KAUNAS UNIVERSITY OF TECHNOLOGY

FACULTY OF MECHANICAL ENGINEERING AND DESIGN

Karthikeyan Saravanan

A STUDY ON TOTAL QUALITY MANAGEMENT IN AVR COMPANY

Master's Degree Final Project

Supervisor
Assoc. prof. dr. Marius Rimašauskas

KAUNAS, 2016

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INDUSTRIAL ENGINEERING AND MANAGEMENT (621H77003)

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KAUNAS, 2016

KAUNAS UNIVERSITY OF TECHNOLOGY

Mechanical Engineering And Design

Karthikeyan Saravanan

Industrial Engineering and Management (621H77003)

"**A Study on Total Quality Management in AVR Company**"

Final Project

DECLARATION OF ACADEMIC INTEGRITY

____ _____ ____

Kaunas

I confirm that the final project of mine, **Karthikeyan Saravanan**,on the subject. "A Study on Total Quality Management in AVR Company" is written completely by myself; all the provided data and research results are correct and have been obtained honestly. None of the parts of this thesis have been plagiarized from any printed, Internet-based or otherwise recorded sources; all direct and indirect quotations from external resources are indicated in the list of references. No monetary funds (unless required by law) have been paid to anyone for any contribution to this thesis.

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Approved:

Head of Production engineering Department — *(Signature, date)*

Kazimieras Juzėnas

MASTERSTUDIES FINAL PROJECT TASK ASSIGNMENT
Study programme INDUSTRIAL ENGINEERING AND MANAGEMENT

The final project of Master studies to gain the master qualification degree, is research or applied type project, for completion and defence of which 30 credits are assigned. The final project of the student must demonstrate the deepened and enlarged knowledge acquired in the main studies, also gained skills to formulate and solve an actual problem having limited and (or) contradictory information, independently conduct scientific or applied analysis and properly interpret data. By completing and defending the final project Master studies student must demonstrate the creativity, ability to apply fundamental knowledge, understanding of social and commercial environment, Legal Acts and financial possibilities, show the information search skills, ability to carry out the qualified analysis, use numerical methods, applied software, common information technologies and correct language, ability to formulate proper conclusions.

1. Title of the project

A STUDY ON TOTAL QUAILTY MANAGEMENT IN AVR COMPANY

Approved by the Dean Order No.V25-11-7, 3 May 2016

2. Aim of the project

To evaluate the Total Quality Management in the AVR Company.

3. Structure of the project

Literature review, significance of total quality management, methodology of study, analysis and interpretation of TQM, implementation and analysis , Future scope, Conclusion ,Reference

4. Requirements and conditions

1. Setup an appointment with AVR Company Data analysis has to be done with hundred employees. Monitor the production by working with production manager for calculating the total amount of wastages.

5. This task assignment is an integral part of the final project

6. Project submission deadline: 2016_____ __

Given to the student Karthikeyan Saravanan

Task Assignment received _____ _____

(*Name, Surname of the Student*) (*Signature, date*)

Supervisor _____ _____

(*Position, Name, Surname*) (*Signature, date*)

Karthikeyan Saravanan. A STUDY ON TOTAL QUALITY MANAGEMENT IN AVR COMPANY: *Master's* thesis / supervisor assoc. prof. Marius Rimašauskas.The Faculty of Mechanical Engineering and Design, Kaunas University of Technology.

Study area and field: Production and Manufacturing Engineering, Technological Sciences

Key words: Total quality management, Wastage management, loss calculation.

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SUMMARY

Today manufacturing industries are always investigating on how to increase the production more efficiently than their competitors and develop better quality products at cheaper, consumer prices. To achieve this, every industry needs to focus on total quality management. The paper discusses the study of total quality management in AVR company, which is automotive parts manufacturing company. The work is carried out by analysing the various quality management issues faced by the labours with the help of data collection questionnaire, which is designed to analysis the various problems and to test the knowledge of workers. The level of skills possessed by him, surveys on company's vision, ethics and their relationship with the management is analysed. By complete observation of the manufacturing process in various shifts (shift 1 and shift 2) the amount of wastage is calculated in two different shifts by the data received. High wastage shift is identified and also the loss which is caused by the wastages in shifts is calculated for the organisation

Karthikeyan Saravanan. VISUOTINĖS KOKYBĖS VADYBOS TYRIMAS AVR ĮMONĖJE: *Magistro* baigiamasis projektas / vadovas doc. dr. Marius Rimašauskas; Kauno technologijos universitetas, Mechanikos inžinerijos ir dizaino fakultetas.

Studijų kryptis ir sritis: Gamybos inžinerija, Technologijos mokslai.

Reikšminiai žodžiai: Visuotinės kokybės vadyba, nusidėvėjimo valdymas, nuostolių skaičiavimas.

Kaunas, 2016. 42 p.

SANTRAUKA

Šiuolaikinės gamybos įmonės pastoviai ieško būdų kaip padaryti gamybą daugiau efektyvią lyginant su konkurentais, pagaminti geros kokybės ir vartotojui prieinamos kainos gaminius. Kad tai pasiektų bet kuri įmonė turi susikoncentruoti į visuotinės kokybės vadybos principus ir jų laikytis. Šis baigiamasis projektas yra apie visuotinės kokybės vadybos tyrimą AVR kompanijoje, kuri gamina detales automobilių pramonei. Darbe buvo analizuojami įvairūs kokybės vadybos momentai, renkama informacija iš įmonės darbuotojų naudojant klausimyną, kuris sukurtas norint sužinoti darbuotojų nuomonę apie įvairias kokybės problemas. Ištyrus skirtingus gamybos procesus ir susisteminus informaciją buvo nustatytas broko kiekis atitinkamai sukuriamas per pirmą ir antrą pamainas. Susistemintai informacijai buvo atliekami skaičiavimai, nustatyti aukščiausią nusidėvėjimo lygį ir apskaičiuoti praradimai skirtingose organizacijos pamainose.

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INTRODUCTION

This project based on a study of total quality management which is carried out in the AVR Manufacturers. The first and foremost objective of the project is to investigate the level of total quality management principles implemented in the organisation and to give suggestions to improve their employee commitment towards the lean tools through the implementation of the world-class manufacturing system and also predict the wastage losses in the product and suggested the better solution.

This study also shows the importance of world-class manufacturing system to maintain and improve the quality of work life of employees. In this paper, `being sensitive to customer requirements' goes beyond defect and error reduction, and merely meeting specifications or reducing customer complaints. The concept of elements is differentiated to take both product and service utilities that giving standard requirements but also improving the abilities and enhanced the quality of it.

Expected results after TQM implementation are improved the quality of supplies, improved quality of processes, improved employee satisfaction and improved customer satisfaction. In this case study, it was found that need of total quality management training is essential for the reduction of defects and wastes in the company to get into the total quality management implementation process. **Aim is to evaluate the Total Quality Management in the AVR Company**; and the major tasks required to reach the aim of this project are

1. Analysis of TQM standards used in the company and employee's knowledge about their business's quality and vision.
2. To investigate the problem in Shifts and to give suggestions for reducing the wastage of materials
3. To analyse and calculate the loss due to wastage of materials, to reduce amount of wastage and to enhance the cost saving activities.

1. LITERATURE REVIEW

A broad audit of writing was doing to distinguish the idea of TQM from quality masters, for example, Deming (1986), (Juranand Gryna, 1993), Crosby (1979), Feigenbaum (1991), and Ishikawa (1985). Their recommendations are the establishment for comprehension the idea of TQM.

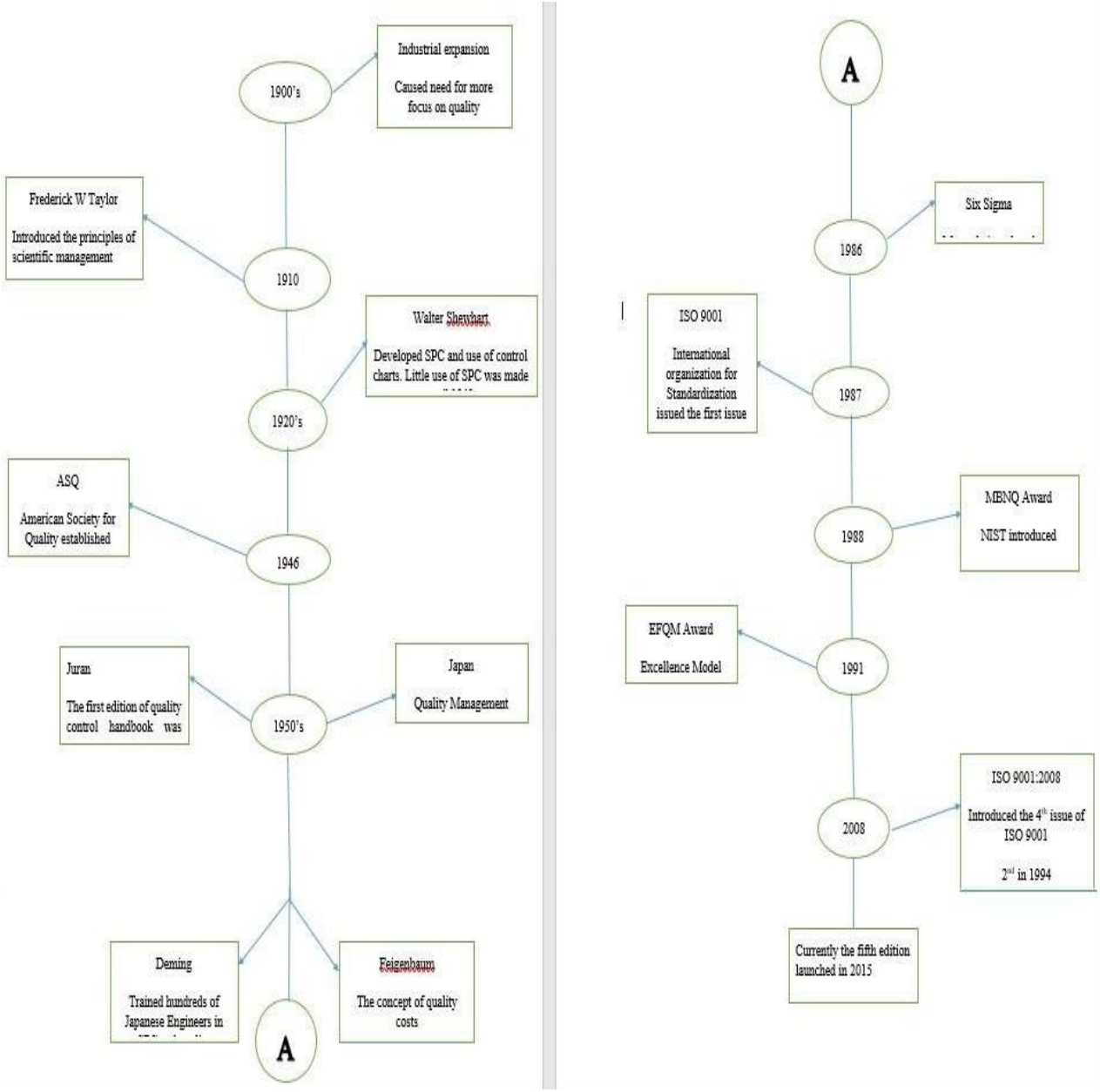

Fig1.1 Flowchart for TQM process approach

The hypothetical quintessence of the Deming way to deal with TQM concerns the formation of an authoritative framework that cultivates collaboration and learning for encouraging. The usage of procedure administration homes, which, thus, prompts the constant change of systems, items, and

policies and also to worker satisfaction, both of which are primary to consumer loyalty, and at last, to firm survival.

TQM is the arrangement of exercises coordinated at accomplishing charmed clients, engaged workers, higher incomes, and lower costs (Juran and Gryna, 1993). Juran trusted that principle quality issues are because of administration as opposed to labourers. The accomplishment of value requires exercises in all elements of a firm. All-inclusive appraisal of value, supplier quality management, utilising measurable routines, quality a data framework, and focused benchmarking are crucial to quality change.

Crosby (1979) recognised various vital standards and homes for an active class change program, which incorporate, forinstance, administration cooperation, management obligation regarding quality. Representative acknowledgement, training, diminishment of the expense of value (counteractive action costs, evaluation costs, and disappointment costs), accentuation on aversion as opposed to after-the-occasion assessment, doing things right the first run through, and zero imperfections.

Feigen Baum (1991) characterised TQM as A robust framework for incorporating the quality advancement, quality support, and quality-change endeavours of the different gatherings in a firm to empower advertising, building, creation, and administration at the most moderate levels which take into consideration full consumer loyalty.

Ishikawa (1985) contended that quality management develops past the item and incorporates after-deals benefit, the nature of administration, the nature of people and the firm itself . He asserted that the accomplishment of business was exceptionally subject to regarding quality change as an endless journey. He supported worker investment as the way to the efficient execution of TQM. QC (Quality circles), he accepted, are a critical vehicle to accomplish this.

Ishikawa utilised the term TQC (all out quality control) rather than TQM in his book. As per ISO 8402 – Quality administration and quality confirmation – vocabulary, TQM is here and there called "complete class", "vast quality control", "absolute quality control", and so forth.

After the ways to deal with TQM of the five quality matters have looked into, it has ended up evident that each has his particular unmistakable methodology [1]. In any case, the standards and practices of TQM proposed by these quality masters do furnish the creator with a superior comprehension of the idea of TQM. Their bits of knowledge offer a secure establishment for leading this study. Despite the fact that their ways to deal with TQM are not absolutely the same, they do provide some basic focuses which are outlined as takes after:

1. It is administration's obligation to give duty, initiative, strengthening, consolation, and the fitting backing to specific and individual procedures.
2. The process, strategy, and complete assessment exercises have underscored.

3. The significance of worker instruction and preparing has underlined in changing representative's convictions, conduct, and states of mind improving agent's capacities in doing their obligations.
4. It is essential to control the procedures and enhance quality framework and item outline.
5. Quality is a regular extensive action from suppliers to clients.

Numerous individuals have a deal with this theme. They found that apply TQM has explicitly expanded their confidence, build the fulfilment level and duty toward their work. These are the finding of different specialists. The real impact of TQM on representative's dedication in the organisation has so far not embraced. This undertaking has been done first time in this organisation.

A. *An experiment study on the relationship between student social and economic profile finance literacy student stratification and innovation within the framework of TQM.*

This paper describes the relationship between student and universities way to find students' needs and school satisfy it or not. By determining the needs and expectations of students from schools, one can offer new perspectives to innovate strategies. These study survey questions are asked to find students' needs from university and their opinions about the quality of services. A total, of 1004 students participated and analysis done by MANOVA also by evaluating data PARETO analysis was found with TQM. Questionnaire suggests a relation between educations levels of students their social and family status [2].

B. *The integration of TQM and technology/r&d management in determining quality and innovation performance*

This paper deals with the study of TQM and relation between the companies by the productivity of the organisational performs regarding quality and innovation. By (SEM) structural equation modelling technique TQM shows the strong relationship between quality performance and weaker in an innovative approach. The method is opposite to the r and d management. This study describes the closer relationship between R&Ds with TQM. Significant implications finding the appropriate resource from r and d to be used in harmony with TQM to enhance organisational performance particularly innovation [3].

C. *Mapping the critical links between corporate culture and TQM/Six Sigma practices*

This study shows that organisational culture by implementing the different practices of recent six sigma approach with traditional TQM methods. By surveying 226 us manufacturing plants finding a relationship between 4 learning types and 10 TQM/Six Sigma practices has examined through structural equation modelling technique. Collected TQM/ Six Sigma practices have discussed. By understanding the usage of each culture type should help managers achieve effective implementation of TQM/ Six Sigma practices for quality management and culture [4].

D. *Minimising wastage of sheet metal for economical manufacturing*

Many industries like automotive, furniture, white and brown goods electric and body building like coaches and containers using the sheet metals frequently. A lot of sheet metal rejected for the wastages during manufacturing. This project explains the wastages of sheet metal and the reduction of it in the layout stage itself. Finding the highly strained regions in the sheet metal blanks and allowing the window of variation in material properties and finding the exact utilisation of the material [5].

2. SIGNIFICANCE OF TOTAL QUALITY MANAGEMENT

2.1 TOTAL QUALITY MANAGEMENT

The quality cannot be defined by an individual it depends on each and every individual. Internal process of the manufacturing enterprise is improved by using the quality process. An enterprise should not be comprised with its quality policy and always should try to improve its process. This can be achieved only by the support of employees and management. The quality can be attained only if the employees work without any distraction, even if they are not monitored. The proper implementation of quality process can reduce the cost and by providing quality product to the customer, it can gain the trust of the customer which will lead to the re-order of the product. This will improve the production and productivity also the business is developed by providing quality products. The service cost can be completely reduced by providing the quality cost. The quality management process is focused on customer oriented organization. The high level quality can be attained only by following the process and procedures. The supplier and vendor are mutually benefited in the total quality management process. Quality is the continuous improvement process, there is no achieving hundred percent in quality the organization should keep on improving the process [6].

2.2 SEVEN PRINCIPLES OF TOTAL QUALITY MANAGEMENT

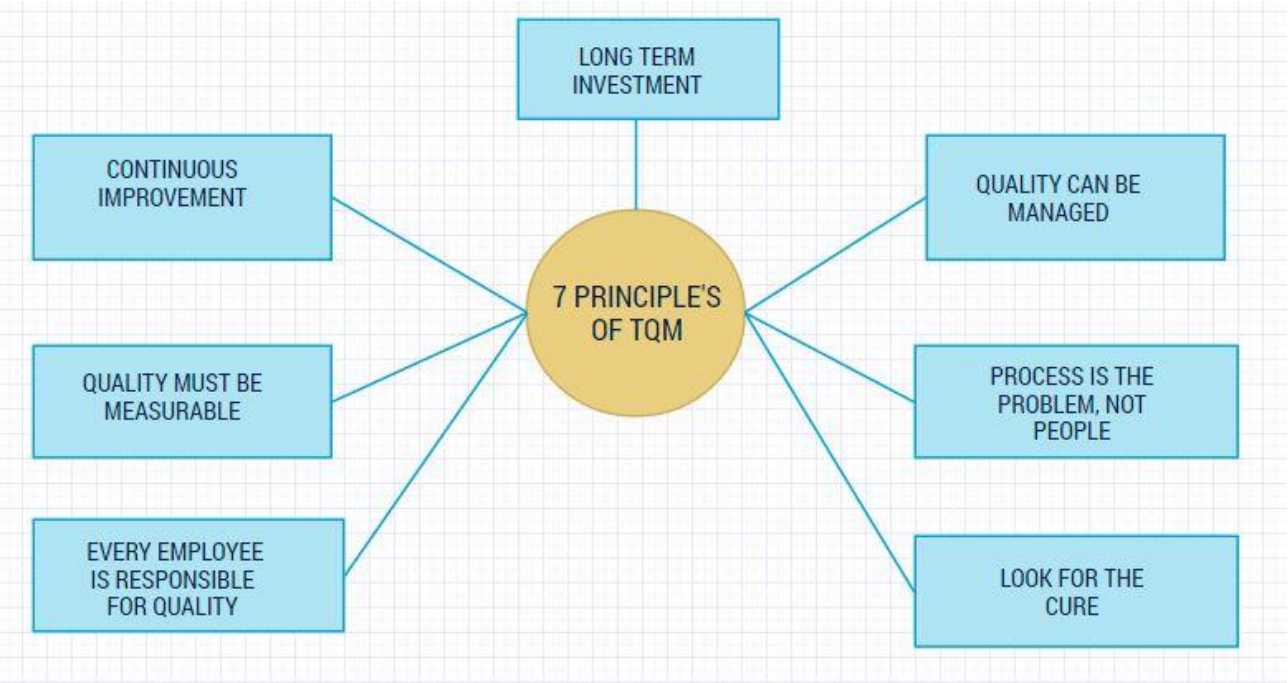

Fig 2.1. 7 principles of TQM

The fundamentals of total quality management are,

1. Employee's commitment
2. Satisfying customer needs
3. Decrease in cycle time
4. Just in time manufacturing
5. Development team's
6. Decreasing cost in production and service.
7. Proper procedure for improvement
8. Responsibility in line management
9. Involvement of employee's
10. Empowerment of employee's

2.2.1 Reasons to Adopt Total Quality Management

1. Enterprise should be made competitive
2. New procedure should be adapted every now and then for growth of the company.
3. The work environment provided should be clean and motivate employees.
4. Reduce waste through waste management.
5. Team work is more important.

Total quality management can be analysed by following methods,

1. Flowcharting
2. Pareto analysis
3. Cause and effect diagram/ fish bones analysis.
4. Survey of customer and employees [7].

2.2.2 Mistakes of Total Quality Management

1. Total quality management should be carried by experienced professionals.
2. Total quality management should bind with day to day activities [8].
3. Total quality management should not have considered as burden or extra expense.
4. Total quality management should understand the necessity of the total quality management.

Table 2.1. Concepts of total quality management

CONCEPTS OF TOTAL QUALITY MANAGEMENT					
S.NO	**MANAGEMENT COMMITMENT**	**EMPLOYEE EMPOWERMENT**	**FACT BASED DECISION MAKING**	**CONTINUOUS IMPROVEMENT**	**CUSTOMER FOCUS**
1	Plan	Training	Statistical Process Control	Systematic measurement and focus on CONQ	Supplier partnership
2	Do	Suggestion scheme	Failure mode and effect analysis	Excellence teams	Service relationship with internal customers
3	Check	Measurement and recognition	The 7 statistical tools	Cross functional process management	Never compromise quality
4	Act	Excellence teams	To promote safety	Attain, maintain, improve standards	Customer driven standards

2.3 AUTOMOTIVE TRADE

The historical backdrop of Total Quality Management (TQM) can be taken after in reverse to mid-1920s when the measurable hypothesis has initially connected to item quality control The centre has extended from nature of items to view of all issues inside of a foundation.

TQM views an organisation as a collection of processes. It maintains that institutions must strive to improve these processes continuously By collecting the data and experiences of staff.TQM is cannot be variable and labile. By initially applied to producing operations, and for a variety of years fully utilised in that limit, TQM is currently changing into recognised as a common management thing, even as applicable in commission and public sector organisations. The therearea unit variety of biological process strands, with completely different areas making their versions from the common ascendant. All out Quality Management (TQM) is an administration approach that goes for long haul accomplishment by focusing on customer fulfilment. TQM depends on the support of all individuals from an association in enhancing operations, items, administrations and the progress in which they work.

Throughout every country in world industry producing automobile has great development and increased profit, and also annual income cannot be compared due to the country economy because of pre-recession in several places

The main objective is the unbalance situations of global markets. The executives and experts automobile companies tend to be full of hope about the U.S. market, in North America by forecasting

the annual sales it is about the raise percentage of 16 million cars from 13million are in the year 2008.Europe is not that much stronger but its sales percentage is raising slowly and for Russia and South America sales percentage rate is low about 25 percentage and 15 percentage respectively in the year August 2014.the performance of Indian market in sales rate is inconsistent. China has good growth rate. since the world's largest vehicle market has fall [9]. Even though the most original equipment manufacturers(OEMs) are investing which is good for the demand in future by this strategic method for demand will give priority to industry leaders 2015.

2.3.1 Automobile Industry in India

The Automotive business in India is one of the greatest on the planet and one of the snappiest building up all around. India makes up more than 11 million vehicles (checking 2 wrangled wheeled) and exchanges around 1.5 million comprising. It is the world's second biggest creator of squad cars, with yearly arrangements surpassing 8.5 million in 2009. India's voyager auto and business vehicle manufacturing industry are the seventh greatest on the planet, with a yearly production of more than 2.6 million units in 2009. In 2009, India created as Asia's fourth biggest exporter of voyager automobiles, behind Japan, South Korea and Thailand.

Beginning 2009, India is home to 40 million voyager vehicles and more than 2.6 million autos were sold in India in 2009 (an extension of 26%), advancing to the nation the second speediest creating auto market on the planet. As assigned by the Society of Indian Automobile Manufacturers, yearly auto arrangements are foreseen to increase up to 5 million vehicles by 2015 and more than 9 million in 2020. By 2050, the country is expected to clean up the world in auto volumes with about 611 million vehicles on the nation's lanes [10]. A cut of India's auto creating industry is arranged in and around the urban focal point of Chennai, generally called the "Detroit of India". With the Indian city speaking to 60 for each penny of the country's auto exchanges. Gurgaon and Manesar close New Delhi are focus focuses where most of the Maruti Suzuki cars in India is created. The Chakan path close Pune, Maharashtra is another vehicular creation focus point with General Motors, Volkswagen/Skoda, Mahindra, Tata amid the time spent repairing or viably set up positions. Ahmedabad with Tata Motors Nano plant and Hall with General Motors in Gujarat, Aurangabad in Maharashtra, Kolkata in West Bengal are a segment of the other auto delivering locales around the nation.

2.3.2 Supply chain of Automobile Industry

While many automobile executives 42.3 percentage expect additional business recollects in 2015 and 2016, simply eight plc. use advanced prognosticative analytics to assist forestall, harden,

and manage recollects, in step with a recent on-line voting. approximately one-quarter 23 percentage doesn't have any operational product safety and recall antecedent analytic capacity. The essential different today's automobile are among the very best quality ever made from a security and irresponsibleness standpoint; innovations in technology have accelerated such makers will currently establish rising safety and quality problems abundant prior to before; and, regulative scrutiny of the automobile business has multiplied dramatically throughout the past 12-18 months," same Henry M. Robert Bisk up, Deloitte informative director, Deloitte money informative Services LLP, and former automotive business chief compliance officer. "While adequate early warning systems appear reachable, not all are taking advantage".

Transactions and Business Analytics LLP, added, "Many automakers still take a manual, rear-view-mirror approach to vehicle quality and safety [11]. But, leading OEMs are beginning to adopt creative analytic capacity like proactive sensing for early issue identification and command centres for campaign administration By cross-source relating internal and external knowledge sources, using specialised advanced analytics, and investing interactive visualisations, these firms will improve client satisfaction, vehicle safety, and whole perceptions.

2.4 AVR COMPANY PROFILE

AVR Manufacturers founded in the year 2003, the production of clamps using sheet metal parts and also the particular type washer, precision sheet metal press components, deep drawn components, and oil seal inner shells. The company use some of the latest technology and which has currently used in automotive industries, automobiles and other engineering firms.

They distribute in a wide range of industries using the different arena for the manufacturing of automobile parts according the companies need in shape and dimensions and also they achieved the targets both technical and marketing aspects. Over a decade, the company has made a distinct place in the market.

The main aim of the company is customer satisfaction by offering their clients with qualitative products and also quantitatively [12]. This Products, owing to its functionality, durability, efficiency, and cost-effectiveness has preferred by a vast list of customers across India. By giving the best quality of the product does not increase the selling price and also satisfies the client needs efficiently.

Vision of the organization

The organization target is to meet the customer requirements by supplying high quality product at competitive price. The organization reputation and longevity and success is based on continuous supply of quality products and service [12].

The company products is produced with certain favour. The features are,

1. Cost efficient
2. Durable for Long lasting service
3. Well tested
4. Prepared from premium quality raw material
5. Rust resistant

The companyproducts contain different dimensions and designs. They are produced from high quality raw material and advance technology is used. Some of the industries where the companyproduct is used [12].

1. Automobile industries
2. Textile machineries manufacturing
3. General Engineering
4. Electrical Panel manufactures
5. Transformer manufacturing
6. Valves manufacturing
7. Switch gear manufacturing

The customer stratification is first priority, we continuously thrive andhard work to provide the quality components in the most efficient way. The company has advanced technology and latest technique it operates strongly even in fluctuating market condition [12].

The company has cost-effective solutions with the help of latest technology, The organization produce the following components and panel boxes in the most productive way. This helps the company helps in utilizing the resources and manufacturing quality products. The production cost is reduced products produced are enabled in high competitive cost [12].

Some of these facilities are accessible

1. On Time Delivery (OTD)
2. Efficient operations with economical machines

3. Open cost system to customer
4. Hourly rates for work center Systematic cost evaluation
5. Operation wise actual production timings
6. Waste and scrap value deduction from cost

Customization

With the help of the company highly experienced team of professionals we provide taylor made facility to the customers of the company. We produce these components and meeting the targets in various plans and sizes to match the required demands of the company's customers [12].

Quality Policy

Organisation choose professional people for evaluating the productswho gives more important to new products produced and also in manufacturing process of the component and the company insists to check their product at various stages [12].

1. Raw Material test
2. Dimensional estimations amid creation
3. Hardness tests
4. Finished test like Plating and Powder covering
5. Final Inspection according to customer necessities

3. METHODOLOGY OF THE STUDY

3.1 PHASE 1

3.1.1 Objectives of the Study

Learning about Quality and finding ways to improve the quality stats effectively is a relatively tough task. But if the quality supervision is done at different levels and later integrating them can be easy to evaluate.

Method of data collection

The two methods of data collection are

1. Primary Data
2. Secondary Data

Primary data

Primary data's area unit those that ought to collect for the first time alone. It's the recent information. During this project, the first information can receive through the form.

Secondary data

Secondary information area unit those that got to collect, during this project, secondary supply like the corporate web site, annual report, the internet, and sure printed journals of the business has accustomed obtain the knowledge.

Research design

Research style constitutes the blue print for the gathering measuring and analysis of information. So review style could be an abstract framework inside the analysis is conducted. I have used a convenient sampling technique to gather the information from the respondent.

Research instrument

The device that has utilised for the gathering of knowledge is that the form. The form may be a Performa containing a sequence of inquiries to collect data from the respondent. Therefore, the structure consists of a variety of queries written in a very definite order of a type or set of types. Here I even have used the structured and not – disguised shape and that I framed the way within the following approach. The first half (1-7) queriescomprise ofthe non-public details of the respondents. The second half (8 and 9) question tells regarding the respondents rating regarding company and TQM system. The third half (10-14) enquires regarding respondents read on quality and quality organisational system certification. The fourth (15-17) queries deal with the defendant data regarding numerous TQM tools. The one-fifth deals with the extent of respondent awareness towards world category producing a system (18-21).

Research Methodology

1. Analysis methodology could be a thanks to consistently solve the analysis downside because it guides however analysis is completed scientifically.
2. The research had used Descriptive research method. The primary purpose of the descriptive research is to describe the stare of view as it exists at present. (S. N Murthy, U.Bhojanna 2004).
3. Based on the manager's suggestion I took the questionnaire based on the TQM techniques.
4. It can be only described as a fact finding investigation.
5. I analysed that Employees are whether satisfied with technology in the company and knowthe reason if they were nothappy with technology in the business.

Sample size

Samples need to collect from staff and employees of the organisation. The whole sample size of each one hundred and a lot of numbers.

3.2 PHASE II

Objectives of the study

The next step it allows to measure the progress against a particular set of goals and time line. Breaking it into steps helps to define the specific tasks that will be able to complete. The two phases of which this project can be able, to complete are.

The Quality Assessment is carried out at the various stages of the production process. They are,

Primary Objective

A study on Wastage Management at AVR Manufacturers

Secondary Objective

The Secondary objectives mean to go even further into the study to find ways to improve the level of Quality to the next step.

1. To identify the wastage parameters at various stages of the production process.
2. To determine the percentage of waste and the parameters contribute to the wastage.
3. To find which shift that contributes to the largest percentage of waste.
4. To determine the relationship between the primary factors accounted for the wastages with quality management.
5. To analyse the data using Quality management techniques and reduce the loss of amount caused by the wastage of material.

1. Collect data by means of interview scheduling

1. Setup a meeting with the Production manager.
2. Monitor the production by working with the production manager.
3. Make an observation of the factors contributing to the quality of those production manager advices.

2. Arranging of data

1. Categorizing the total amount of wastage by observing the factory floors based on the factors.
2. Based on the shifts of work arrange the data.

Scope of The Study

The study leans toward the determination of Quality through the management of wastes by finding the key parameters that cause waste in a production process. Moreover, by not stopping with the evaluation of Quality, Finding ways to improve Quality even further to improve Quality and reduce Cost and waste thus paving way for the processes of effective management of resources. It is easy to sort out the tasks and measure the level of wastes at each level by dividing the means of assessment at various levels of the production process it is easy to sort out the tasks and measure the level of wastes at each level and hence by monitoring at these levels waste can be easily managed and Quality can be achieved in the process.

4. ANALYSIS AND INTERPRETATION

4.1 DATA ANALYSIS

Examination of information is the standard separating into reliable parts and control of information get an answer for exploration goals. Here the specialist has made recurrence and rate technique for dissecting the information.

Table 4.1. Age of the Respondents

AGE	NUMBER OF RESPONDENTS	PERCENTAGE
Below 25	20	20%
25-35	23	23%
36-45	39	39%
Above 45	18	18%
Total	100	100%

From the above table (Table 4.1) it was found that, about 20% of the respondent have the age of below 25 years, 23% of respondents are in the age group of between 25 to 35 years, 39% of them are in age group between 36 to 45 years and 18% of them above 45 years. Most of the respondents belong to the age group of 35-45 years.

The company recruits more young people, which gives the company an added advantage, as the young minds generates lot of innovative ideas that helps improving the company technically and management gives lot of freedom for them to think and suggest their views to the company which says that the company allows interaction of the employee with the top management. The organization allows the student to pursue their thesis and get their input and improve the process of the company.

Table 4.2. Educational Qualification

EDUCATIONAL QUALIFICATION	NUMBER OF RESPONDENTS	PERCENTAGE
SSLC/Diploma/ITI	32	32%
Hr. Sec	28	28%
U.G.Degree	25	25%
P.G. Degree	7	7%
Others	8	8%
Total	100	100%

The research indicates that (Table 4.2) 32% of the respondents have studied SSLC/Diploma/ITI, 28% of respondents have considered Higher secondary, 25% of the interviewees. Some of them having studied U.G degree, 7% of the respondents have studied P.G degree, and 8% of the respondents have studied other than above four categories. From this, it is evident that most of the respondents have studied SSLC/Diploma/ITI.

The employees with under graduate and post graduate degree will be in high level management which give the organization a push in managing a high budget project the employees without the degree are in labour level who work as a helpers and production workers. These employees possess lot of experience thus the work is done in a good pace to complete the project within the due date.

Table 4.3. Experience

EXPERIENCE	NUMBER OF RESPONDENTS	PERCENTAGE
Below 1 Year	4	4%
1-5 Years	25	25%
6-10 Years	40	40%
11-15 Years	19	19%
Above 15 Years	12	12%
Total	100	100%

The research indicates that (Table 4.3) 4% of the respondents have experienced below one year, 25% of respondents have experience between 1 to 5 years, 40% of the respondents. And they have experience between 6 to 10 years, 19% of the respondents have experience between 11 to 15 years, and 12% of the respondents have experienced more than 15 years. From this, it is evident that most of the respondents have working experience between 6 to 10 years.

The experienced employees will train the fresh employees which will be the base for the future of the company this will help the company not to lose its chain of employees with the experience. Experience of the employees plays a major role in improving the productivity and quality of the employees. these experienced employees can handle the pressure at the ease and the production due date is not a concern.

Table 4.4. Monthly Income

MONTHLY INCOME	NUMBER OF RESPONDENTS	PERCENTAGE
Below 8000	2	2%
8001-13000	21	21%
13001-18000	59	59%
Above 18001	18	18%
Total	100	100%

The research indicates that (Table 4.4) only 2% of the respondents have monthly salary below 8000 (106 euros), 21% of respondents. And they have a monthly salary between 8001(105 rupees) to 13000 (172 euros), 51% of the respondents have a monthly salary between 13001(172 euros) to 18000 (238 euros), and 18 % of the respondents have a salary above 18001. Most of the respondents have a monthly salary in the range of 13001 (172 euros) to 18000(238 euros)

Company provides salary by the basis on experience of the employee since the provide more internship and job opportunity for freshers the can make employee to get experience and also they provide salary according to it

Table 4.5. Respondents feeling about Organisation

FEELING ABOUT ORGANISATION	NUMBER OF RESPONDENTS	PERCENTAGE
Excellent	50	50%
Above Average	39	39%
Average	9	9%
Below Average	2	2%
Total	100	100%

From the above table (Table 4.5) it was found that 50 % of the respondents feel that AVR Manufacturers. It is an excellent place to work, 39 % of the respondents feel that the working environment is above average, 9% of them feel that the working environment is average, and only 2% of the respondents believe that working environment is below average. Most of the respondents are satisfied with the company working environment.

The organization should be in good environment which gives the employee a good atmosphere to work without any huddles and the production of the company increases as the employee works in a good atmosphere.

Table 4.6. Respondents rating of TQM system

RATING OF TQM SYSTEM	NUMBER OF RESPONDENTS	PERCENTAGE
Excellent	27	27%
Good	34	34%
Average	26	26%
Below Average	13	13%
Total	100	100%

From the above table (Table 4.6) it was found that 27 % of the respondents rate the TQM system as excellent, 34 % of the respondents rate the TQM system as above average, 26% of respondents rate the TQM system as average and 13 % of the respondents rate the TQM system as below average. Most of the respondents rate their TQM system as good.

Table 4.7. Quality is must in a product Respondents view

NEED OF QUALITY IN PRODUCT	NUMBER OF RESPONDENTS	PERCENTAGE
Strongly Agree	37	37%
Agree	54	54%
Strongly Disagree	2	2%
Disagree	7	7%
Total	100	100%

From the above table (Table 4.7) it was found that 37 % of the respondents strongly agree that quality is needed in a product to give customer satisfaction, 54 % of the respondents agree that quality is needed in a product to give customer satisfaction, 2% of the respondents strong disagree that quality is needed in a product to give customer satisfaction and 7% of the respondents disagree that quality is needed in a product to give customer satisfaction. Most of the respondents agree quality is needed in a product to give customer satisfaction.

The quality of the product is very important for an organization as their reputation is in the product quality. this also makes the customer satisfied which will result in the further order of the product so the company can improve its production capability and improve the production and business to the next level this will help us to reach to the vast customer base. the quality should not be comprised at any cost the management should be very concerned about the quality of the product and should fund the quality department without any second thoughts

Table 4.8. AVR Manufacturers is quality conscious towards employees

QUALITY CONSCIOUS TOWARDS EMPLOYEES	NUMBER OF RESPONDENTS	PERCENTAGE
Yes	80	80%
No	20	20%
Total	100	100%

The research indicates that (Table 4.8) 80% of the respondents feel that the organisation is quality conscious towards employees, and 20 % of the respondents feel that the organisation is not quality conscious towards employees. Most of the respondents agree that the organisation is quality conscious towards employees.

The quality awareness should be made to the employee and make him understand how the quality helps improving the individual work and the improvement of the company on the whole .the organization should encourage the employee with incentive the one who thrives for quality of the product

Table 4.9. Quality Assurance System and Operation

QUALITY ASSURANCE SYSTEM PRESENT	NUMBER OF RESPONDENTS	PERCENTAGE
Yes	55	55%
No	19	19%
Don’t know	26	26%
Total	100	100%

The research indicates that (Table 4.9) 55% of the respondents said that the organisation is providing quality assurance system and operation, 19 % of the respondents. They also mentioned that the organisation is not providing quality assurance system and exploitation and 26 % of the respondents don’t know whether the organization is providing quality assurance system and operation. Most of the respondents said that the organisation is providing quality assurance system and process.

There is no quality assurance satisfaction level as quality is a continuous improvement process every employee should try to improve the process every now then practicing same quality process won’t help in the improvement of the company both technically and financially

Table 4.10. Quality Circle present

QUALITY CIRCLE	NUMBER OF RESPONDENTS	PERCENTAGE
Yes	85	85%
No	3	3%
Don’t	12	12%
Total	100	100%

The research indicates that (Table 4.10) 85% of the respondents said that the organization have quality circle, 3 % of the respondents said that the organization have no quality ring and 12 % of the respondents don’t know whether the organization have quality circle or not. Most of the respondents are aware of the presence of quality circle and its functions

The quality assurance procedures is followed in repairing the documents and arranging the document according to their ISO standard

Table. 4.11. Other Company Benchmarking of AVR Manufacturers. Policy

BENCH MARKING OF AVR MANUFACTURERS POLICY	NUMBER OF RESPONDENTS	PERCENTAGE
Yes	42	42%
No	25	25%
Don’t know	33	33%
Total	100	100%

The research indicates that (Table 4.11) 43% of the respondents said that other companies are bench marking AVR Manufacturers. policy, 25 % of the respondents said that other businesses are not bench marking AVR Manufacturers. System and 33 % of the respondents don’t know whether other businesses are bench marking AVR Manufacturers. policy or not. Most of the respondents said that the AVR Manufacturers. policies are bench marked and followed by other company.

Table 4.12. Practicing 5S

PRACTICING 5S	NUMBER OF RESPONDENTS	PERCENTAGE
Yes	89	89%
No	6	6%
Don’t know	5	5%
Total	100	100%

The research indicates that (Table 4.12) 85% of the respondents said that company is practising 5S system, 6 % of the respondents said that company is not practising 5S system, and 5 % ofthe respondentsdon’t know whether the group is exercising 5S system or not. Most of the respondents said that the AVR Manufacturers. is practising 5S system.

Table 4.13. Practicing Six Sigma

PRACTISING SIX SIGMA	NUMBER OF RESPONDENTS	PERCENTAGE
Yes	6	6%
No	46	46%
Don’t know	48	48%
Total	100	100%

Respondents said that company is practicing six sigma system for error control, 46 % of the respondents said that company is not practicing six sigma method for error control and 48 % of the respondents don’t know whether group is practicing six sigma system for error control or not. Most

of the respondent (48%) said that they don't know whether AVR Manufacturers. Drilling six sigma methods for error control or not. But the real fact is that company has not reached the stage of using six sigma methods for error control.

Table. 4.14. Respondents aware about all the WCM Strategy

KNOW ALL THE WCM STRATEGY	NUMBER OF RESPONDENTS	PERCENTAGE
Yes	28	28%
No	72	72%
Total	100	100%

The research indicates that (Table 3.14) 28 % of the respondents are aware about all world class manufacturing (WCM) strategy followed by the company, 72% of the respondents are not aware of all world class manufacturing (WCM) strategy developed by the company. Most of the respondents (72%) said that they are not aware of all world class manufacturing (WCM) strategy followed by AVR Manufacturers

Table 4.15. Stage of Company in WCM system

STAGE OF COMPANY IN WCM	NUMBER OF RESPONDENTS	PERCENTAGE
Yes	30	30%
No	70	70%
Total	100	100%

The research indicates that (Table no. 4.15) 30 % of the respondents know the present stage of the company in world class manufacturing (WCM) system, 70% of the respondents did not know the current stage of the company in world class manufacturing (WCM) system. Most of the respondents (70%) said that they don't know the current stage of the company in world class manufacturing (WCM) system

Table. 4.16. Training given to work in WCM systems

TRAINING GIVEN	NUMBER OF RESPONDENTS	PERCENTAGE
Strongly Agree	32	32%
Agree	45	45%
Strongly Disagree	8	8%
Disagree	15	15%
Total	100	100%

From the above table (Table 4.16) it was found that 32 % of the respondents strongly agree that training is given to them to work in WCM system, 45 % of the respondents agree that training is given to them to work in WCM system, 8% of the respondents strong disagree that training is given to them to work in WCM system and 15% of the respondents disagree that training is given to them to work in WCM system. Most of the respondents (45%) agree that sufficient training is given to them to work in WCM system.

Table 4.17. Studied lean tools before AVR Manufacturers.

LEAN TOOLS BEFORE	NUMBER OF RESPONDENTS	PERCENTAGE
Yes	15	15%
No	85	85%
Total	100	100%

From the above table (Table 4.17) it was found that 37 % of the respondents studied lean tools before joining AVR, 63 % of the respondents not considered any of the lean tools before joining AVR. Most of the respondents (63%) not studied any lean tools before joining AVR.

Table. 4.18. Wastes are reduced by using Lean tools

WASTES ARE REDUCED IN LEAN TOOLS	NUMBER OF RESPONDENTS	PRECENTAGE
Yes	64	64%
No	18	18%
Don’t know	18	18%
Total	100	100%

The research indicates that (Table 4.18) 65% of the respondents said that wastes are reduced by using lean tools in production, 18 % of the respondents said that wastes are not reduced by using lean tools and 18 % of the respondents don’t know whether residues are reduced by using lean tools or not. Most of the respondents (65%) said that wastes are reduced by using lean tools in production.

Table 4.19. Difficult to work and learn Lean tools

DIFFICULT TO WORK AND LEARN LEAN TOOLS	NUMBER OF RESPONDENTS	PRECENTAGE
Yes	35	35%
No	65	65%
Total	100	100%

The research indicates that (Table 4.19) 35% of the respondents said that it's difficult to learn and work in lean tools, and 65 % of the respondents said that it's not difficult to learn and work in lean tools. Most of the respondents (65%) said that it's easier to learn and work in lean tools.

Table 4.20. Lean tools are necessary for an organisation

LEAN TOOLS ARE NECESSARY	NUMBER OR RESPONDENTS	PERCENTAGE
Strongly Agree	40	40%
Agree	44	44%
Strongly Disagree	7	7%
Disagree	9	9%
Total	100	100%

The research indicates that (Table 4.20) 40 % of the respondents strongly agree that lean tools are necessary for an organisation, 44 % of the respondents agree that lean tools are necessary for a group, 7 % of the respondents strong disagree that lean tools are necessary for an organisation, and 9% of the respondents disagree that lean tools are necessary for an organisation. Most of the respondents (44%) agree that lean tools are necessary for an organisation.

4.2 FINDINGS AND SUGGESTIONS

In this 39% of the respondents belong to the age group of 35-45 years. Most of the respondents (32 %) have studied SSLC/Diploma/ITI. The workers mostly studied diploma or higher secondary. Most of the respondents (40%) have working experience between 6 to 10 years. Most of the respondents (50%) feel that AVR is an excellent place to work. 34% of the respondents rated the TQM system in AVR is good. 54% of the respondents agree that quality is needed in a product to give customer satisfaction. Most of the respondents (80%) agree that the organization is quality conscious towards employees. Most of the respondents (55%) said that the team is providing quality assurance system and operation. 85% of the respondents are aware about the presence of quality circle

and its functions. Most of the respondents (42%) said that the AVR Manufacturers. policies are bench marked and followed by other company. Most of the respondents (89%) said that the AVR Manufacturers. is practicing 5S system. Most of the respondents (48%) said that they don't know whether AVR Manufacturers. practicing six sigma systems for error control or not.

Most of the respondent (72%) said that they are not aware about all world class manufacturing (WCM) strategy followed by AVR Manufacturers. Most of the respondents (70%) said that they don't know the present stage of the company in world class manufacturing (WCM) system. 45% of the respondents agree that sufficient training is given to them to work in WCM system. 63% of the respondents said that not studied any lean tools before joining AVR. Most of the respondents (65%) said that wastes are reduced by using lean tools in production. Most of the respondents (65%) said that it's easier to learn and work in lean tools. Most of the respondents (44%) agree that lean tools are necessary for an organization.

The company should educate the worker about the various world class manufacturing system and the importance of lean tools. The priority attention must have to give the employees for training in latest lean tools. The company should take the necessary step to implement proper waste effluent treatment plant. The management should buy advanced machines for production so that quality products manufactured quickly. The company should promote their product by giving advertisement in leading printing and electronic media. The company should use waste paper and bagasse for making paper than only cutting of trees for making paper has avoided.

The company should not cut the trees from the forest (deforestation) to prevent environmental degradation. The company should take necessary steps to reduce the amount of air pollutant that they are emitting. The company should take the necessary action to implement proper waste effluent treatment plant. The management has to take the necessary step to measure the employee's suggestion in company's decision-making process. The company should take particular measures to provide adequate information to the employees regarding works.

5. IMPLEMENTATION AND ANALYSIS

The wastages for sheet metal product for shift 1 and shift 2 has been acquired by monitoring the production process for a period of one month under the manager's guidance. The obtained values are shown in the table below.

Table 5.1 Defective materials for one month period.

DAY	WASTAGES IN SHIFT 1	WASTAGES IN SHIFT 2
1	293	259
2	88	94
3	343	376
4	180	296
5	256	172
6	193	422
7	589	408
8	318	180
9	649	287
10	459	923
11	212	268
12	223	398
13	214	488
14	402	494
15	225	426
16	128	415
17	361	457
18	283	45
19	556	460
20	297	145
21	152	177
Total	6,421	7,190

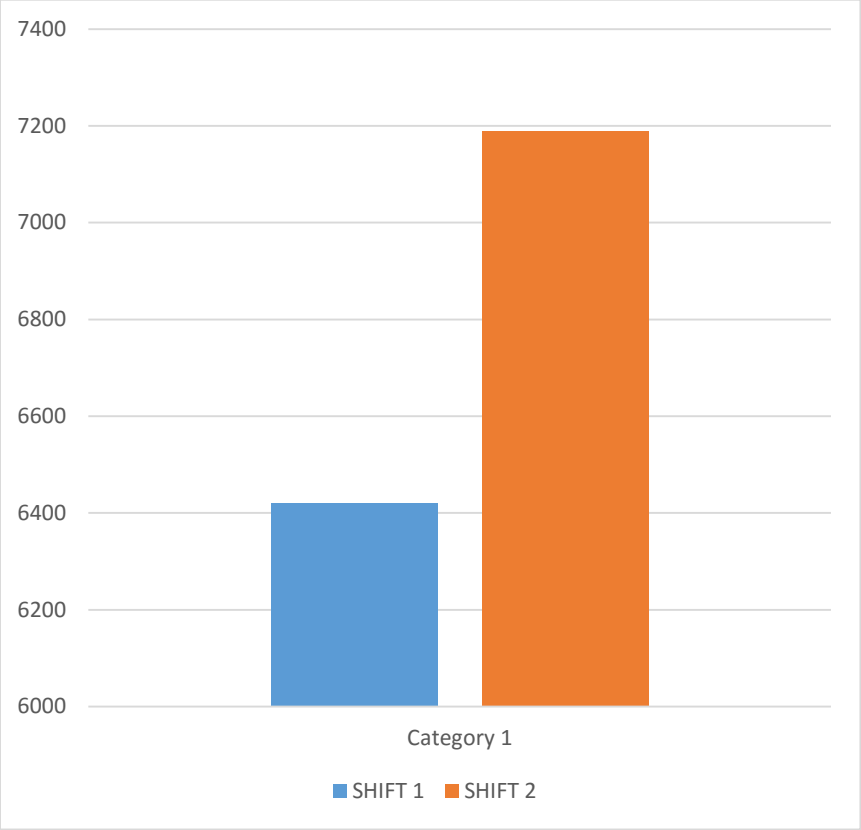

Fig 5.1 Defective materials for one month period

The amount of wastage occurs more in Shift 2 is significantly greater than in Shift 1. The variation in the wastage produced in the shift 1 and 2 occurs, based on the size of the product, time usage for the machines without errors. Mainly it happens because of human errors based on the skilled and non-skilled labours working in the shifts

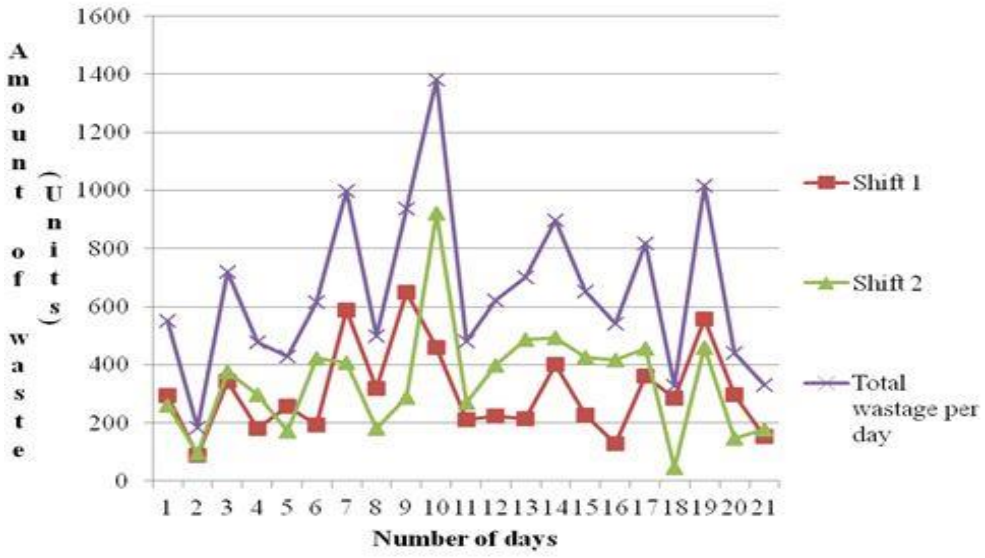

Fig5.2. Fluctuation in waste in production on shifts

Inference

From the control chart, the Quality improvement is not uniform i.e.) it is in constant fluctuation. Main reason for this type of variation has based on the different size (dimensions) clamp has manufactured in both shifts. Sometimes occurs different type of product (clamps) is made based on the customer's requirement.

Table 5.2. Arrangement of wastage parameters

DEFECTIVE PARAMETERS	SHIFT1 (UNITS)	TOTAL DEFECT % IN SHIFT 1	SHIFT 2 (UNITS)	TOTAL DEFECT % IN SHIFT 2	TOTAL (UNITS)
Casting defects	1256	9.23	2229	16.37	3485
Small outer ϕ	1042	7.6	1803	13.25	2845
Big outer ϕ	1479	10.87	987	7.25	2466
Big inner ϕ	386	2.68	1824	13.45	2210
Small inner ϕ	729	5.42	905	6.75	1634
Drilling	606	4.45	365	2.68	971
Total	5498	40.18	8113	59.82	13611

Interpretation

Where,

Φ – diameter

The values obtained from table 5.2 are plotted in a pictorial representation in the pie charts and bar diagram below.

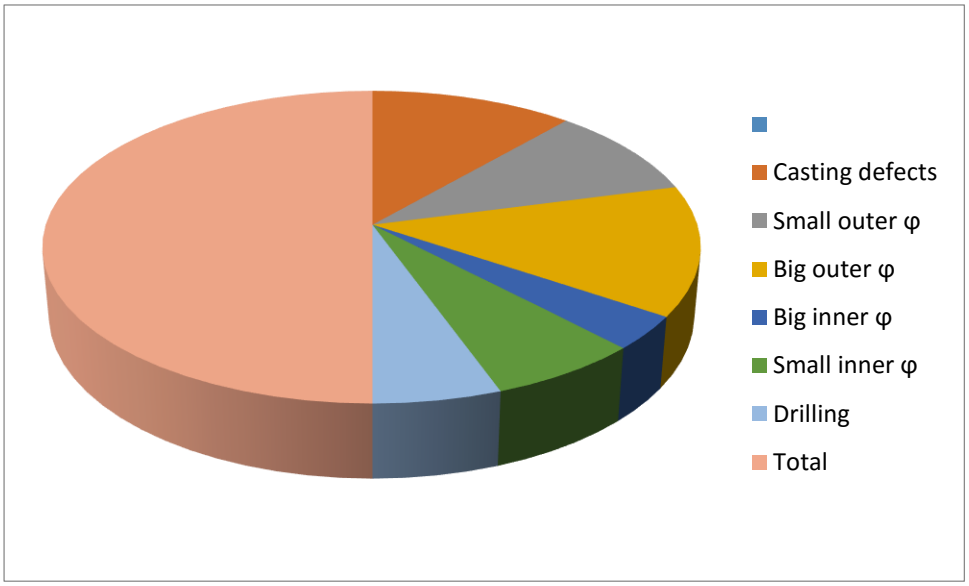

Fig 5.3. Percentage of waste contributed for shift 1

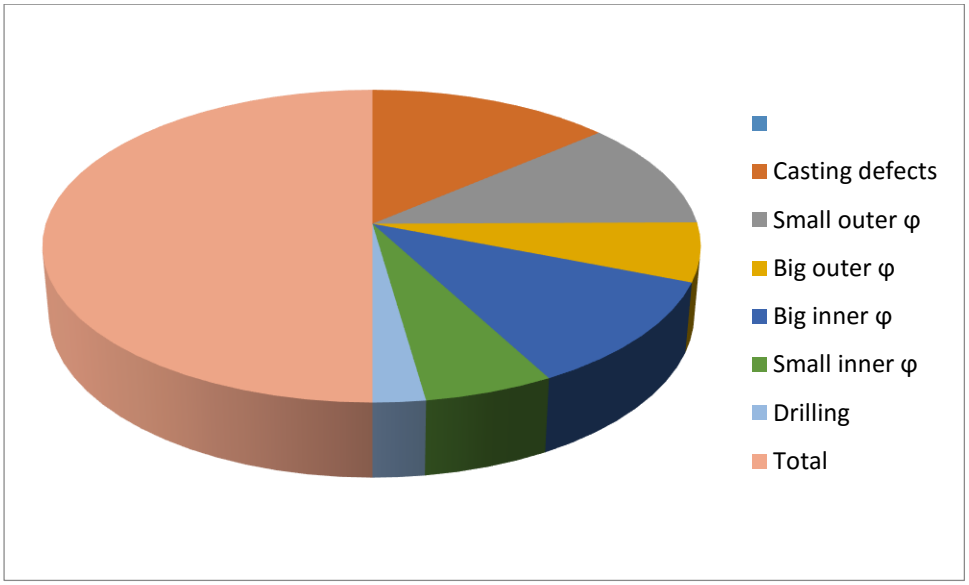

Fig 5.4. Percentage of waste contributed for shift 2

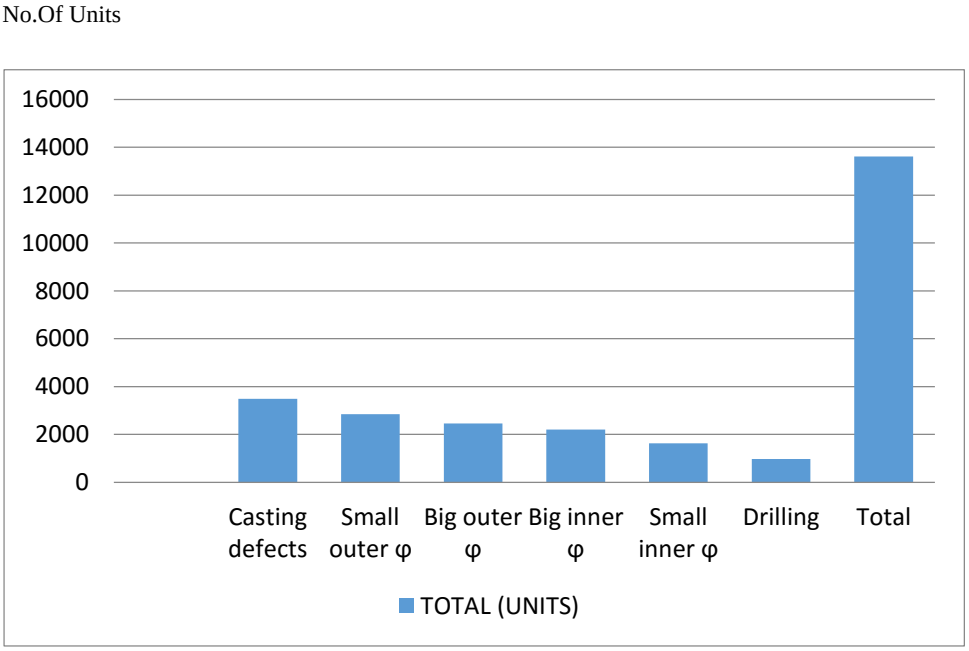

Fig5.5. Total units of wastage

5.1 LOSS AND CALCULATION OF WASTAGE

Loss due to defects

The defects mentioned in the table 5.2 are for one month due to this defect there is loss in money invested for this material the loss should be calculated and eradicated from the system that is why the defects are found specially in each machining operation ,the problems for this defects to happen is discussed already now by rectifying these defects the amount money saved for the company is to be determined .Labor cost ,material cost, Machining cost, overhead cost are area where loss happens these areas are calculated to show how much loss happens due to defective parts.

Calculation of loss due to defects

$$Loss\ due\ to\ defects = Labor + material\ + machining\ + overhead \quad (1)$$

Labor cost

The labor cost means that salary or wages which is paid to the employee in addition with taxes of pay roll and other profits labor cost can be further divided into [13].

1. Direct labor cost
2. Indirect labor cost

$$Labor\ cost = \frac{Total\ labor\ cost}{Total\ no\ of\ units\ produced} \quad (2)$$

Material cost

The cost for every material is necessary for the needs of the service and production on goods direct material cost does not include non production material cost such as stationary furniture [14].

$$Material\ cost = Actual\ cost - standard\ cost\ of\ actual\ quantity \quad (3)$$

$$Actual\ cost = actual\ quantity\ \times Actual\ price \quad (4)$$

$$Standard\ cost\ of\ actual\ quantity = Actual\ quantity\ \times Standard\ price \quad (5)$$

Machining cost

$$Machining\ cost = FE + FS + I + D \quad (6)$$

Where,

FE – Fixed expense per unit

FS – Foreman salary

I – Insurance

D – Depreciation cost per unit

Over head cost

This cost refers to operating cost which is essential for business generally overhead cost include expenditure that indirectly generate profit such as labor and material which are unnecessary to maintain business function it includes

1. Supplies for operating manufacturing process cost
2. Safety and Environment cost
3. Maintenance
4. Material Handling

$$overhead\ cost = SOM + SnE + M + MH \quad (7)$$

Where,

SOM – Supplies for operating manufacturing process cost ,

SNE – Safety and Environment cost ,

M – Maintenance,

MH – Material Handling .

Loss calculation for defective casting

$$Labor\ cost\ per\ unit = \frac{total\ labor\ cost\ per\ day}{total\ no\ of\ units\ produced\ per\ day}$$

$$Total\ labor\ cost = no\ of\ labors\ \times salary\ of\ the\ labors$$

No of labours – 60

Salary of the labours – € 65

$$Total\ labor\ costs = 60\ \times 65 = 3900€/month$$

$$Total\ labor\ costs\ per\ day = \frac{total\ labor\ costs\ per\ month}{no\ of\ days\ in\ a\ month}$$

$$Total\ labor\ costs\ per\ day = \frac{3900}{30} = 130€/day$$

Total no of units produced per month – 1,50000

$$Total\ no\ of\ units\ produced\ per\ day = \frac{total\ no\ of\ units\ produced\ per\ month}{no\ of\ days\ in\ a\ month}$$

$$Total\ no\ of\ units\ produced\ per\ day = \frac{150000}{30} = 5000\ units$$

$$\boldsymbol{Labor\ cost\ per\ unit = \frac{130}{5000} = € 0.026}$$

Material Cost

$$Material\ cost = Actual\ cost - standard\ cost\ of\ actual\ quantity$$

$$Actual\ cost = actual\ quantity\ \times Actual\ price$$

$$Standard\ cost\ of\ actual\ quantity = Actual\ quantity\ \times Standard\ price$$

Actual quantity/month – 150000 unit

Actual price/unit – € 1.92

Standard price/unit – € 1.10

$$Actual\ cost\ = 150000\ \times 1.92 = €\ 288000$$

$$standard\ cost\ of\ actual\ quantity = 150000 \times 1.10 =\ 165000$$

$$Material\ cost = 288000 - 165000 = 123000$$

$$\boldsymbol{Material\ cost\ per\ unit = \frac{5000}{4100} = €\ 1.22}$$

Machining Cost

$$Machining\ cost = FE + FS + I + D$$

Fixed expense per unit – 0.79

Foreman salary

No of foreman – 4

Salary of foreman – € 400

Total salary of foreman= € 1600

$$Total\ salary\ of\ foreman\ per\ unit = \frac{1600}{5000} = €\ 0.32$$

Insurance per unit – € 0.46

Depriciation cost per unit – € 0.9

$$Machining\ cost = 0.79 + 0.32 + 0.46 + 0.9 =\ €\ 2.47$$

Over head cost

$$overhead\ cost = SOM + SnE + M + MH$$

Supplies for operating manufacturing process cost / unit – € 0.85

Safety and Environment cost per unit – € 0.59

Maintenance cost per unit – € 0.18

Material Handling per unit – € 0.37

$$overhead\ cost = 0.85 + 0.59 + 0.18 + 0.37 = €\ 1.99$$

$$Loss\ due\ to\ defects = 0.026 + 1.22 + 2.47 + 1.99 = €\ 5.70$$

Loss calculation for defective (SOD,BOD,SID,BID)

$$Labor\ cost\ per\ unit = \frac{total\ labor\ cost\ per\ day}{total\ no\ of\ units\ produced\ per\ day}$$

$$Total\ labor\ cost = no\ of\ labors\ \times salary\ of\ the\ labors$$

No of labours – 30

Salary of the labours – € 200

$$Total\ labor\ costs = 30\ \times 200 = 6000€/month$$

$$Total\ labor\ costs\ per\ day = \frac{total\ labor\ costs\ per\ month}{no\ of\ days\ in\ a\ month}$$

$$Total\ labor\ costs\ per\ day = \frac{6000}{30} = 200€/day$$

Total no of units produced per month – 1,50000

$$Total\ no\ of\ units\ produced\ per\ day = \frac{total\ no\ of\ units\ produced\ per\ month}{no\ of\ days\ in\ a\ month}$$

$$Total\ no\ of\ units\ produced\ per\ day = \frac{150000}{30} = 5000\ units$$

$$\boldsymbol{Labor\ cost\ per\ unit = \frac{200}{5000} = €\ 0.04}$$

Material Cost

$$Material\ cost = Actual\ cost - standard\ cost\ of\ actual\ quantity$$

$$Actual\ cost = actual\ quantity\ \times Actual\ price$$

$$Standard\ cost\ of\ actual\ quantity = Actual\ quantity\ \times Standard\ price$$

Actual quantity/month – 150000 unit

Actual price/unit – € 1.92

Standard price/unit – € 1.10

$$Actual\ cost\ = 150000\ \times 1.92 = €\ 288000$$

$$standard\ cost\ of\ actual\ quantity = 150000 \times 1.10 = 165000$$

$$Material\ cost = 288000 - 165000 = 123000$$

$$\boldsymbol{Material\ cost\ per\ unit = \frac{5000}{4100} = €\ 1.22}$$

Machining Cost

$$Machining\ cost = FE + FS + I + D$$

Fixed expense per unit – 0.55

Foreman salary

No of foreman – 2

Salary of foreman – € 350

Total salary of foreman= € 700

$Total\ salary\ of\ foreman\ per\ unit = \frac{700}{5000}$ = € 0.14

Insurance per unit – € 0.46

Depriciation cost per unit – € 0.40

$Machining\ cost = 0.55 + 0.14 + 0.46 + 0.40 =$ € 1.55

Over head cost

$overhead\ cost = SOM + SnE + M + MH$

Supplies for operating manufacturing process cost / unit – € 0.60

Safety and Environment cost per unit – € 0.43

Maintenance cost per unit – € 0.52

Material Handling per unit – € 0.33

$overhead\ cost = 0.60 + 0.43 + 0.52 + 0.33 =$ € 1.88

$$Loss\ due\ to\ defects = 0.04 + 1.22 + 1.55 + 1.88 = € 4.69$$

Loss calculation for defective drilling

$$Labor\ cost\ per\ unit = \frac{total\ labor\ cost\ per\ day}{total\ no\ of\ units\ produced\ per\ day}$$

$$Total\ labor\ cost = no\ of\ labors \times salary\ of\ the\ labors$$

No of labours – 15

Salary of the labours – € 200

$Total\ labor\ costs = 15 \times 200 = 3000€/month$

$$Total\ labor\ costs\ per\ day = \frac{total\ labor\ costs\ per\ month}{no\ of\ days\ in\ a\ month}$$

$Total\ labor\ costs\ per\ day = \frac{3000}{30} = 100€/day$

Total no of units produced per month – 1,50000

$$Total\ no\ of\ units\ produced\ per\ day = \frac{total\ no\ of\ units\ produced\ per\ month}{no\ of\ days\ in\ a\ month}$$

$Total\ no\ of\ units\ produced\ per\ day = \frac{150000}{30} = 5000\ units$

$\boldsymbol{Labor\ cost\ per\ unit = \frac{100}{5000} = €\ 0.02}$

Material Cost

$Material\ cost = Actual\ cost - standard\ cost\ of\ actual\ quantity$

$Actual\ cost = actual\ quantity\ \times Actual\ price$

$Standard\ cost\ of\ actual\ quantity = Actual\ quantity\ \times Standard\ price$

Actual quantity/month – 150000 unit

Actual price/unit – € 1.92

Standard price/unit – € 1.10

$Actual\ cost\ = 150000\ \times 1.92 = €\ 288000$

$standard\ cost\ of\ actual\ quantity = 150000 \times 1.10 = 165000$

$Material\ cost = 288000 - 165000 = 123000$

$\boldsymbol{Material\ cost\ per\ unit = \frac{5000}{4100} = €\ 1.22}$

Machining Cost

$Machining\ cost = FE + FS + I + D$

Fixed expense per unit – 0.46

Foreman salary

No of foreman – 1

Salary of foreman – € 350

Total salary of foreman= € 350

$Total\ salary\ of\ foreman\ per\ unit = \frac{350}{5000} =$ € 0.07

Insurance per unit – € 0.30

Depriciation cost per unit – € 0.62

$Machining\ cost = 0.46 + 0.07 + 0.30 + 0.62 =$ € 1.45

Over head cost

$overhead\ cost = SOM + SnE + M + MH$

Supplies for operating manufacturing process cost / unit – € 0.45

Safety and Environment cost per unit – € 0.39

Maintenance cost per unit – € 0.67

Material Handling per unit – € 0.31

$overhead\ cost = 0.45 + 0.39 + 0.67 + 0.31 = €\ 1.82$

$Loss\ due\ to\ defects = 0.02 + 1.22 + 1.45 + 1.82 = €\ 4.51$

Table5.3.Loss calculation

DEFECTIVE PARAMETERS	SHIFT1 (UNITS)	LOSS PER UNIT €	LOSS FOR A MONTH	SHFIT 2 (UNITS)	LOSS PER UNIT €	LOSS FOR A MONTH
Casting defects	1256	5.7	7159.2	2229	5.7	12705.3
Small outer ϕ	1042	4.69	4886.98	1803	4.69	8456.07
Big outer ϕ	1479	4.69	6936.51	987	4.69	4629.03
Big inner ϕ	386	4.69	1810.34	1824	4.69	8554.56
Small inner ϕ	729	4.69	3419.01	905	4.69	4244.45
Drilling	606	4.51	2733.06	365	4.51	1646.15
Total			26945.1			40235.56

$$Grand\ Total\ for\ loss = Loss\ in\ shift\ 1 + loss\ in\ shift\ 2 \quad (4.8)$$

$$Grand\ Total\ for\ loss = 26945.1 + 40235.56 = €\ 67180.66$$

5.2 FINDINGS AND SUGGESTIONS

From the table 5.2 comparing shift 1 and shift 2, it is found that the shift 2 has more defects than shift 1 this says that always the general shift is more effective and productive ,Shift 1 where all the officials are present and the labours work properly under their observation ,where as in the second shift the labours efficiency is dull and more defective materials are produced due to carelessness which is to be noted. Some suggestions for reducing or eradicating the defects.

1. The labors can be given rotational shifts
2. The labor propotion of skilled and semi skilled should be of proper mix.
3. The semi skilled workers can be given more training
4. The precision of the machines must be checked.
5. The maintenance of the machines should be carried out weekly for proper functioning of the machines
6. The labours who produces zero defect material can be rewarded
7. The second shift labors should be monitored properly by supervisor of the bay.
8. Different products are produced and the dimensional changes of the products gives problems to the labor.

The calculation made for each unit of the product produced their cost is calculated, like labor cost, material cost, machining cost, overhead cost . These cost gives the value of the defective materials calculated through calculating this cost the company can save approximately, the amount of € 67180.66 every month which is a huge amount that can be invested in further expansion of the

business. These defects found by proper inspecting of the material so the quality team should be funded more so that the department further improve its process and improve the quality of the product which is very important for a company to widen its customer base and make its reputation high. By making the quality products it can reduce the service cost after sales.

5.3 STAGES OF PDCA FOR REDUCTION OF WASTAGE OF MATERIAL DURING PRODUCTION

Plan

To plan is to develop a method or process. In manufacturing environment in sheet metal clamp for the automobile. I have designed for the problem needs to resolve and concerned for the improvement recycling the wastage and reuse or other selling as metal sheet itself. The program made was defining the activities that need to do on the workstation as well the warehouse. For the better outcome of the process of production, it's timing mainly, avoiding a collision which is the root for the whole production program.

Do

To do is to execute or complete. The ideas and plan that we created changing the arrangement of the workstation to check whether the machines are working in a proper condition and removing the older machinery to avoid wastage. And process in the plan we put in the place. Also implemented maintains strategies, training also production process changed.

Check

To check we did the examination of the accuracy of the plan, to do that various simulation were done to deliver the significant outcome. Safety statistics ensured and measured by reduction of the collision. Mainly the wastage was measured at each workstation and warehouse.

Act

After all process of reviewing data's in the "check" process. Decision is take

1. Redo 5s system.
2. Changed the existing arrangement of machinery into the more efficient way, which resulted in safe transportation time. Avoid collision which all led to good production result in time.
3. Change the number of employees in each area according to the necessity and skill needed.
4. Providing Training for employees.
5. Dividing the responsibility within the employees depend on upon their ability.

Organizational problems in the workplace

Because of the improper arrangements employees was facing collision which results in damage to the material of the product. They were working under high stress without any motivation. Laziness, communication gap, lack of knowledge, improper participation. Team issues are quickly expanding entire organisation, result in an awkward working situation. Must avoid this situation at all costs, should all your avoidance actions fail, be ready to take much more dramatic corrective measures. You must prevent these problems from negatively changing the real form culture should carefully have cultivated to make your company and workplace a high performing entity.

FUTURE SCOPE

1. Management of waste is crucial to the improvement of Quality Thus by concentrating on those Quality grounds the future is Quality Assured.
2. Deviation from making a profit to minimising waste leads to Quality.
3. The logical term “Quality Competition” comes into play because when every other company focuses their ideas towards Quality, there would be Quality products everywhere.
4. Waste management to increase Quality will lead to the Future to Green and Lean
5. Manufacturing by minimising the Runoff and Start-up wastes.
6. Cluster Quality programs to help smaller companies to get a scope of Quality and be a setting an example to others.
7. Balance in the Quality of both Imports and Exports leading to larger Export numbers.

CONCLUSION

1. A literature analysis of problems related to TQM was done and the various methods of reducing wastage with the help of questionnaire are discussed.
2. A survey was conducted among 100 employees with the help of a questionnaire (see anexxure) consisting of 21 questions. The insights and opinions of the employees where recorded and used for the betterment of the organizations practices.
3. The wastage for shift 1 is 6421 and shift 2 is 7190 (see table. 5.1). The comparison clearly shows that the wastage in shift 2 is more when compared to that of shift 1.
4. The loss of waste is calculated for every unit of the material which then gives the whole picture of the amount lost without proper machining. The loss due to wastages calculated and obtained for shift 1 is € 26945.1 and shift 2 is € 40235.56 (see table 5.3), by reducing this wastage the company could save € 67180.66. This considerable amount of money can be used in other departments for their improvements.

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ANNEXURE

QUESTIONNAIRE

Guidelines to be known before filling a questionnaire

- Please read carefully before taking a decision.
- Please select the best option carefully by putting a tick mark in the box given.
- Please try to keep it without any over marking.
- The personal details should be true.

I assure you that this information will be kept confidential.

01. Name : _____(Optional)

02. Age : □Below25 □25-35 □36-45 □Above 45

03. Educational Qualification:

□SSLC/Diploma/ITI □Hr. Sec □ U.G.Degree □P.G. Degree □Others

04. Experience:

□Below 1 years □1-5 years □6-10 years □11-15 years □Above15years

05. Monthly Income:

□Below ₹8000 □ ₹8001-13,000 □ ₹ 13, 001-18,000 □Above ₹ 18, 001

06. How do you feel about your Organisation?

□Excellent □Above average □Average □Below average

07. How do you rate the TQM system in the organisation

□ Excellent □Good □Average □Below Average

08. Quality is needed in a product to give customer satisfaction.

□Strongly Agree □Agree □Strongly Disagree □Disagree

09. Do you think the organization is quality conscious toward employees?

□Yes □No

10. Is the organization providing quality assurance system and operation?

□Yes □No □Don't Know

11. Does the organization have quality circle?

□Yes □No □Don't Know

12. Do you think other organization bench marking AVR Manufacturers Policy?

□Yes □No □Don't Know

13. Are you practicing the 5's Japanese philosophy?

□Yes □No □Don't Know

14. Are you practicing six sigma for error control?

□Yes □No □Don't Know

15. Do you know all the World Class Manufacturing (WCM) strategy of organisation?

□Yes □No

16. Do you know now exactly at which Stage Company stands in WCM system?

□Yes □No

17. Workers in the organisation are given sufficient training to work in the WCM system.

□Strongly Agree □Agree □Strongly Disagree □Disagree

18. Do you know about any lean tools before joining AVR Manufacturers.?

□Yes □No

19. Do you think wastes are reduced because of using lean tools in production?

□Yes □No □Don't Know

20. Are you feeling difficult to learn and work in Lean tools?

□Yes □No

21. Lean tools are necessary for an organisation to improve productivity.

□Strongly Agree □Agree □Strongly Disagree □Disagree