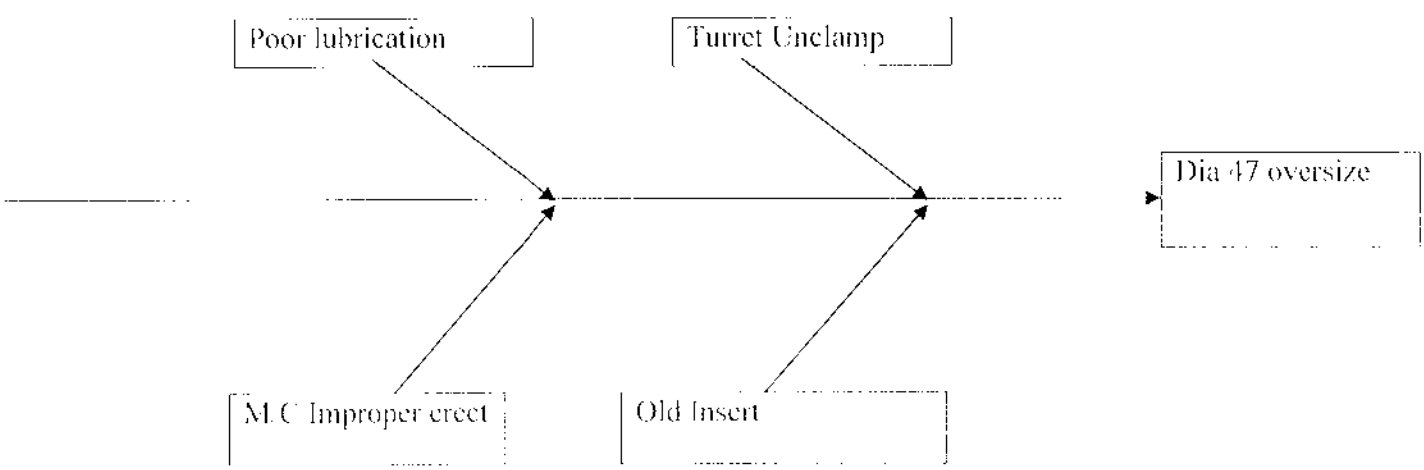
1. Generative causality: The most common in daily affairs, refers to that which produces an effect.
2. Purposive causality: Points to the God (or) purpose of an action. This notion is often used to explain human behavior.
3. Functional causality: Used in science, refers to an explanatory law (or) Principle.
4. Essential causality: Explains events in terms of the natures of the things involved their traits (or) essences.

Key points about causes

1. A single cause can have the multiple effects.
2. An effect can have multiple causes.

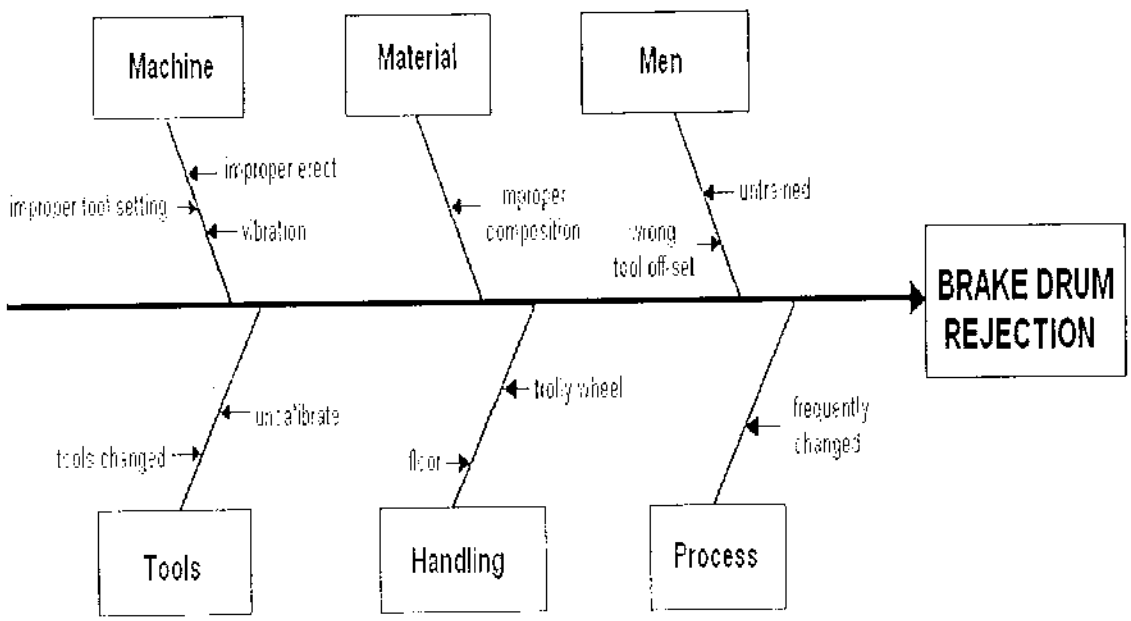


Ishikawa diagram



CHA 8

CAUSE AND EFFECT DIAGRAM FOR BRAKE DRUM REJECTION:



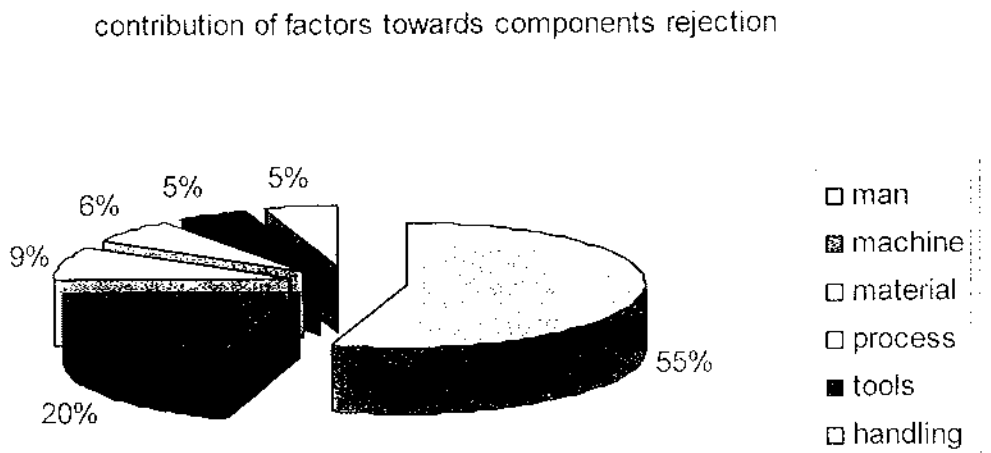
CHA 9

7.5 BRAIN STORMING:

A brain storming session was conducted involving the workers, supervisors and engineers from machine shop different causes for various detects were collected.futher causes were classified so that the causes and effect could be analyzed.

7.6 ANALYSIS AND INTERPRETATION:

CONTRIBUTION OF FACTORS:



Cha 10

ANALYSIS AND INTERPRETATION

TABLE NO-7.1

TABLE SHOWING AGE GROUP OF THE RESPONDENTS

AGE GROUP	NUMBER OF RESPONDENTS	PERCENTAGE
Below20 yrs	2	2.5
21-30 yrs	38	47.5
31-40 yrs	36	45
41-50 yrs	4	5
Total	80	100

INTERPRETATION:-

From the above it is cleared that 47.5% of the respondents are in the age group of 21-30 yrs, 45% of the respondents are in the age group of 31-40 yrs, 5% of the respondents are in the age group of 41-50yrs and 2.5 % of the respondents are in the age group of below 20yrs.

Majority of the respondent are in the age group of 21-30 yrs.

CHA 11

FIGURE -7.1: AGE GROUP

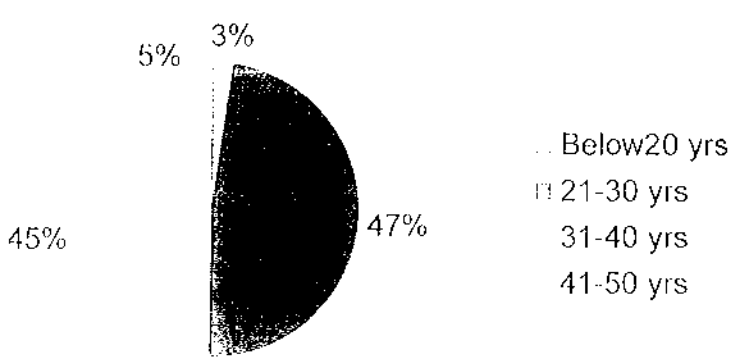


TABLE NO-7.2

TABLE SHOWING GENDER OF THE RESPONDENTS

GENDER	NUMBER OF RESPONDENTS	PERCENTAGE
MALE	42	52.5
FEMALE	38	47.5
TOTAL	80	100

INTERPRETATION

Majority of the respondents 52.5% are male and 47.5% of the respondents are female.

CHA 12

FIGURE-7.2: GENDER

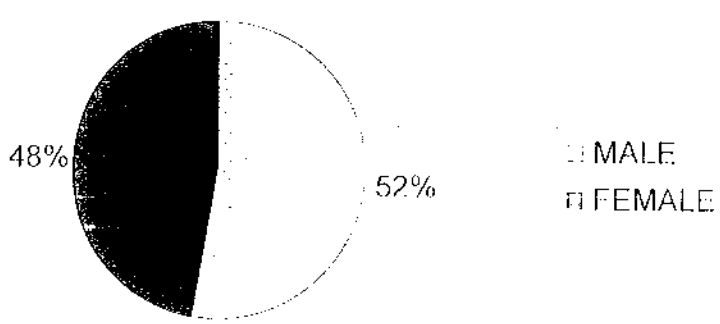


TABLE NO-7.3

TABLE SHOWING MARTIAL STATUS

MARTIAL STATUS	NUMBER OF RESPONDENTS	PERCENTAGE
MARRIED	54	67.5
UNMARRIED	26	32.5
TOTAL	80	100

INTERPETATION

From the above table it is understood that 67.5% of the respondents are married and 32.5% of the respondents are unmarried.

CHA 13

FIGURE-7.3: MARTIAL STATUS

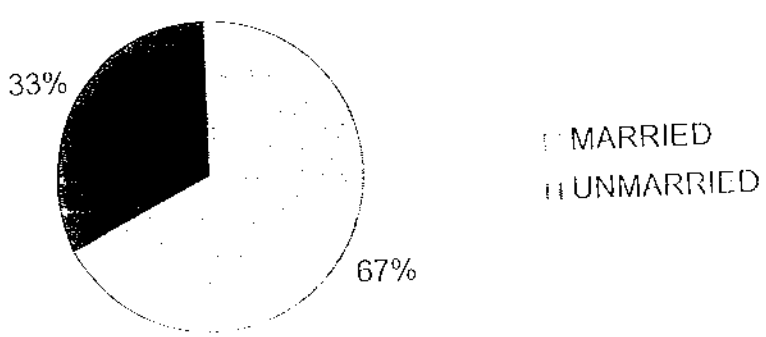


TABLE NO-7.4

TABLE SHOWING EDUCATIONAL QUALIFICATION

QUALIFICATION	NUMBER OF RESPONDENTS	PERCENTAGE
School level	48	60
Under graduate	30	37.5
Post graduate	2	2.5
Professional	0	0
Others	0	0
Total	80	100

INTERPRETATION

From the above table it is found that 60% of the respondents hold only school level, 37.5 % of the respondents are under graduate, 2.5 % of the respondents are postgraduate.

CHA 14

FIGURE-7.4: EDUCATIONAL QUALIFICATION

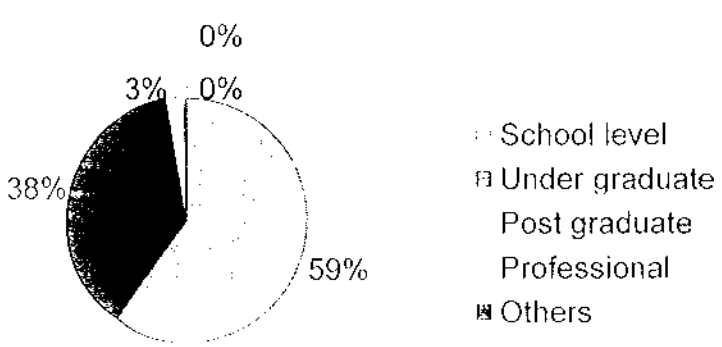


TABLE NO-7.5

TABLE SHOWING WORK EXPERIENCE

WORKE EXPERIENCE	NUMBER OF RESPONDENTS	PERCENTAGE
<1YR	4	5
1-3YRS	44	55
3-5YRS	14	17.5
5-10YRS	12	15
>10YRS	6	7.5
TOTAL	80	100

INTERPRETATION

The above table shows that 55% of the respondents have work experience of 1-3 yrs.17.5 of the respondents have 3-5 yrs.15% of the respondents have 5-10yrs.7.5% of the respondents have>10yrs and 5% of the respondents have <1yr.

CHA 15

FIGURE-7.5: WORK EXPERIENCE

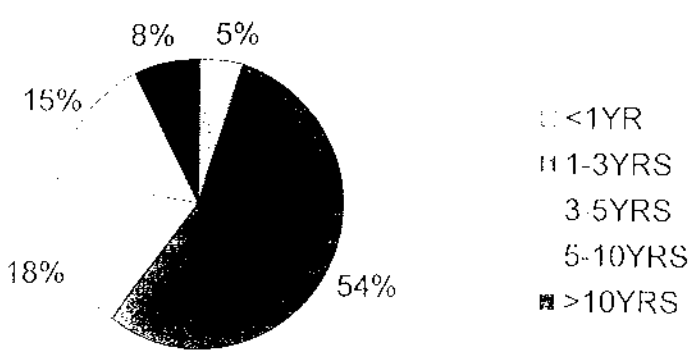


TABLE NO-7.6

TABLE SHOWING SALARY SATISFATION

SALARY SATISFATION	NUMBER OF RESPONDENTS	PERCENTAGE
STRONGLY AGREE	6	7.5
AGREE	48	60
NEUTRAL	26	32.5
DISAGREE	0	0
STONGLY DISAGREE	0	0
TOTAL	80	100

INTERPRETATION

The above it is cleared that 60% of the respondents agreed with their salary,32.5% of the respondents are disagree with their salary.7.5% of the respondents are strongly agree with their salary and none of the respondents are disagree and strongly disagree with their salary.

CHA 16

FIGURE-7.6: SALARY SATISFACTION

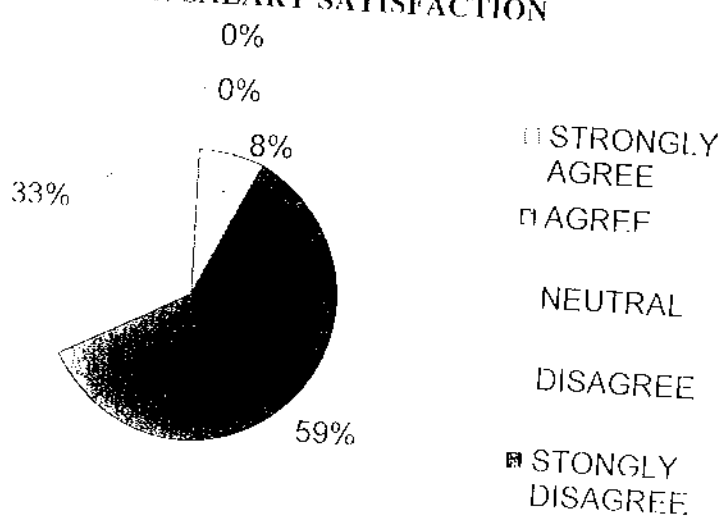


TABLE NO-7.7

TABLE SHOWING SATISFACTION TOWARDS ORGANISATIONAL BENEFIT

SATISFACTION TOWARDS ORGANISATION BENEFIT	NUMBER OF RESPONDENTS	PERCENTAGE
STRONGLY AGREE	2	2.5
AGREE	44	55
NEUTRAL	30	37.5
DISAGREE	4	5
STONGLY DISAGREE	0	0
TOTAL	80	100

INTERPRETATION:-

From the above table it is found that 55% of the respondents agreed with their organizational benefit. 37.5% of the respondents are neutral with their organizational benefit. 5% of the respondents are disagree with their organizational benefit .2.5% of the respondents are strongly agree with their organizational benefit. and none of the respondent are strongly disagree with their organizational benefit.

CHA 17

FIGURE-7.7: SATISFACTION TOWARDS ORGANISATIONAL BENEFIT

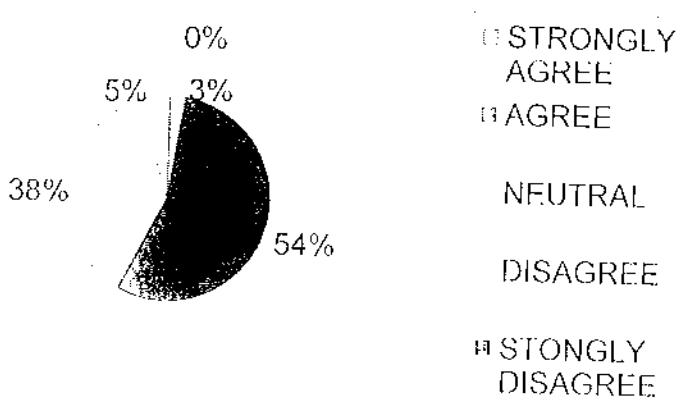


TABLE NO-7.8

TABLE SHOWING JOB SECURITY

JOB SECURITY	NUMBER OF RESPONDENTS	PERCENTAGE
STRONGLY AGREE	4	5
AGREE	24	30
NEUTRAL	36	45
DISAGREE	12	15
STONGLY DISAGREE	4	5
TOTAL	80	100

INTERPRETATION:-

The above table shows that 45% of the respondent's feels job security is neutral, 30% of the respondents agree that they have job security, 15% of the respondents are disagreed.

CHA 18

FIGURE-7.8: JOB SECURITY

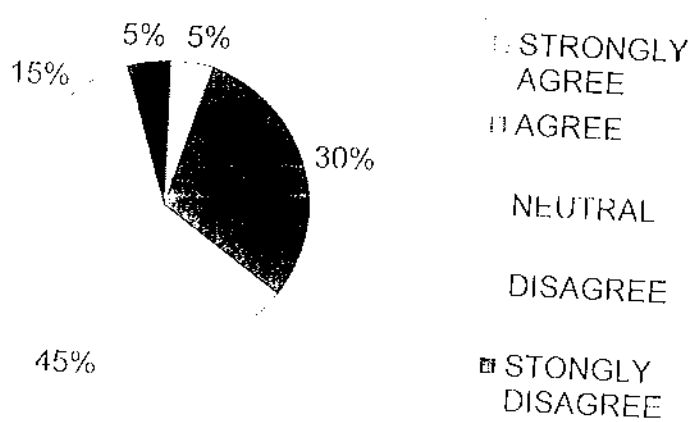


TABLE NO-7.9

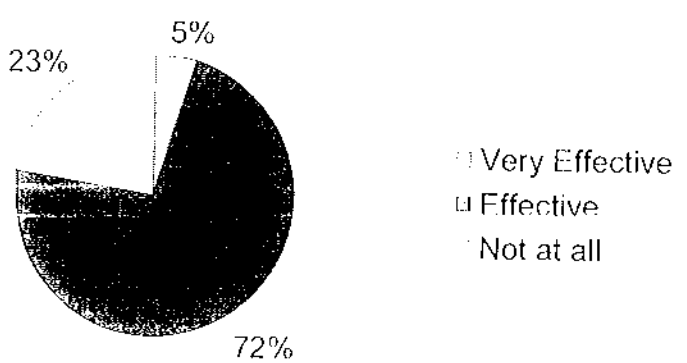
TABLE SHOWING EFFECTIVE TRAINING

EFFECTIVE TRAINING	NUMBER OF RESPONDENTS	PERCENTAGE
VERY EFFECTIVE	4	5
EFFECTIVE	58	72.5
NOT AT ALL	18	22.5
TOTAL	80	100

INTERPRETATION

From the above table it is inferred that 72.5% of the respondents feels that there is effective training in their organization. 22.5% of the respondents feels there is no effective training in their organization

FIGURE -7.9: EFFECTIVE TRAINING



CHA 19

TABLE NO-7.10

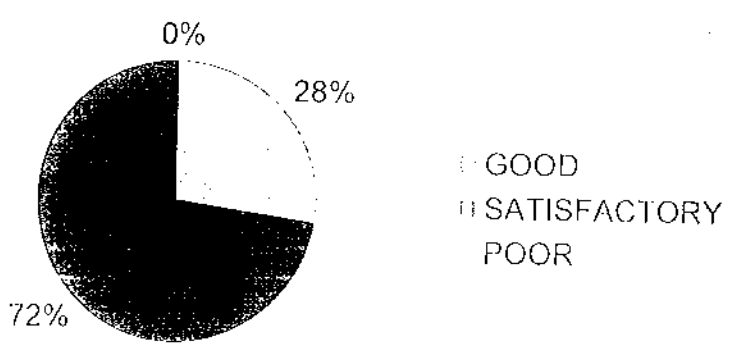
TABLE SHOWING THE LIGHTING

LIGHTING	NUMBER OF RESPONDENTS	PERCENTAGE
GOOD	22	27.5
SATISFACTORY	58	72.5
POOR	0	0
TOTAL	80	100

INTERPRETATION:-

58% of the respondents are satisfactory with lighting facilities. 27% of the respondents feels good.

FIGURE-7.10: LIGHTING



CHA 20

TABLE NO-7.11

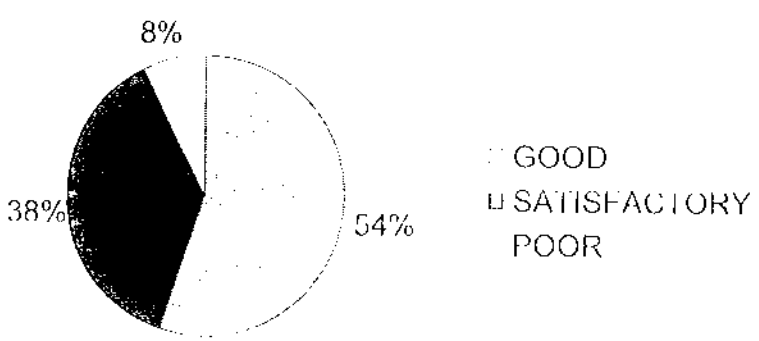
TABLE SHOWING THE VENTILATION

VENTILATION	NUMBER OF RESPONDENTS	PERCENTAGE
GOOD	44	55
SATISFACTORY	30	37.5
POOR	6	7.5
TOTAL	80	100

INTERPRETATION:-

The above table shows that 55% of the respondents feel ventilation is good, 30% of the respondents feel ventilation is satisfactory and 7.5% of the respondents feel ventilation is poor.

FIGURE-7.11: VENTILATION



CHA 21

TABLE NO-7.12

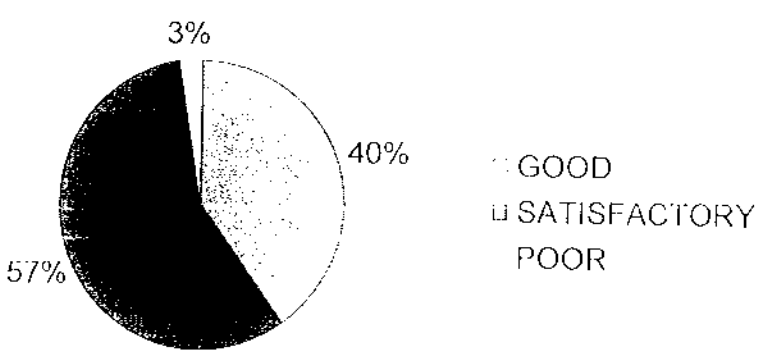
TABLE SHOWING THE DRINKING WATER

DRINKING WATER	NUMBER OF RESPONDENTS	PERCENTAGE
GOOD	32	40
SATISFACTORY	46	57.5
POOR	2	2.5
TOTAL	80	100

INTERPRETATION

The above table shows 57.5% of the respondents are satisfactory and 40% of the respondents feel good and 2.5% of the respondents feel poor.

FIGURE-7.12: DRINKING WATER



CHA 22

TABLE NO-7.13

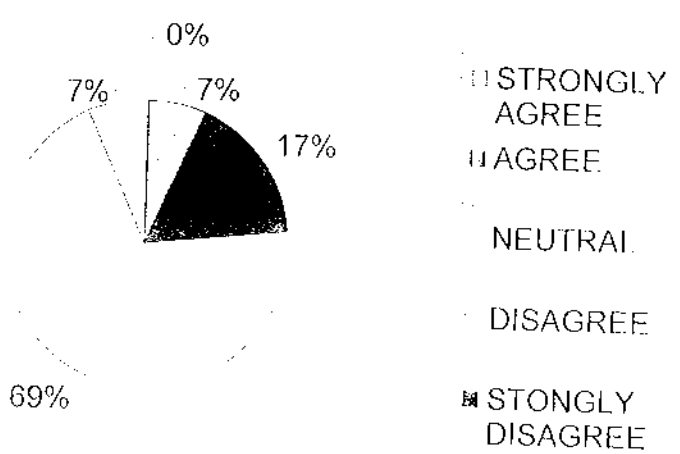
TABLE SHOWING THE WORK ALLOTMENT

WORK ALLOTMENT	NUMBER OF RESPONDENTS	PERCENTAGE
STRONGLY AGREE	4	5
AGREE	10	12.5
NEUTRAL	41	51.25
DISAGREE	4	5
STONGLY DISAGREE	0	0
TOTAL	80	100

INTERPRETATION

The above table shows that 51.25% of the respondents feel neutral. 12.5% of the respondents are agreed. and 5% of the respondents are disagreed and strongly agreed.

FIGURE-7.13: WORK ALLOTMENT



CHA 23

TABLE NO-7.14

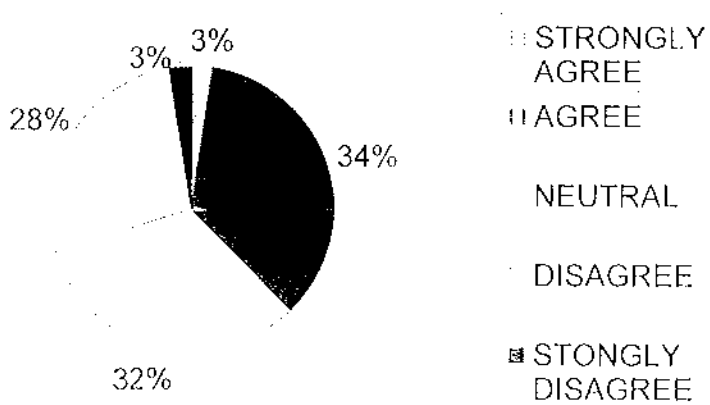
TABLE SHOWING THE HOUSING FACILITIES

HOUSING FACILITIES	NUMBER OF RESPONDENTS	PERCENTAGE
STRONGLY AGREE	2	2.5
AGREE	28	35
NEUTRAL	26	32.5
DISAGREE	22	27.5
STONGLY DISAGREE	2	2.5
TOTAL	80	100

INTERPRETATION

The above table shows that 35% of the respondents agree, 32.5% of the respondents are neutral, 27.5% of the respondents are disagreed and 2.5% of the respondents are strongly agree and disagree.

FIGURE-7.14: HOUSING FACILITIES



CHA 24

TABLE NO-7.15

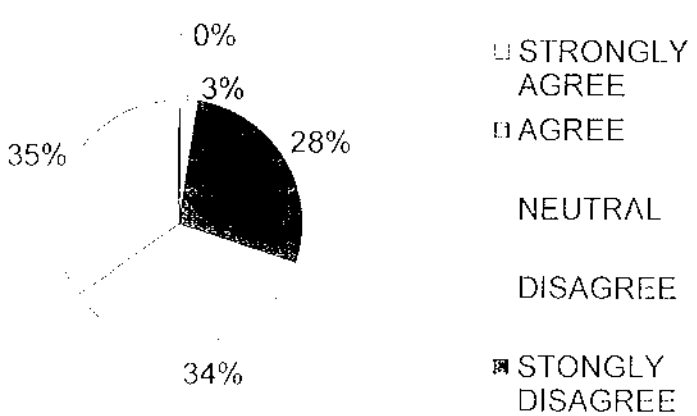
TABLE SHOWING THE TRANSPORTATION FACILITIES

TRANSPORTATION FACILITIES	NUMBER OF RESPONDENTS	PERCENTAGE
STRONGLY AGREE	2	2.5
AGREE	22	27.5
NEUTRAL	28	35
DISAGREE	28	35
STONGLY DISAGREE	0	0
TOTAL	80	100

INTERPRETATION

The above table shows that 35% of the respondents are neutral and disagree, 27.5% of the respondents are agree, 2.5% of the respondents are strongly agree.

FIGURE-7.15: TRANSPORTATION FACILITIES



CHA 25

TABLE NO-7.16

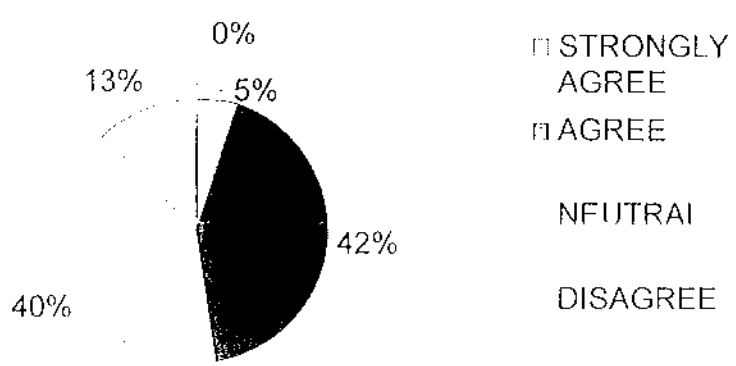
TABLE SHOWING THE SELF IMPROVEMENT OF EMPLOYEES

SELF IMPROVEMENT OF EMPLOYEES	NUMBER OF RESPONDENTS	PERCENTAGE
STRONGLY AGREE	4	5
AGREE	34	42.5
NEUTRAL	32	40
DISAGREE	10	12.5
STONGLY DISAGREE	0	0
TOTAL	80	100

INTERPRETATION

The above table shows that 42.5% of the respondents are agree 40% of the respondents are neutral. 12.5% of the respondents are disagree and 5% of the respondents are strongly agree

FIGURE-7.16: SELF IMPROVEMENT OF EMPLOYEES



CHA 26

TABLE NO-7.17

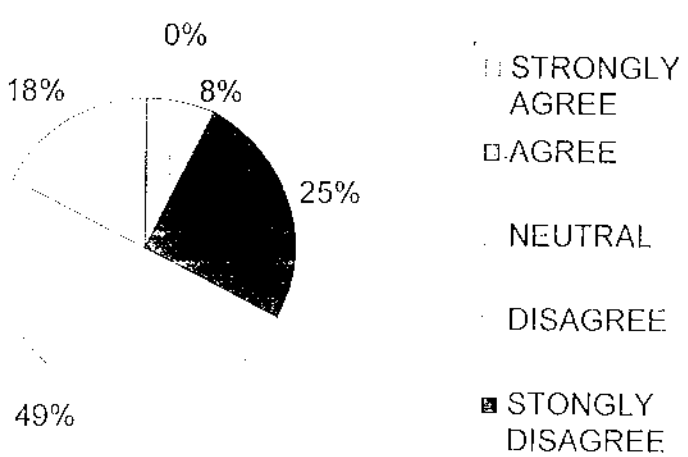
TABLE SHOWING THE COMMUNICATION BETWEEN TOP MANAGEMENT AND EMPLOYEES

COMMUNICATION	NUMBER OF RESPONDENTS	PERCENTAGE
STRONGLY AGREE	6	7.5
AGREE	20	25
NEUTRAL	40	50
DISAGREE	14	17.5
STONGLY DISAGREE	0	0
TOTAL	80	100

INTERPRETATION

The above table shows that 50%% of the respondents are neutral. 25% of the respondents are agree, 17.5% of the respondents are disagree, 7.5% of the respondents are strongly agree.

FIGURE-7.17: COMMUNICATION



CHA 27

TABLE NO-7.18

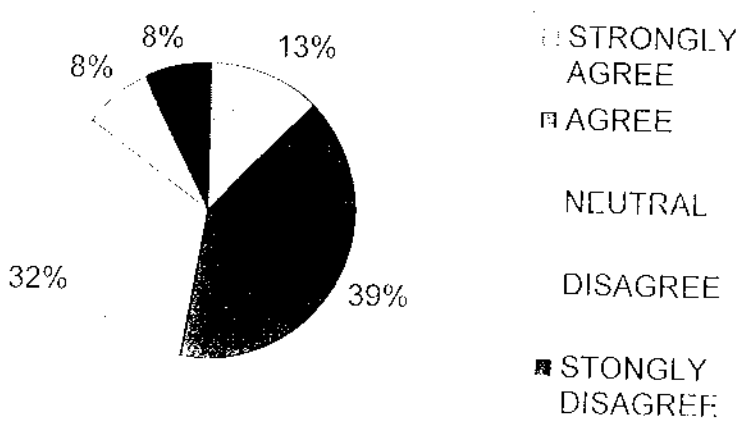
TABLE SHOWING THE PRESENT WORK LOAD

WORK LOAD	NUMBER OF RESPONDENTS	PERCENTAGE
STRONGLY AGREE	10	12.5
AGREE	32	40
NEUTRAL	26	32.5
DISAGREE	6	7.5
STONGLY DISAGREE	6	7.5
TOTAL	80	100

INTERPRETATION

The above table shows that 40% of the respondents are agree, 32.5% of the respondents are neutral, 12.5% of the respondents are strongly agree and 7.5% of the respondents are disagree and strongly disagree.

FIGURE-7.18: WORK LOAD



CHA 28

TABLE NO-7.19

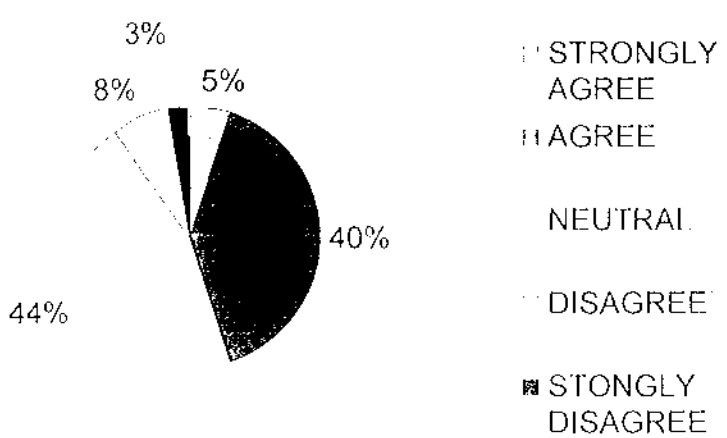
TABLE SHOWING THE COMPANIES POLICY OF PROMOTION

COMPANIES POLICY OF PROMOTION	NUMBER OF RESPONDENTS	PERCENTAGE
STRONGLY AGREE	4	5
AGREE	32	40
NEUTRAL	36	45
DISAGREE	6	7.5
STONGLY DISAGREE	2	2.5
TOTAL	80	100

INTERPRETATION

The above table shows that 45% of the respondents are neutral. 40% of the respondents are agree.7.5% of the respondents are disagree. 5% of the respondents are strongly agree and 2.5% of the respondents are strongly disagree.

FIGURE-7.19: COMPANY'S POLICY OF PROMOTION



CHA 29

TABLE NO-7.20

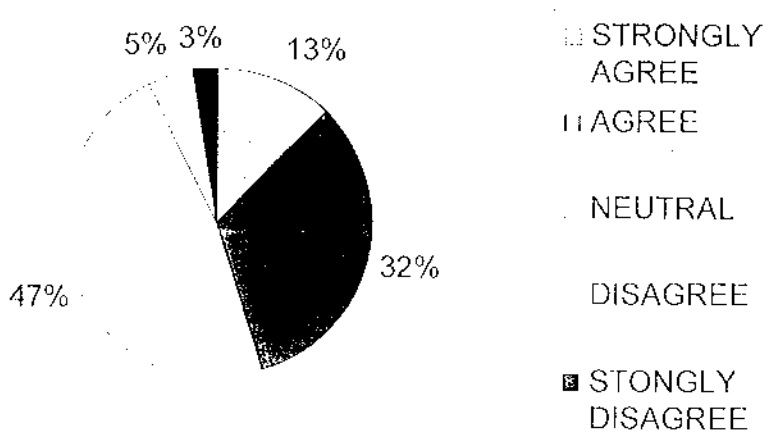
TABLE SHOWING THE QUALITY APPRAISAL SYSTEM

QUALITY APPRAISAL SYSTEM	NUMBER OF RESPONDENTS	PERCENTAGE
STRONGLY AGREE	10	12.5
AGREE	26	32.5
NEUTRAL	38	47.5
DISAGREE	4	5
STONGLY DISAGREE	2	2.5
TOTAL	80	100

INTERPRETATION:-

The above table shows that 47.5%% of the respondents are neutral, 32.5% of the respondents are agree,12.5% of the respondents are strongly agree. 5% of the respondents are disagree and 2.5% of the respondents are strongly disagree.

FIGURE-7.20: QUALITY APPRAISAL



CHA 30

7.7 Findings:

- Majority of the respondent are in the age group of 21-30 yrs.
- Majority of the respondents 52.5% are male and 47.5% of the respondents are female.
- 67.5% of the respondents are married.
- 60% of the respondents hold only school level education.
- 55% of the respondents have work experience of 1-3 yrs.
- 60% of the respondents are satisfied with their salary.
- 55% of the respondents agreed with their organizational benefit
- 45% of the respondent's feels job security is neutral
- 72.5% of the respondents feel that there is effective training in their organization.
- 72.5% of the respondents are satisfied with lighting facilities.
- 55% of the respondents are satisfied with ventilation.
- 57.5% of the respondents are satisfied with drinking water.
- 51.25% of the respondents are neutral with work allotment.
- 50% of the respondents are neutral with the communication between top management and employees.
- 45% of the respondents are moderate towards company policy of promotion.
- 47.5% of the respondents are moderate in quality appraisal.

7.8 Suggestions recommended for reduction of parts rejection:

Dia 52 Oversize and 47 oversize:

1. The workers should be monitored the deviation of oversize.
2. After this process has done, piece must check with proper gauges.
3. Calibrate the gauges and other instruments in proper interval.
4. Work instructions were written and displayed near the machine.

7.9 EXPERT SYSTEM

An expert system has been developed using VB .NET 2005 SQL server 2000.this system helps in determining the causes for the particular defect and provides suggestions to over come it.

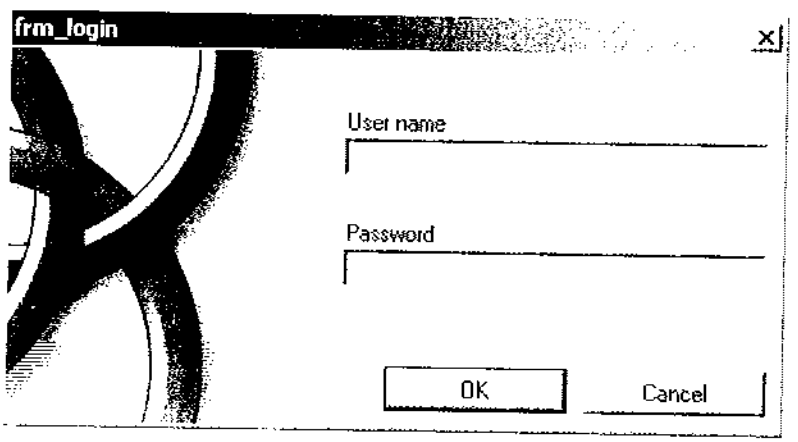


FIG 2 Login to Expert System

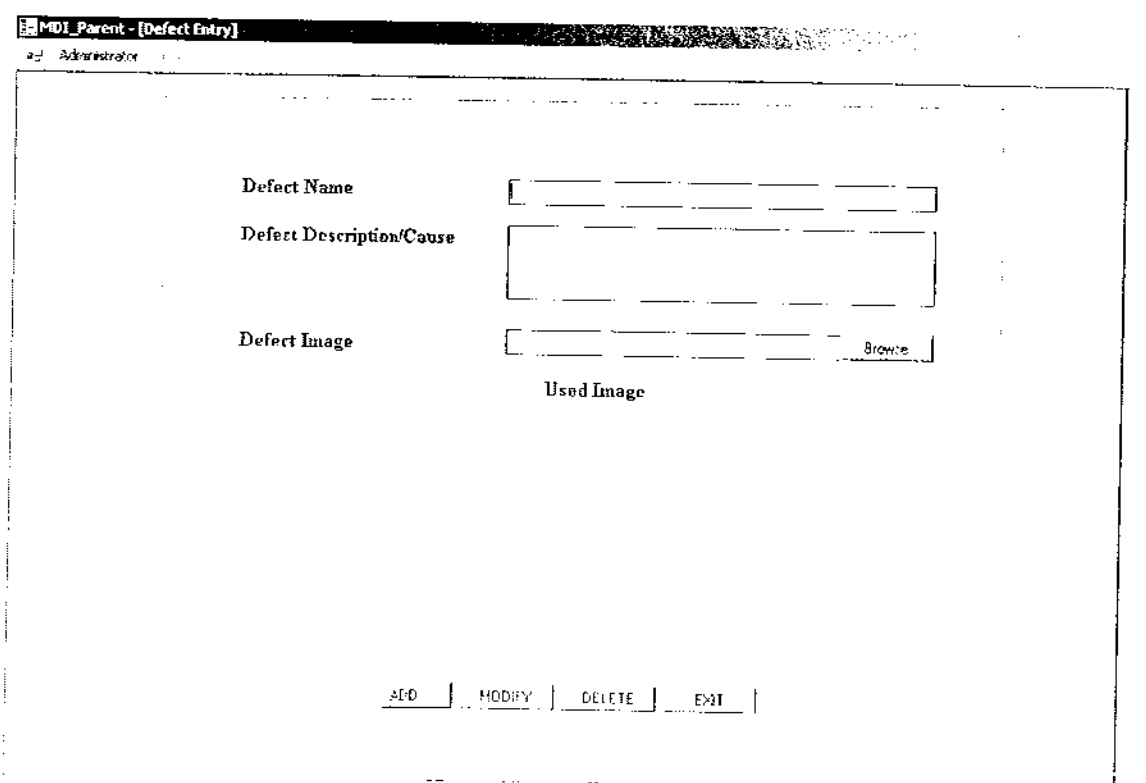


FIG 3 Admin Edit Wizard 1

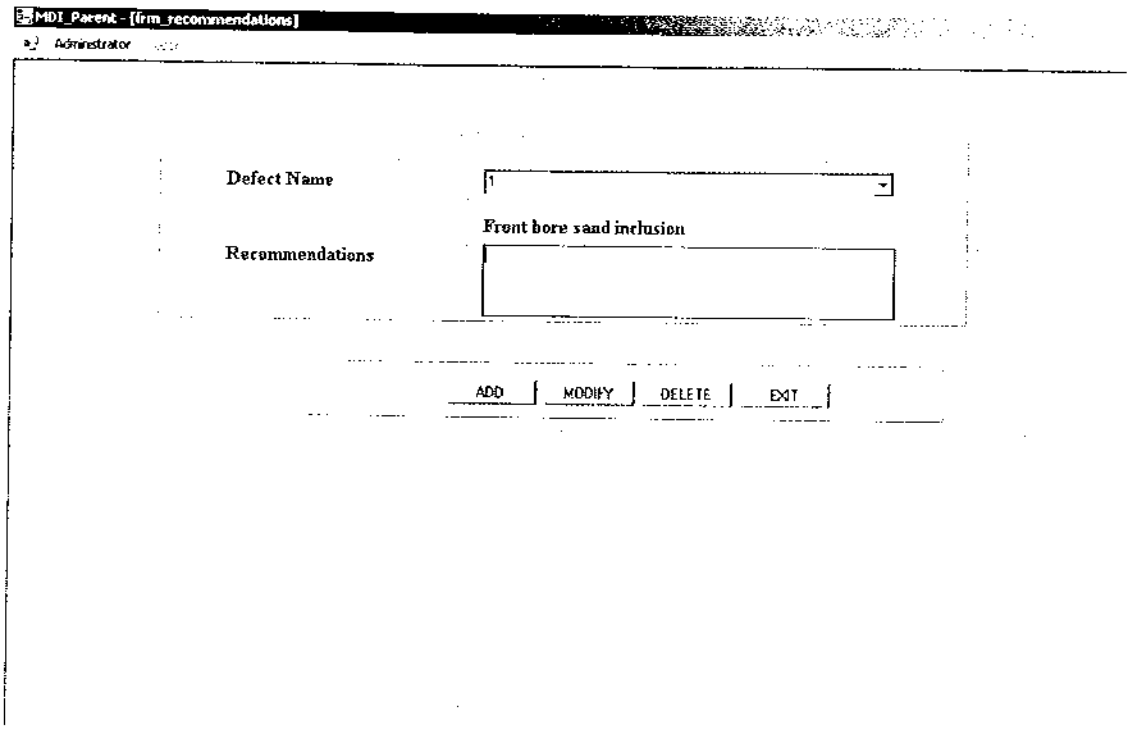


FIG 4 Admin Edit Wizard 2

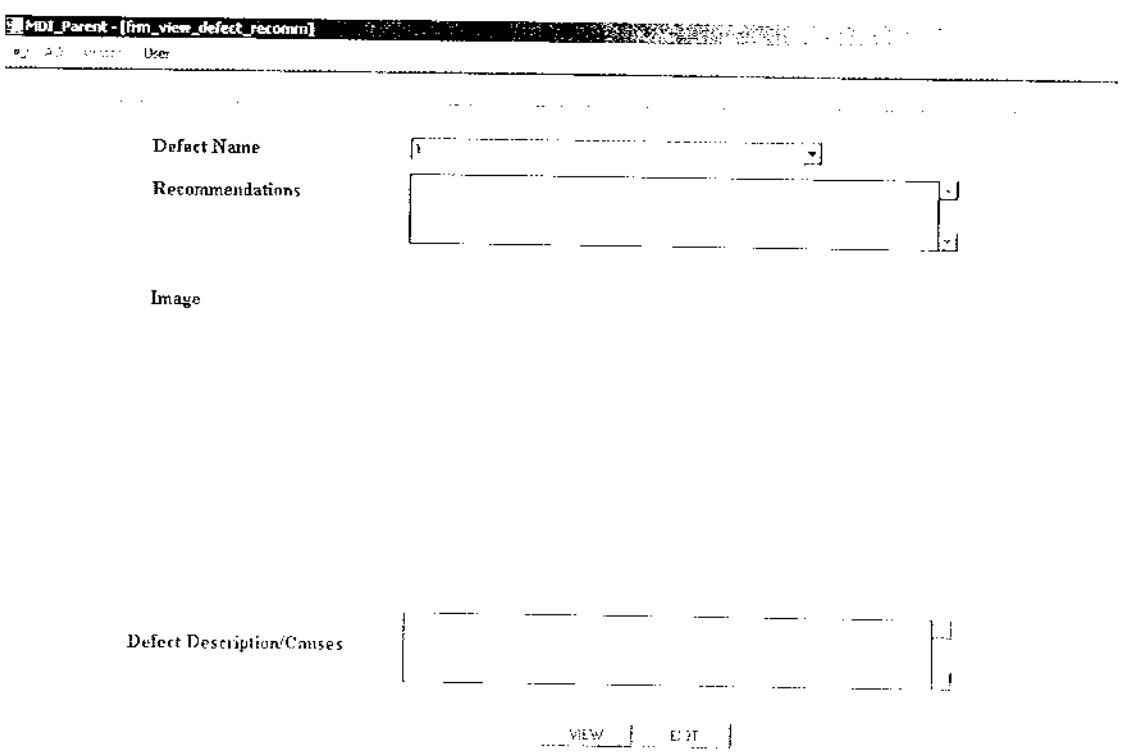


FIG 5 User Wizard

RESULT AND DISCUSSIONS

CHAPTER 8
RESULT AND DISCUSSIONS

The recommended suggestions to minimize the brake drum rejection were gradually implemented in actual practice. Accordingly, the rejections of brake drums are gradually decreases. The important and essential benefits of the reduction of brake drum rejection are cost reduction and brake drums with improved quality can be obtained.

CONCLUSION

CHAPTER 9
CONCLUSION

Quality tools used in this analysis are very simple and cheap. The causes for more number of rejections in the critical automobile components (brake drum) in the production line are analyzed using QC tools. From this study, it is concluded that the human factor contributes around 40-50 % towards brake drum rejection. Analysis of human resource management was carried out to identify the problems related to the men. For this, data was collected in the form of Questionnaires from men. By using this data, problems were identified and the corresponding solutions were suggested to the management. By implementing one of the ideas it was found that the rejection got reduced by 20 %. So by fulfilling their (men) needs, human resource can be effectively utilized and hence rejection of components can be reduced.

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CHAPTER 10

REFERENCES

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10. What do you think about the Lighting condition?

(a) Good (b) Satisfactory (c) Poor

11. What do you think about the Ventilation condition?

(a) Good (b) Satisfactory (c) Poor

12. What do you think about the Drinking water condition?

(a) Good (b) Satisfactory (c) Poor

13. In your organization whether the work is allotted equally among the staffs of equal scale

(a) Strongly agree (b) Agree (c) Neutral (d) Disagree

(e) Strongly Disagree

14. Are you satisfied with the housing facilities provided by the organization?

(a) Strongly agree (b) Agree (c) Neutral (d) Disagree

(e) Strongly Disagree

15. Are you satisfied with transportation facilities provided by the organization?

(a) Strongly agree (b) Agree (c) Neutral (d) Disagree

(e) Strongly Disagree

16. Whether the organization is very much interested in self improvement of employees

(a) Strongly agree (b) Agree (c) Neutral (d) Disagree

(e) Strongly Disagree

17. Is there proper communication between top management and employees?

(a) Strongly agree (b) Agree (c) Neutral (d) Disagree

(e) Strongly Disagree

18. How satisfied are you with the present work load?

(a) Highly satisfied (b) Satisfied (c) Moderate

(d) Dissatisfied (e) Highly dissatisfied

19. Your feeling towards company's policy of promotion

(a) Excellence (b) Good (c) Medium

(d) Not good (e) Poor

20. Are you satisfied with the quality appraisal system?

(a) Highly satisfied (b) Satisfied (c) Moderate
(d) Dissatisfied (e) Highly dissatisfied