AN ANALYTICAL STUDY ON IMPROVING PRODUCTIVITY IN MANUFACTURING INDUSTRIES THROUGH DEPLOYING QUALITY MANAGEMENT CONCEPTS WITH REFERENCE TO RAMPRASAD TUBES AND BARS PRIVATE LIMITED

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ABSTRACT

Now a days small scale industries are facing many problems due to heavy rejections in production, which affects productivity and On Time Delivery which in term reduces customer satisfaction. Ultimately this leads to loss in net profit.

Ram Prasad Tubes and Bars Pvt limited, Coimbatore was chosen for this study. Production and Rejection level was monitored for three months (Aug'08 to Oct'08) the rejection level studied was 12.13%, 11.39% and 11.77% in one component. The rejection level was high. So, Quality Management Concepts was implemented to improve the Quality of the product.

After three months, (Nov'08 to Jan'08) again the rejection level was analyzed and was found decreased. It was found, there was large amount of cost saving due to decrease in rejection per product for three months. (Rs.88,560).It was suggested to implement the Quality Management Concepts for all the other products in Ram Prasad Tubes and Bars pvt limited in future.

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CERTIFICATE OF VIVA–VOCE-EXAMINATION

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CHAPTER-1

INTRODUCTION

CHAPTER 1 - INTRODUCTION

1.1. RESEARCH BACKGROUND

Any companies in the world promote quality as the central customer value and regard it as a key concept of company strategy in order to achieve the competitive edge. There is one factor that makes the difference between the costly way and beneficial way of achieving quality. This factor is quality costs. Quality costs information can be used to indicate major opportunities for corrective action and to Provide incentives for quality improvement. Quality costs can help to quantify specific quality levels and ultimately improve productivity.

Productivity in economics refers to metrics and measures of output from production processes, per unit of input. Productivity, is typically measured as a ratio of output per labor-hour, an input. Productivity may be conceived of as a metrics of the technical or engineering efficiency of production. As such quantitative metrics of input, and sometimes output, are emphasized. Productivity is distinct from metrics of allocative efficiency, which take into account both the value of what is produced and the cost of inputs used, and also distinct from metrics of profitability, which address the difference between the revenues obtained from output and the expense associated with consumption of inputs.

Accordingly, an increase in productivity is characterized by a shift of the production function and a consequent change to the output/input relation. The formula of total productivity is normally written as follows:

- *Total productivity = Output quantity / Input quantity*

1.2. PROBLEM IDENTIFIED AND CONFIRMED

Every Manufacturing Organization is concerned with the quality of its product. While it is important that quantity requirements be satisfied and production schedules met, it is equally important that the finished product meet established specifications.

Quality and Productivity are more likely to bring prosperity into the country and improve quality of work life.

Productivity is a ratio to measure how well an organization (or individual, industry, country) converts input resources (labor, materials, machines etc.) into goods and services.

Quality management is a method for ensuring that all the activities necessary to design, develop and implement a product or service are effective and efficient with respect to the system and its performance. Quality management can be considered to have three main components: quality control, quality assurance and quality improvement. Quality management is focused not only on product quality, but also the means to achieve it. Quality management therefore uses quality assurance and control of processes as well as products to achieve more consistent quality.

1.3. BACKGROUND STUDY

To achieve in Quality Management, one need to be in possession of various tools and techniques. To establish a house of Quality, We need to have an umbrella like coverage in the form of Quality function deployment. Loss minimization, failure reduction process reliability improvements are possible to be achieved through the application of various Quality Control Tools.

Many factors affecting productivity of each organization; also, they are dependent.

Industries where labor and capital costs are low compared to the material costs, better use of material and plant gives the greatest scope of cost reduction.

1.4. NEED FOR STUDY

This project analyzes the productivity improvement and trends in relative acceptance levels in the Manufacturing industries. The well-known slowdown in economic growth pushes the manufacturing industries to improve their productivity and cost reduction through low scrap level rate.

Today's market demand is high quality products at low cost. Having `high quality' reputation is not enough! Internal cost of maintaining the reputation should be less.

The new customer is not only commanding priority based on volume but is more demanding about the "Quality of the Product."

1.5. OBJECTIVES AND SCOPE OF THE STUDY

The main objective of this project is to improve the productivity of the Manufacturing Industries through the Quality Management concepts.

Identify the current scenario in manufacturing sectors and to address the important of Quality in the manufacturing sectors.

Meeting the high productivity in the industries by meeting the specifications of the products and to make the higher market share through Quality products or services. By applying Quality concepts, the productivity will be increased and scrap level will be decreased.

Another objective of this study is the attempt to improve the productivity in small scale industries by concentrating on Quality management.

This study will give the cost benefits to the industries through Quality products to the customers.

1.6. DELIVERABLES

The Expected deliverables of this project is to satisfy the needs and expectations of the customers and other internal parties, including their economic, social and environmental concerns.

Higher productivity and acceptance level in manufacturing industries are the expected deliverables of this project.

CHAPTER-2

LITERATURE SURVEY

CHAPTER 2 - LITERATURE SURVEY

2.1. REVIEW OF LITERATURE

This Section deals with Review of literature collected from various sources

2.1.1. Casting Process

A foundry is a factory which produces metal castings from either ferrous or non-ferrous alloys. Metals are turned into parts by melting the metal into a liquid, pouring the metal in a mold, and then removing the mold material or casting. The most common metal alloys processed are aluminum and cast iron. However, other metals, such as steel, magnesium, copper, tin, and zinc, can be processed.

In the casting process a pattern is made in the shape of the desired part. This pattern is made out of wood, plastic or metal. Simple designs can be made in a single piece or solid pattern. More complex designs are made in two parts, called split patterns. A split pattern has a top or upper section, called a cope, and a bottom or lower section called a drag. Both solid and split patterns can have cores inserted to complete the final part shape. Where the cope and drag separates is called the parting line. When making a pattern it is best to taper the edges so that the pattern can be removed without breaking the mold.

The patterns are then packed in sand with a binder, which helps to harden the sand into a semi-permanent shape. Once the sand mold is cured, the pattern is removed leaving a hollow space in the sand in the shape of the desired part. The pattern is intentionally made larger than the cast part to allow for shrinkage during cooling. Sand cores can then be inserted in the mold to create holes and improve the casting's net shape. Simple patterns are normally open on top and melted metal poured into them. Two piece molds are clamped together and melted metal is then poured in to an opening, called a gate. If necessary, vent holes will be created to allow hot gases to escape during the pour. The pouring temperature of the metal should be a few hundred degrees higher than the melting point to assure good fluidity, thereby avoiding prematurely cooling, which will cause voids and porosity. When the metal cools, the sand mold is removed and the metal part is ready for secondary operations, such as machining and plating.

Steps

Melting

Melting is performed in a furnace. Virgin material, external scrap, internal scrap, and alloying elements are used to charge the furnace. Virgin material refers to commercially pure forms of the primary metal used to form a particular alloy. Alloying elements are either pure forms of an alloying element, like electrolytic nickel, or alloys of limited composition, such as ferroalloys or master alloys. External scrap is material from other forming processes such as punching, forging, or machining. Internal scrap consists of the gates, risers, or defective castings.

The process includes melting the charge, refining the melt, adjusting the melt chemistry and tapping into a transport vessel. Refining is done to remove deleterious gases and elements from the molten metal. Material is added during the melting process to bring the final chemistry within a specific range specified by industry and/or internal standards. During the tap, final chemistry adjustments are made.

Furnace

Several specialised furnaces are used to melt the metal. Furnaces are refractory lined vessels that contain the material to be melted and provide the energy to melt it. Modern furnace types include electric arc furnaces (EAF), induction furnaces, cupolas, reverberatory, and crucible furnaces. Furnace choice is dependent on the alloy system and quantities produced. For ferrous materials, EAFs, cupolas, and induction furnaces are commonly used. Reverberatory and crucible furnaces are common for producing aluminum castings.

Furnace design is a complex process, and the design can be optimized based on multiple factors. Furnaces in foundries can be any size, ranging from mere ounces to hundreds of tons, and they are designed according to the type of metals that are to be melted. Also, furnaces must be designed around the fuel being used to produce the desired temperature. For low temperature melting point alloys, such as zinc or tin, melting furnaces may reach around 327 Celsius. Electricity, propane, or natural gas are usually used for these temperatures. For high melting point alloys such as steel or nickel based alloys, the furnace must be designed for temperatures over 3600 Celsius. The fuel used to reach these high temperatures can be electricity or coke.

The majority of foundries specializes in a particular metal and has furnaces dedicated to these metals. For example, an iron foundry (for cast iron) may use a cupola, induction furnace, or EAF, while a steel foundry will use an EAF or induction furnace. Bronze or brass foundries use crucible furnaces or induction furnaces. Most aluminum foundries use either an electric resistance or gas heated crucible furnaces .

Casting

Prior to pouring a casting, the foundry produces a mold. The molds are constructed by several different processes dependent upon the type of foundry, metal to be poured, quantity of parts to be produced, size of the casting and complexity of the casting.

Pouring

In a foundry, molten metal is poured into molds. Pouring can be accomplished with gravity, or it may be assisted with a vacuum or pressurized gas. Many modern foundries use robots or automatic pouring machines for pouring molten metal. Traditionally, molds were poured by hand using ladles.

Shakeout

The solidified metal component is then removed from its mold. Where the mold is sand based, this can be done by shaking or tumbling. This frees the casting from the sand, which is still attached to the metal runners and gates - which are the channels through which the molten metal traveled to reach the component itself.

Degating

Degating is the removal of the heads, runners, gates, and risers from the casting. Runners, gates, and risers may be removed using cutting torches, band saws or ceramic cutoff blades. For some metal types, and with some gating system designs, the sprue, runners and gates can be removed by breaking them away from the casting with a hammer or specially designed knockout machinery. Risers must usually be removed using a cutting method (see above) but some newer methods of riser removal use knockoff machinery with special designs incorporated into the riser neck geometry that allow the riser to break off at the right place.

The gating system required to produce castings in a mold yields leftover metal, including heads, risers and sprue, sometimes collectively called sprue that can exceed 50% of the metal required to pour a full mold. Since this metal must be remelted as salvage, the yield of a particular gating configuration becomes an important economic consideration when designing various gating schemes, to minimize the cost of excess sprue, and thus melting costs.

Surface Cleaning

After degating, sand or other molding media may adhere to the casting. To remove the surface is cleaned using a blasting process. This means a granular media will be propelled against the surface of the casting to mechanically knock away the adhering sand. The media may be blown with compressed air, or may be hurled using a shot wheel. The media strikes the casting surface at high velocity to dislodge the molding media (for example, sand, slag) from the casting surface. Numerous materials may be used as media, including steel, iron, other metal alloys, aluminum oxides, glass beads, walnut shells, baking powder or numerous other materials. The blasting media is selected to develop the color and reflectance of the cast surface. Terms used to describe this process include cleaning, blasting, shot blasting and sand blasting of castings.

Finishing

The final step in the process usually involves grinding, sanding, or machining the component in order to achieve the desired dimensional accuracies, physical shape and surface finish.

Removing the remaining gate material, called a gate stub, is usually done using a grinder or sanding. These processes are used because their material removal rates are slow enough to control the amount of material. These steps are done prior to any final machining.

After grinding, any surfaces that require tight dimensional control are machined. Many castings are machined in CNC milling centers. The reason for this is that these processes have better dimensional capability and repeatability than many casting processes. However, it is not uncommon today for many components to be used without machining.

A few foundries provide other services before shipping components to their customers. Painting components to prevent corrosion and improve visual appeal is common. Some foundries will assemble their castings into complete machines or sub-assemblies. Other foundries weld multiple castings or wrought metals together to form a finished product.

2.1.2. Casting Defects

Several factors affect the quality of metal castings. These casting defects will leads to reject the material. Some of these factors are listed below:

Flash

This is a very common defect, flash. This is where the mold somehow separated enough to allow metal between the halves, along the parting line. Fixing flash is no problem as it's usually less than 1/8" thick (unless something really bad happened) so can be broken off with a hammer or pliers. A file will take it down to the parting line. Causes include letting the mold dry out; the clay in the sand shrinks resulting in a gap between the halves. Another cause is much more serious if sprue is very tall and the casting covers a wide area of the mold face, it's very possible for the mold to actually be forced up by the hydrostatic pressure of the metal. The seriousness of this depends on the density of the metal (aluminum is very light, but be careful with a bronze pour!) and the weight of the mold fighting it. The solution here is very simple: weight down the mold.

Mold Shift

This is due to operator error: not aligning the mold correctly. Most flasks have alignment pins to prevent this, but some cases never installed the pins in the moulds.

Sand Drop

Molding sand drops from the top mold to the bottom mold. This sand will be eroded by the metal and this will leads to rejection of the component. This defect is known as Sand Drop.

Sand Inclusions

Molding sand fell to the bottom of the mold, coming to rest in the corner, forming a notch in the metal as it solidified around it. This is much more of a problem in sand molds, since loose sand can easily be abraded off and let loose in the mold cavity. Makes for a bad finish on (usually) the drag side of the casting. For sand molds, the solution is to fastidiously blow out all loose sand, and make sure the sprue and gate areas are strong, since the metal will erode sand and wash it deeper into the mold.

Slag

Another type of inclusion Cause is insufficient de-slagging, i.e. skimming of the melt, leaving slag in it, allowing it to be entrained in the pour and get trapped in the mold.

Blow Holes

Gas pockets come from gas dissolving in the melt then coming out (like shaking a can of pop) when it solidifies. This usually manifests itself as a rough surface on areas exposed to air (such as the top of the sprue, riser or ingots) or pockets of varying size in the cross-section of the metal. Gas comes from melting too long or heating too hot, 'stewing' the metal (keeping it molten longer than needed), using an unusually oxidizing or reducing flame in the furnace, getting water (or pretty much anything else that has hydrogen in it, or will burn; painted scrap for instance) in the melt, and the alignment of the Moon with the Earth and Sun. A good idea is to recycle scrap into ingots as a first step since the scrap might be wet, oily or painted and will add gas to the melt. The gas comes out in the ingots, not your casting.

Short Casting

The mold didn't fill all the way. This is usually caused by the metal solidifying before it fills the cavity - the metal was too cold. It could also be a restriction: too small a sprue, gate, or not enough venting keeping the metal from going in.

"The objective of Productivity is to create a multiplier effect in productivity enhancement in the Manufacturing Industry. It will bring together productivity 'gurus', champions and aspiring leaders on a common platform to share experiences, ideas and thoughts on new challenges facing productivity in metalworking manufacturing industries" Ebeling, Charles E., (1997), An Introduction to Reliability and maintainability Engineering, McGraw-Hill Companies, Inc.,

Quality management is not a recent phenomenon. Advanced civilizations that supported the arts and crafts allowed clients to choose goods meeting higher quality standards than normal goods. In societies where art and craft (and craftsmanship) were valued, one of the responsibilities of a master craftsman (and similarly for artists) was to lead their studio, train and supervise the work of their craftsmen and apprentices. The master craftsman set standards, reviewed the work of others and ordered rework and revision as necessary. One of the limitations of the craft approach was that relatively few goods could be produced; on the other hand an advantage was that each item produced could be individually shaped to suit the client. This craft based approach to quality and the practices used were major inputs when quality management was created as a management science. http://en.wikipedia.org/wiki/Quality_management

Productivity in industries to measures of output from production processes, per unit of input. for example, is typically measured as a ratio of output per labor-hour, an input. Productivity may be conceived of as a measure of the technical or engineering efficiency of production. As such quantitative measures of input, and sometimes output, are emphasized. Productivity is distinct from measures of allocative efficiency, which take into account both the value of what is produced and the cost of inputs used, and also distinct from measures of profitability, which address the difference between the revenues obtained from output and the expense associated with consumption of inputs. “Productivity Measurement and the Bottom Line". (Courbois & Temple 1975, Gollop 1979, Kurosawa 1975, Pineda 1990, Saari 2006)

“**Quality control** is a method for ensuring that all the activities necessary to design, develop and implement a product or service are effective and efficient with respect to the system and its performance. Quality management can be considered to have three main components: quality control, quality assurance and quality improvement. Quality management is focused not only on product quality, but also the means to achieve it. Quality management therefore uses quality assurance and control of processes as well as products to achieve more consistent quality” Pyzdek, T, "Quality Engineering Handbook", 2003, ISBN 0824746147

2.2. RESEARCH GAP

While analying the past research reports and literature, there is some gap found in the literatures. That is, the quality concepts are not properly applied in the small scale foundries and small scale manufacturing industries.Most of researches were carried out in the large scale industries and automobile industries.So I have taken small scale foundry for my study.This gap will be fullfilled by applying Quality management concepts within this manufacturing Industry.

Quality management concepts will be applied in this manufacturing industry and analyse various parameters within this Organisation. Productivity will be improved after appling the Quality cocepts.

CHAPTER-3

METHODOLOGY

CHAPTER 3 - METHODOLOGY

3.1. PROPOSED METHODOLOGY

The methodology proposed is the convenient sampling method within the Manufacturing industry.

3.2. TYPE OF DATA

Data will be Primary data as well as secondary data. Primary data collected from the shop floor rejection details of Ram Prasad Tubes and Bars Private Limited. Secondary data collected from the journals and the magazines.

3.3. DATA COLLECTION

Primary data collected from M/S.Ram Prasad Tubes and Bars Private Limited, (Foundry) Coimbatore.The Primary Datas are Production and Rejection quantity for three months and reasons for the rejections.

3.4. TOOLS FOR ANALYSIS

7 QC Tools has been used to analyze the data collected from the shop floor rejection details. The 7 Qc Tools are,

- Check Sheet
- Pareto Chart
- Ishikawa Diagram
- Flow Chart
- Control Chart
- Histogram
- Scatter Diagram

CHAPTER-4

DATA ANALYSIS AND INTERPRETATION

CHAPTER 4 - DATA ANALYSIS AND INTERPRETATION

4.1. ORGANIZATION PROFILE

Ram Prasad Tubes and Bars Pvt Ltd is part of the multi business and growth - oriented Ramprasad Group of Companies located in Coimbatore, manufacturing a wide range of Grey and S. G. Iron Castings in various graded as per customer specifications to Indian and International Standards for all types of Engineering Industries. The installed capacity is 6600 MTS per annum with following facilities. Melting: Provided with "Inducto Therm" make melting furnace. Machine Moulding Green Sand for producing castings weight 0.5 Kgs. to 100 Kgs. Hand Moulding for producing castings weights 0.5 Kgs to 100 Kgs. Shell Moulding for Producing Castings weights 0.2 Kgs to 10 Kgs.Ram Prasad Tubes and Bars Pvt Limited is having ISO 9001 : 2000 certificate.

4.1.1. Products Profile

Ram Prasad Tubes and Bars Pvt Limited is a major supplier of critical components to various Industries. The components are Rotor Housing, Stators, Rotors, Bearing Caps and Manifolds etc. Presently the supplies of these components are made to ELGI Equipments Limited., Hyundai, Ind Auto Ltd., Lakshmi Machine Works and Grundfos Pumps etc.

4.1.2 Scrap Level

I have taken three months in house rejection data from Ram Prasad Tubes and Bars Private Limited. The average Rejection level for three month is 11.76%. So I have decided to reduce the rejection by applying 7 QC Tools.

This Three month data were collected from the shop floor data from the Ram Prasad Tubes and Bars Private Limited .While seeing the data there are so many reasons for rejections.

This Rejection Level data have been taken on Monthly Basis. These Data have been taken From Aug'08 to Oct'08 before applying Quality Management Concepts and From Nov'08 to Jan'09 I have taken the details after applying the Quality Management Concepts.

4.2. ANALYSIS OF DATA

The data is been analyzed from the three months Rejection status of ram Prasad Tubes and Bars Private Limited

7 QC Tools will be used to analyze the primary data.

Seven QC tools are fundamental instruments to improve the quality of the product. They are used to analyze the production process, identify the major problems, control fluctuations of product quality, and provide solutions to avoid future defects. Statistical literacy is necessary to effectively use the seven QC tools. These tools use statistical techniques and knowledge to accumulate data and analyze them.

Seven QC tools are utilized to organize the collected data in a way that is easy to understand and analyze. Moreover, from using the seven QC tools, any specific problems in a process are identified. These Tools are,

- Check Sheet
- Pareto Chart
- Ishikawa Diagram
- Flow Chart
- Control Chart
- Histogram
- Scatter Diagram

- **Check Sheet** is used to easily collect data. Decision-making and actions are taken from the data.
- **Pareto Chart** is used to define problems, to set their priority, to illustrate the problems detected, and determine their frequency in the process.
- **Ishikawa Diagram** (Fishbone Diagram) is used to figure out any possible causes of a problem. After the major causes are known, we can solve the problem accurately.
- **Flow Chart** shows the process step by step and can sometimes identify an unnecessary procedure.
- **Control Chart** provides control limits which are generally three standard deviations above and below average, whether or not our process is in control.
- **Histogram** shows a bar chart of accumulated data and provides the easiest way to evaluate the distribution of data.
- **Scatter Diagram** is a graphical tool that plots many data points and shows a pattern of correlation between two variables.

4.2.1. Floor Rejection Details

The shop floor rejection details are collected from the daily scrap of the Company. These rejections are agreed by both production and Quality people of the company. The following is the three month Rejection status of the company.

M/S.Ram Prasad Tubes and Bars Pvt.Ltd				
Floor Rejection Details				
Before Applying 7 QC Tools				
Month		Aug'08	Sep'08	Oct'08
Total Prod Qty		2185	2485	2574
Total Rej.Qty		265	283	303
% Of Rej		12.13%	11.39%	11.77%
Reason for Rejections	Slag Inclusion	29	31	29
	Cold Lap	3	8	7
	Mould Broken	9	11	9
	Sand Fusion	31	35	29
	Sand Drop	77	91	108
	Scabbing	9	5	7
	Core Shift	8	4	3
	Damage	9	3	2
	Core Broken	0	2	2
	Sand Inclusion	69	65	84
	Blow Holes	21	27	19
	Dimension Variation	0	1	4
	Hardness Problem	0	0	0
	Wrong Grade	0	0	0

Table 4.1

4.2.2. Pareto Chart

Vilfredo Pareto was an Italian Engineer in the 19th century who tells the Pareto principle to the world.

The Pareto principle (also known as the 80-20 rule, the law of the vital few and the principle of factor sparsity) states that, for many events, roughly 80% of the effects come from 20% of the causes.[2][3] Business management thinker Joseph M. Juran suggested the principle and named it after Italian economist Vilfredo Pareto, who observed that 80% of the land in Italy was owned by 20% of the population. It is a common rule of thumb in business; e.g., "80% of your sales come from 20% of your clients.

Pareto Principle

Pareto Principle holds good to the present day in various applications

"A FEW CAUSES LEAD TO MANY DEFECTS;

MANY CAUSES LEAD TO FEW DEFECTS "

The few causes that lead to many defects are the vital few. The many causes that lead to few defects are the trivial many.

While Drawing the Pareto diagram, we know that Sand drop and Sand Inclusion defects contributing more than 50% in the overall rejections. So, I have decided to know the real root cause of sand Drop and sand Inclusion defects by applying Ishikawa Diagram.

Pareto Analysis for the Month of Aug'08

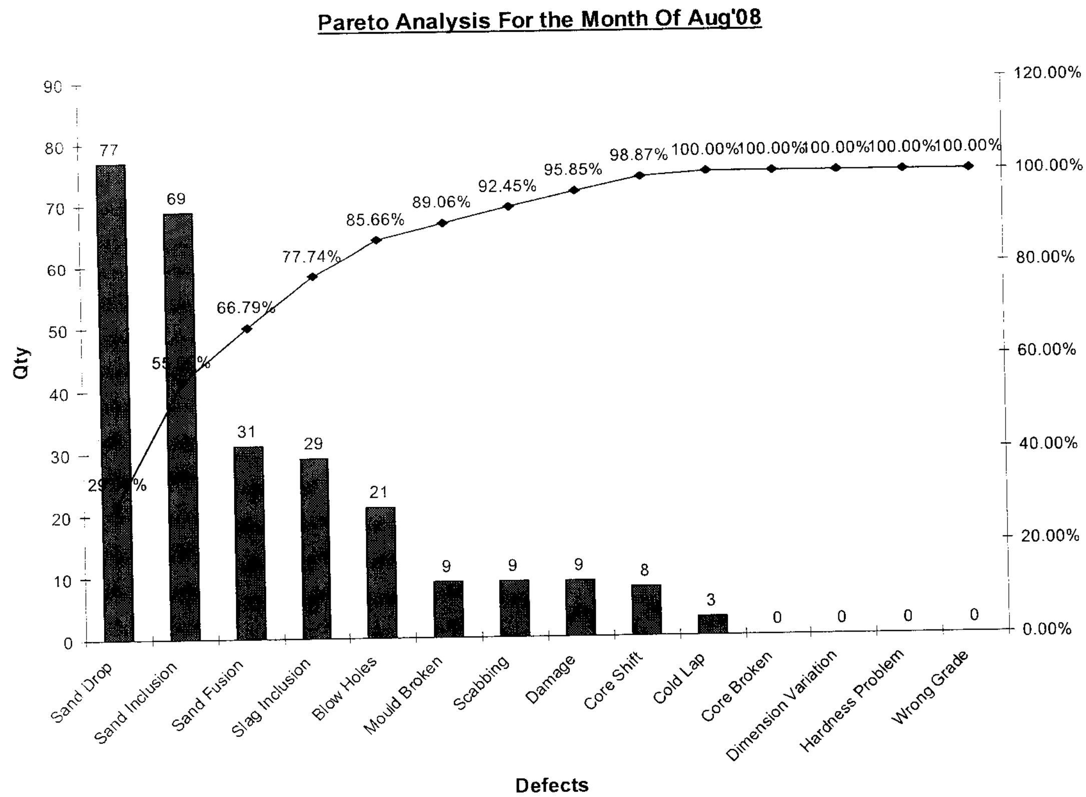

Figure 4.1

Pareto Analysis for the Month of Sep'08

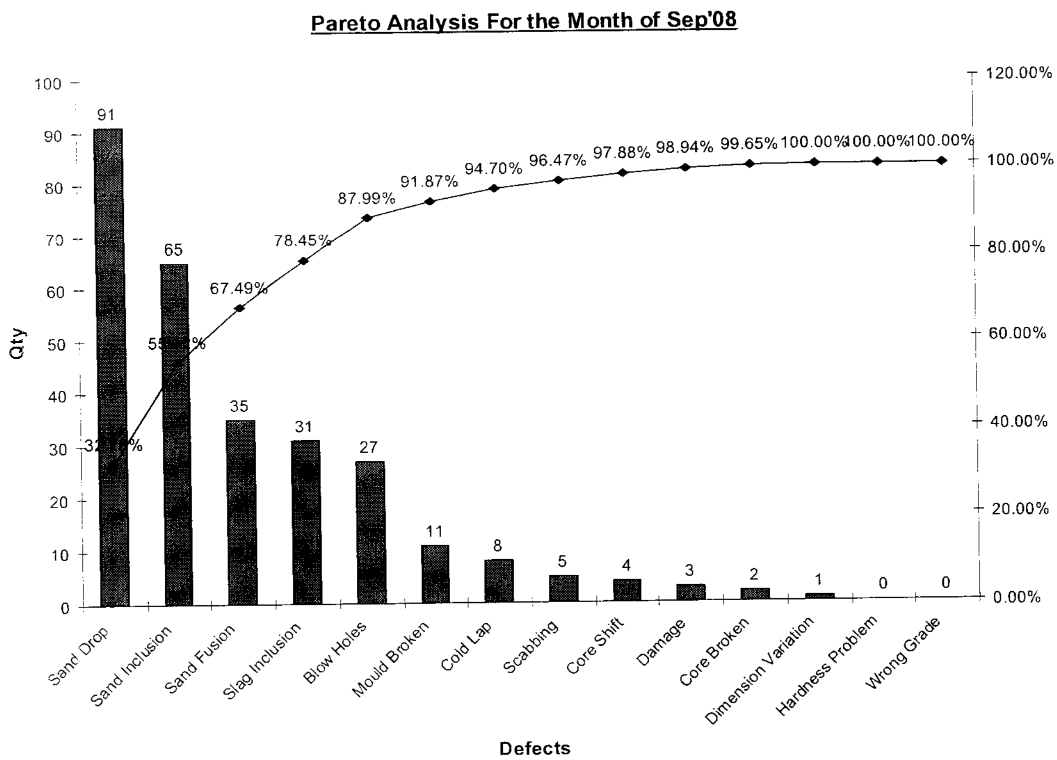

Figure 4.2

Pareto Analysis for the Month of Oct'08

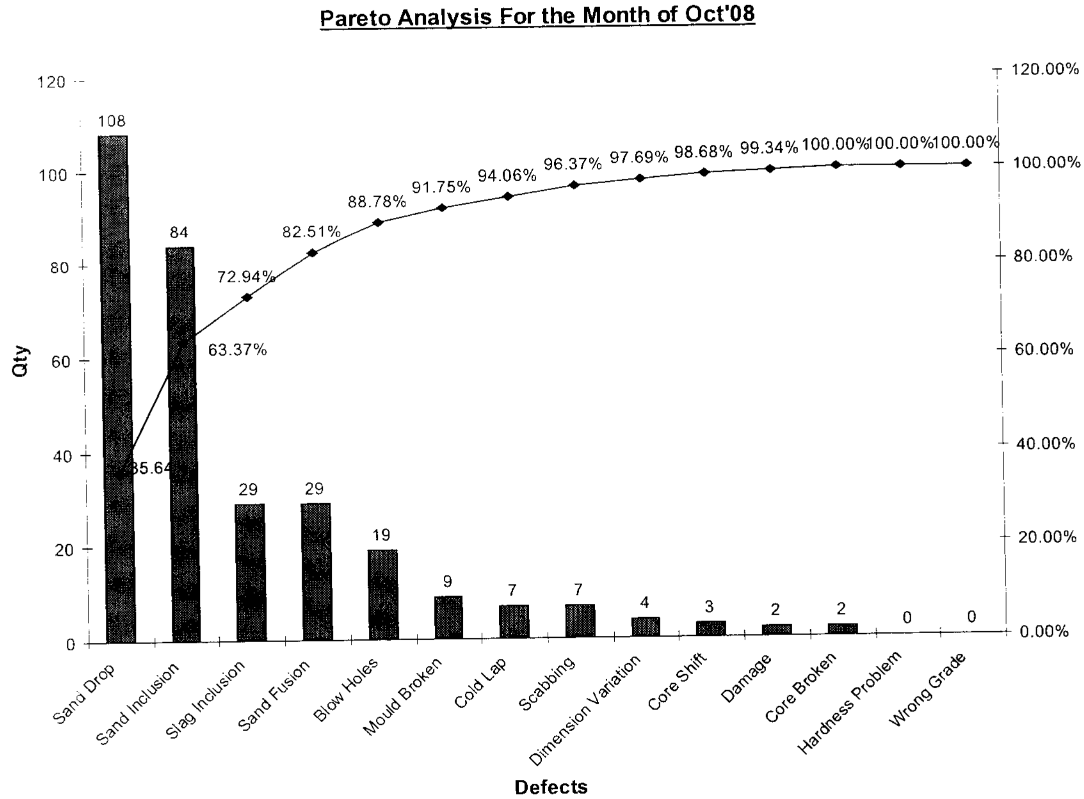

Figure 4.3

Major Causes

From the above analysis, sand drop and Sand Inclusions are more contributing overall rejection of the company. The root cause of these defects can be derived from the cause and Effect Diagram as follows,

4.2.3. Ishikawa Diagram (Cause and Effect Diagram)

In 1953, Kaoru Ishikawa, professor of the University of Tokyo, used the cause & Effect diagram for the first time.

A cause & Effect diagram is also called a fish bone diagram since it looks like the skeleton of a fish.

Why Cause and Effect?

To identify systematically list the different causes that can be attributed to a (or an effect)

To identify the reasons why a process goes out of control

To decide which causes to investigate for process improvement

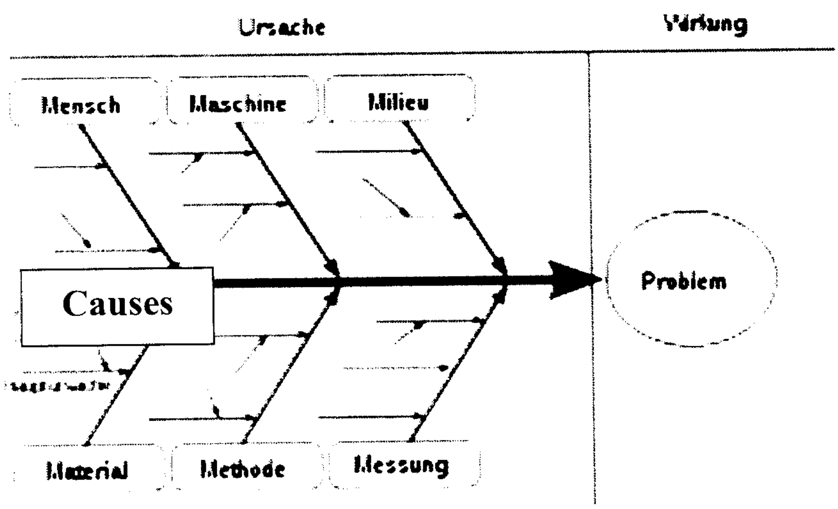

Figure 4.4

Ishikawa diagram, in fishbone shape, showing factors of men, machines, milieu (workplace), materials, methods, measurement, all affecting the overall problem. Smaller arrows connect the sub-causes to major causes.

The Ishikawa diagram (or *fishbone diagram* or also *cause-and-effect diagram*) are diagrams, that shows the causes of a certain event. A common use of the Ishikawa diagram is in product design, to identify potential factors causing an overall effect.

Cause and Effect Diagram from Pareto

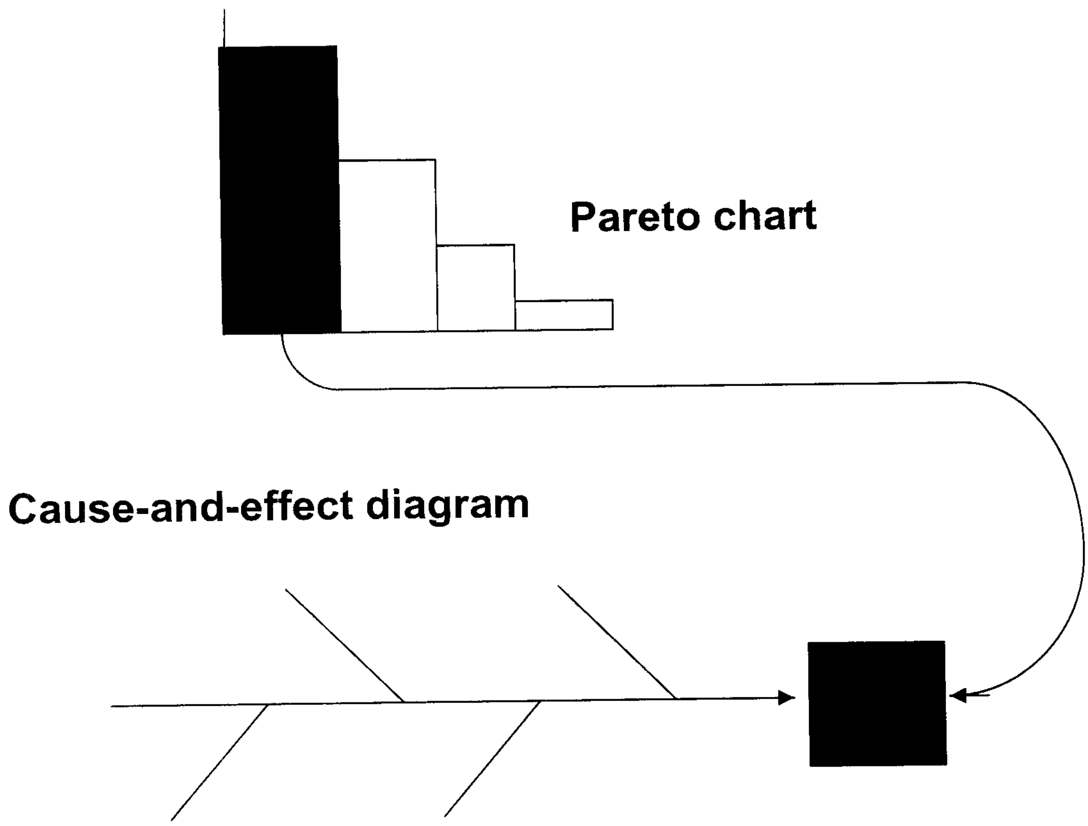

Figure 4.5

Ishikawa Diagram For Sand Drop and Sand Inclusion

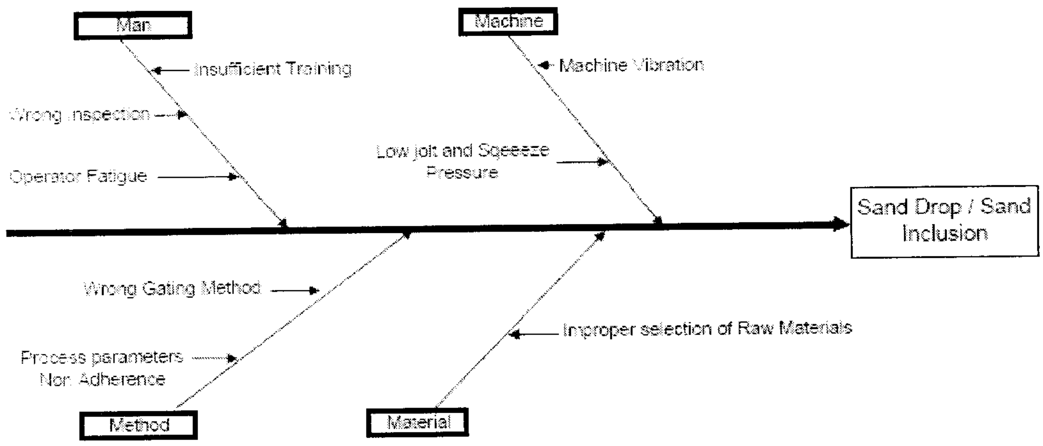

Figure 4.6

Brain Storming

Brain storming session has conducted at the Ram Prasad Tubes and Bars Pvt Limited. After this session I have concluded that Low jolt and squeeze pressure has the root cause of the defect. Low Operating pressure of the machine leads to low mold strength of casting. The operating pressure of the machine should be 6 to 8 bar. But the machine has operated by 5 bar in the period of Aug'08 to Oct'08.

4.3. DELIVERABLES

The machine was corrected after discussing with the management. After correcting the machine, the rejection level of Ram Prasad Tubes and Bars have decreased.

Rejection level of Ram Prasad Tubes and Bars Pvt Limited, after applying the 7 QC Tools is as follows,

M/S.Ram Prasad Tubes and Bars Pvt.Ltd				
Floor Rejection Details				
After Applying 7 QC Tools				
Month		Nov'08	Dec'08	Jan'09
Total Prod Qty		2368	2485	2574
Total Rej.Qty		174	171	146
% Of Rej		7.35%	6.88%	5.67%
Reason for Rejections	Slag Inclusion	26	28	25
	Cold Lap	2	7	8
	Mould Broken	8	4	5
	Sand Fusion	30	27	15
	Sand Drop	37	41	33
	Scabbing	4	6	2
	Core Shift	7	5	2
	Damage	5	0	1
	Core Broken	0	2	2
	Sand Inclusion	34	23	32
	Blow Holes	21	27	19
	Dimension Variation	0	1	2
	Hardness Problem	0	0	0
	Wrong Grade	0	0	0

Table 4.2

4.4. COST BENEFITS

Production and Rejection Details (Aug'08 to Jan'09)						
Month	Aug'08	Sep'08	Oct'08	Nov'08	Dec'08	Jan'08
Produced Qty	2185	2485	2574	2368	2485	2574
Rejection Before	265	283	303	-	-	-
Rejection After	-	-	-	174	171	146
% of Rejection	12.13%	11.39%	11.77%	7.35%	6.88%	5.67%

Table 4.3

Before Applying Quality Management Concepts:

Total Number of Components Rejected (Aug'08 to Oct'08) = 851

Cost per Component = Rs.246

Total value of Rejected Component = 851 X 246

= Rs.2,09,346

After Applying Quality Management Concepts:

Total Number of Components Rejected (Nov'08 to Jan'09) = 491

Cost per Component = Rs.246

Total value of Rejected Component = 491 X 246

= Rs.1,20,786

Savings in Rejections = 2,09,346 – 1,20,786

= Rs.88,560

CHAPTER-5

CONCLUSIONS

CHAPTER 5 - CONCLUSIONS
5.1. SUMMARY OF FINDINGS

The Overall floor rejection level of Ram Prasad Tubes and Bars Pvt Limited has decreased after applying Quality Management concepts. The main root cause of shop floor rejection is due to low operating pressure of the molding machine. The operating pressure has increased after finding out the root cause, hence the rejection has decreased. It has brought out to a savings of Rs.88,560 for the period of three months. So, the Productivity of this industry has increased. Acceptance level of this manufacturing industry has increased. So, customer satisfaction level also increased because of On time delivery of the materials and Quality of the materials.

Rejection Trend Before Applying Quality Concepts

Floor Rejection Details (Aug'08 to Oct'08)

(Before Applying Quality Management Concepts)

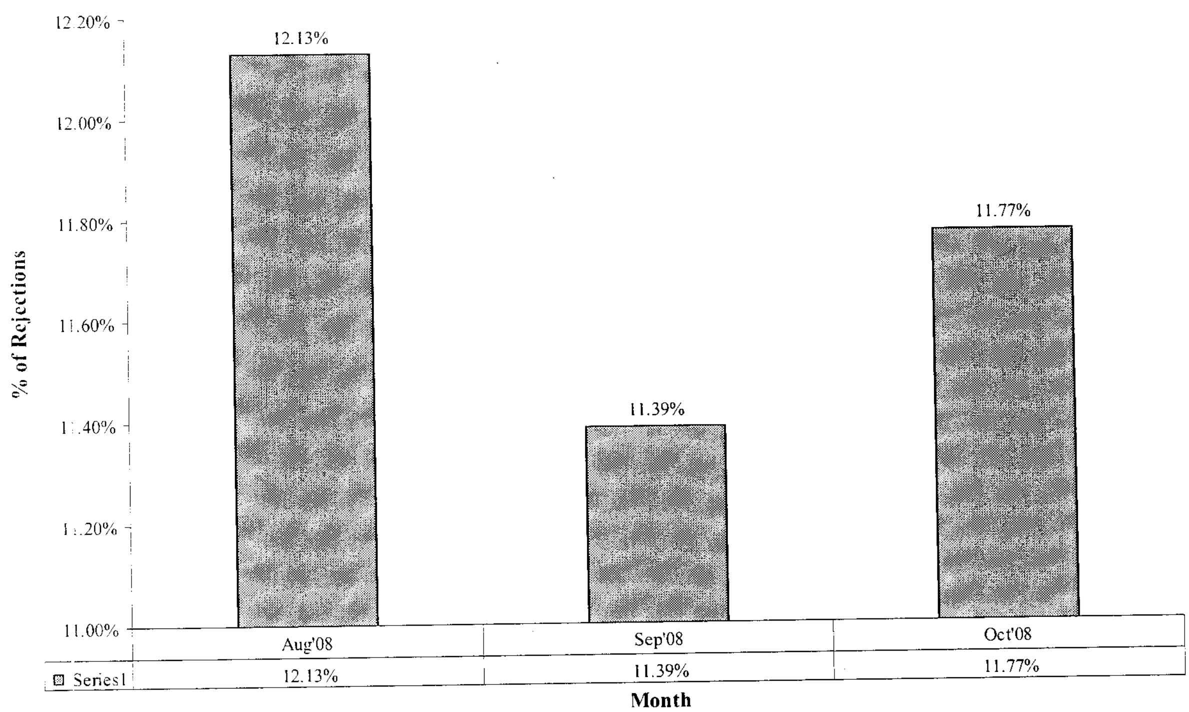

Figure 5.1

Rejection Trend After Applying Quality Concepts

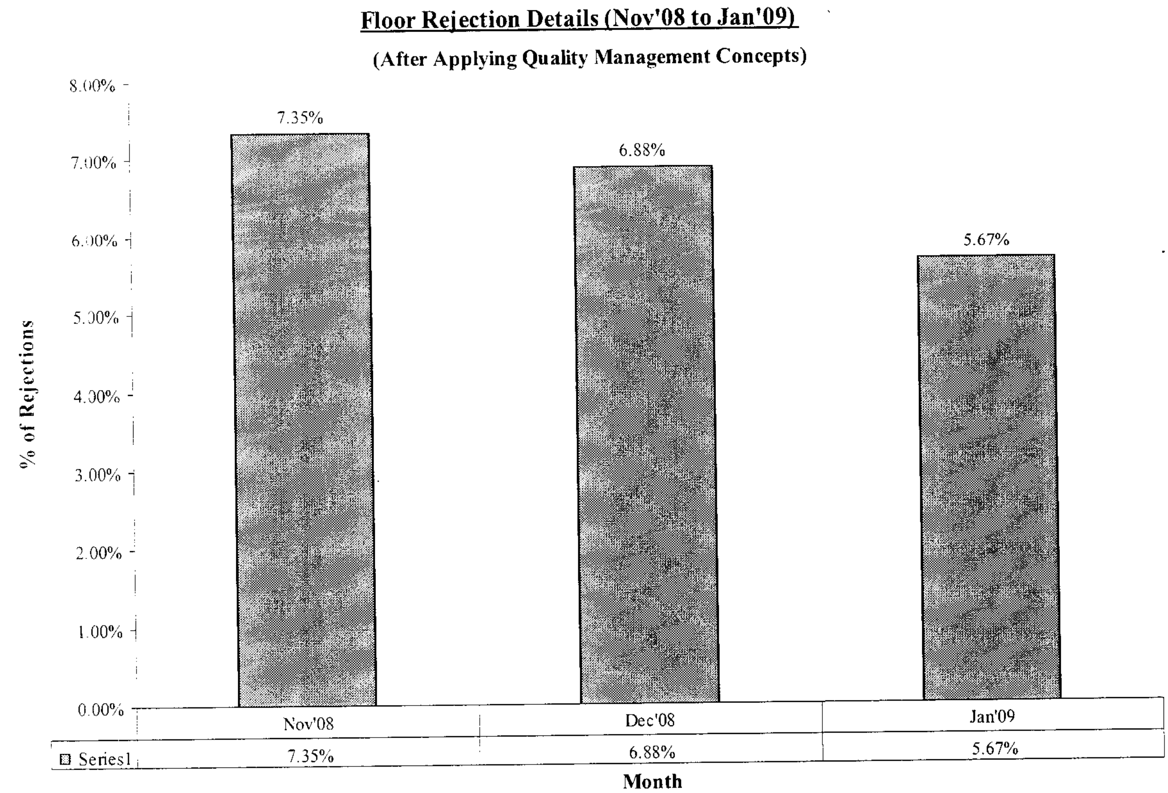

Figure 5.2

5.2. SUGGESTIONS & RECOMMENDATIONS

Having a selected particular industry, an effort has been taken to improve the Quality of output as a result to improve the productivity of the overall company. It was found by applying quality tools, that the causes of rejections can be controlled by concentrating to avoid major defects like sand drops and sand inclusions. This attempt reveals the fact that similar efforts can be made in any type of manufacturing industry to identify the major root cause of the rejections. Quality tools are very much helpful to narrow down the root cause. By taking necessary steps to avoid the identified causes, the quality can be improved further. This work also reveals that higher quality controls and quality management approach results with an increase in the savings of an Industry.

With reference to the given Case study, the selected company is having totally 77 components processed in foundry. Results obtained from one sample component proves the fact that remaining 76 components can be analyzed in the similar way and more savings can be obtained through effective quality management approaches.

5.3. CONCLUSIONS

The study of analyzing bearing cap manufacturing through casting process resulted in quality problems are identified clearly and removed through appropriate solutions.

As a result, a cost savings of Rs.88,560 is obtained in this component processing within a period of three months.

5.4. DIRECTIONS FOR FUTURE RESEARCH

In future we can apply these Quality concepts to the various small and medium scale industries. After realizing the cost benefits the work can be extended towards achieving 6 sigma quality levels.

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