KALSEKAR TECHNICAL CAMPUS NEW PANVEL NAVI MUMBAI – 410206A PROJECT REPORT ON

"IMPLEMENTING EBQ MODEL AND SUGGESTING 5S AT NAVKAR FITTING AND FORGING TALOJA "

Submitted By

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In Partial Fulfillment for the Award of Degree Of

BACHELOR OF ENGINEERING
IN
MECHANICAL ENGINEERING

UNDER THE GUIDANCE OF: PROF. MOHAMED JAVED

DEPARTMENT OF MECHANICAL ENGINEERING
ANJUMUN-I-ISLAM
UNIVERSITY OF MUMBAI
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ANJUMAN-I-ISLAM
KALSEKAR TECHNICAL CAMPUS, NEW PANVEL
(Approved by AICTE, recg. By Maharashtra Govt. DTE, Affiliated to Mumbai University)
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CERTIFICATE

This is to certify that the project entitled

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To the Kalsekar Technical Campus, New Panvel is a record of bonfide work carried out by him under our supervision and guidance, for partial fulfillment of the requirements for the award of the Degree of Bachelor of Engineering in Mechanical Engineering as prescribed by **University Of Mumbai**, is approved.

Internal Examiner
Prof. - _____

External Examiner
Prof. - _____

Head of Department
Prof. _____

Principal
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APPROVAL OF DISSERTATION

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In partial fulfillment of the requirements for the award of the Degree of Bachelor of Engineering in Mechanical Engineering, as prescribed by University of Mumbai approved.

(Internal Examiner) **(External Examiner)**

_____ _____

Date:_____

DEDICATED

TO

OUR PARENTS

ACKNOWLEDGEMENT

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INTRODUCTION

NAVKAR
Fittings & Forgings Pvt. Ltd.

DIN EN ISO 9001:2008
CERT NO. 44 100 084123-E3

Navkar Fittings & Forgings is one of the leaders amongst manufacturers and exporters of high quality pipe fittings, buttweld and socketweld fittings in alloy steel, carbon steel, stainless steel, nickel alloys. Their products have found various applications in different industrial requirements, including - Oil & Gas, Chemical, Petrochemical, Power Plant, Pulp & Paper, Environmental & Water Projects, Engineering Projects and more. Through regular and consistent supply of our products at industry leading prices, we have established ourselves a reliable.

The product range, includes - elbows, tees & cross, reducers, caps & stub ends, couplings , socklets, , , flanges, socket weld threaded fittings, steel pipe fittings, carbon steel pipe fittings, forged pipe fittings. They have the capability and expertise to design these products in different metal alloys and in a variety of specifications to fulfill the various requirements of our clients.

They work with the core objective of providing maximum customer satisfaction and are committed to continuously improve the quality of their products & services, to create value for the customers. Whether big or small, they respect all their clients and every care is taken to give them a pleasant and hassle-free business experience. They deliver their orders in bulk as well as economic order quantities and as a rule, the quality of their products and services always remains the same, regardless of specification or quantity desired.

Evolving theirselves with time, they have secured a special place for them within the industry as well as among the clients in the domestic as well as international markets.

They have been able to progress in this highly competitive market under the expert supervision of their mentor, 'Mr. Kamble'. His vast knowledge in pipe production industry has helped them in offering superior quality products to the customers. They advocate the environmental benefits of corrugated packaging and offer the best-in-class range to the customers.

What is Economic Batch Quantity:

The Economic Batch Quantity is very similar to Economic order Quantity. But, there is only one difference ie Economic Batch Quantity is calculated to fix the level of production at minimum cost but Economic Order Quantity is calculated to fix the level for ordering the purchase of raw materials, stores and spares.

The following points are considered while fixing the Economic Batch Quantity.

1. Annual demand for the product
2. Setting up of cost
3. Manufacturing cost.
4. Rate of consumption.
5. Storage costs.
6. Interest on capital.
7. Times lag between production and consumption of product.

If the machines are set up for production frequently, certainly, the set up cost will be high. If the size of batch is large, automatically, the storage cost will be high. Hence, there is a need of Economic Batch Quantity

ELBOW MANUFACTURING PROCESS:

Elbow is used for pipe turn a fitting, a 90 - degree Angle, 45 degree Angle, etc., may, according to the needs of engineering, manufacturing, different material and different pressure elbow manufacture craft is different also, so far, the commonly used seamless elbow bend production manufacturer production manufacturing hot pushing elbow, stamping elbow, squeeze the elbow, butt weld bend the elbow manufacture methods.Hot pushing elbow is seamless elbow to adoption of a process for manufacturing the elbow making machine, core mold and heating device, using a set of machine on the mould of billet in elbow push system run to front, under the impetus of the heated in the pipe run hole enlargement and forming process.Hot push bend deformation characteristics are based on volume before and after plastic deformation rule of metal materials determine the pipe diameter, when using the pipe, the pipe diameter less than the diameter of bend, in the process of pipe heat deformation, the compensation to other parts of the thinned by expanding diameter, so get the wall thickness of the elbow, which is pushing elbow manufacture process.Push machine push out of the elbow, beautiful appearance, uniform wall thickness can be continuous production and manufacturing, mass production can elbow push system, so the general carbon steel elbow, alloy steel elbow manufacture process is to choose a major production and manufacturing, and also applied in some of the specifications of the stainless steel elbow forming.Stamping elbow manufacture technology is applied in first batch production of seamless elbow molding process, in the elbow specifications usually used has been replaced by a hot pushing elbow, but in some types of elbow because production quantity is less, the wall thickness is too thick or thin.Products have special requirements is to use stamping production manufacturing process, in the process of stamping elbow forming, need diameter and producing good bend diameter is the same, use direct pressure

MANDREL METHOD

Manufacturing process of elbow

So, the outer arc of wall thickness thinning is about 10% or so.However, due to the characteristics of unit manufacturing and low cost, the manufacturing process of stamping elbow is suitable for the production of high pressure and thick wall stamping elbows.Using dedicated bend forming machine, extrusion elbow pipe to be included in the mould, after the upper and lower mould clamping, under the impetus of the push rod, tube billet model along the internal model and reserved clearance sports and forming process.Using die cold extrusion process inside and outside the elbow and good appearance, uniform wall thickness, size deviation is small, so the cold extrusion production process is suitable for the manufacture of the thin w all stainless steel elbow, the process of the inner and outer mold used high precision requirement;The wall thickness deviation requirement of tube billet is also strict.Butt welding elbow manufacture process of large diameter bend commonly used butt welding production process, the steel plate in the roll into the shape of a bend, then welding, after welding and then shoot to the elbow, large diameter bend, generally USES the butt welding elbow, butt welding elbow pretty appearance than other manufacturing process, but DN800 bend over other processes can't manufacture, will adopt the butt welding elbow production process.

1.1 PROBLEM DEFINITION:

"IMPROPER MANAGEMENT OF FINISHED PRODUCT INVENTORY AND POOR SPACE UTILIZATION LEADING TO PRODUCT DAMAGE."

Aftervisiting many industries in the MIDC areas of Taloja, Mahape and Rabale we got the problem in NAVKAR Fitting and ForginG industry in Taloja on which we can do our project. We have visited the industries on 10th august 2019. In that visit we got the knowledge of how the production and manufacturing of various size elbow is done. In our first visit we observe the process of manufacturing. We saw all the process from starting of raw material intake to end of the finishing product. After this visit we analyzed and found that there is improper management of finished product. Due to which they are having a problem of space utilization and product damage.Many batches of product was just laid on the ground which lead to rust formation so there was additional expense of rust removal process.

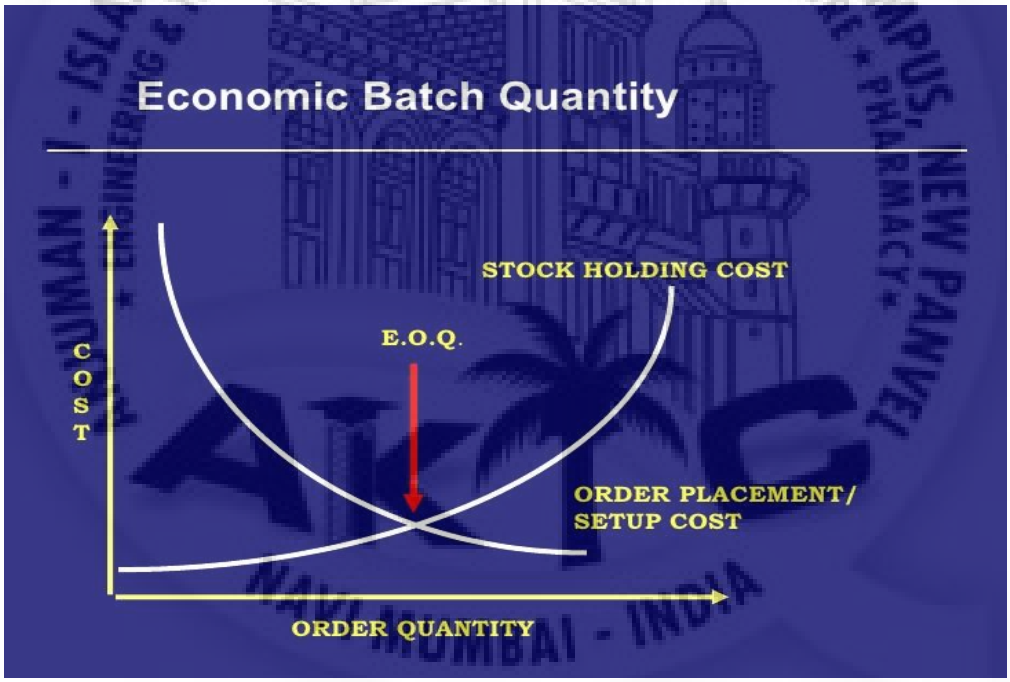
AIM/PURPOSE OF STUDY/OBJECTIVE:

AIM:

"The main aim of this project is the Implementation of **EBQ** model to establish the Quantity of Units in a batch which will minimize Production costs and Inventory Holding cost."

PURPOSE OF STUDY:

The main purpose of study is to achieve economy by efficiently managing the finished product inventory. As we have studied the **EBQ analysis** in PRODUCTION PROGRAMING AND CONTROL for finished product inventory management hence, we decided to apply this technique of analysis in our project.



OBJECTIVE:

- To enhance the material handling capacity.
- To use the space efficiently.
- To improve Supply Chain Management.
- To reduce Annual, Holding, Product and Raw material Management cost.

❖ CHAPTER NO: 2

❖LITERATURE SURVEY

❖

❖ Economic batch quantity is a measure used to determine the quantity of units that can be produced at the minimum average costs in a given batch or product run. Some assumptions made in economic batch quantity they are: 1.Demand is known and constant within a certain period of time 2.Unit cost of the inventory item is constant 3.Production time is known and constant 4.Setup cost is constant and does not change II. METHODOLOGY: Table 1: Methodology 2.1 Determining the need for EBQ implementation 2.2 Data Collection and Analysis 2.3 Design for implementation 2.1. Determining The Needs For EBQ implementation EBQ is a value adding activity that every organization should follow. It gives the basic idea that what batch quantity should be made for better utilization of available resources. Before implementing EBQ in mutual industries it was found that there is uneven quantity of finished goods being manufactured so there was need to implement EBQ at mutual industries. According to survey results before implementation of EBQ varying batch quantity can be seen from following tables results into varying cost per batch,

Table 1 : Varying batch Quantity

Batch Number	Batch 1	Batch 2	Batch 3	Batch 4	Batch 5
Batch Quantity (Finished goods)	750	1100	1800	1250	900
Total Cost	54075	79310	12978	90125	64890

NOTE: Cost for each finished good is taken to be RS.721 Which includes Set up Cost And Inventory cost From above table it can be seen that there is huge difference between batch Quantity, so to have a perfect batch quantity EBQ model should be implemented. 2.2. Data Collection & Analysis With the help of the staff present in industries and past records of the company, data needed for the implementation of EBQ model is gathered before that some common terms are used in data collection they are as follows:

1. K = Set up cost or order cost
2. D = Annual Demand or annual usage
3. F = Holding cost or carrying cost

4. Q = Economical batch quantity

Now after data collection it was found that:

- Per day demand in Mutual industries for finished goods is = 1000
- Hence monthly demand for finished goods is = 24000

3Design For Implementation

Now most important part is implementation of EBQ model. EBQ model is illustrated by following equation

$$\text{ECONOMIC BATCH QUANTITY} = \sqrt{\frac{2DS}{C}}$$

EBQ = 1550 Units

This value are taken for monthly execution of EBQ model if we want to make it annually then it should be multiplied by 12, hence the annual demand. From above equation it is found that if batch of 1550 units is made it has minimum average cost hence minimum batch size is obtained. Cost occurred after obtaining the minimum batch quantity can be elaborated as follows

Table 2: Cost after implementing EBQ

Below table will indicate the total cost arising after the implementation of EBQ model:

Batch quantity	1550
Total cost	1117550

Batch number	Batch 1	Batch 2	Batch 3	Batch 4	Batch 5	Average
Batch quantity (before ebq model)	750	1100	1800	1250	900	1160
Total cost (before ebq model)	540750	793100	1297800	901250	648900	836360
Batch quantity(after ebq model)	1550	1550	1550	1550	1550	1550
Total cost(after ebq)	1117550	1117550	111750	1117550	1117550	1117550

Hence Final conclusion is that after implementing EBQ model productivity increases as seen from table difference comes out to be of 390 units

But a strict instruction should be given that minimum cost associated should not be less than Rs.117550 otherwise that wont be consider as economic order quantity.

Hence from table it is seen that total cost related with 1550 units will be 1117550 hence this cost will be Economical for production purpose and 1550 units will be Economical ordering quantity that means to have a effective cost from company point of view minimum 1550 units should be produced in one batch quantity less than this wont be economical.

SUMMARY & CONCLUSION:

The table below will show the effect of EBQ model due to which effective cost per batch has decreased. The table show the comparison of product produced and their cost before and after the implementation of EBQ model.Gains through EBQ model are tremendous it should be properly exercise in industries, so that volume of the product can be increased also the cost associated with this product can be decreased

CHAPTER NO: 3

METHODOLOGY

Methodology:

In inventory management, **Economic Batch Quantity (EBQ)**, also known as Optimum Batch Quantity (OBQ) is a measure used to determine the quantity of units that can be produced at the minimum average costs in a given batch or product run. EBQ is basically a refinement of the economic order quantity (EOQ) model to take into account circumstances in which the goods are produced in batches.[1][2] The goal of calculating EBQ is that the product is produced in the required quantity and required quality at the lowest cost

The EOQ model was developed by Ford W. Harris in 1913, but R. H. Wilson, a consultant who applied it extensively, and K. Andler are given credit for their in-depth analysis. Aggterleky described the optimal planning planes and the meaning of under and over planning, and the influence of the reduction of total cost.[6][7] Wiendahl used Harris and Andler's equation for the determination of the optimal quantity.[8] Härdler took into account the costs of storage and delivery in determining the optimal batch quantity (EBQ).[9] Muller and Piasecki asserted that inventory management is explained only with the basics of an optimal quantity calculation.

There are basically two options of planning the batch quantity: planning a large batch of a product in long intervals, and planning a small batch of a product in short intervals.

The advantages of planning a large batch of product are that the price of ordering a large batch, administrative costs, costs of tests and shipping are lower, and there is a lower risk of interruption of production because of the large stock. The disadvantages of planning a large batch are that there is higher tied-up capital, and storage costs of product inventory are also higher.[12]

The advantages of planning a small batch of product are that there is less tied-up capital, storage costs of product inventory are low, and there is a higher flexibility if quantities change at suppliers and buyers. The disadvantages of planning a small batch are that there will be costs of frequent ordering, and a high risk of interruption of production because of a small product inventory.

Somewhere between the large and small batch quantity is the optimal batch quantity, i.e. the quantity in which the cost per product unit is the lowest.

Variables and assumptions

In the EOQ model, it is assumed that the orders are received all at once. However in the EBQ model, this assumption is relaxed

There are two types of costs: those which increase with the batch size such as working capital investment in materials and labor, cost of handling and storing materials, insurance and tax charges, interest on capital investment, etc., and those which decrease with the batch size such as cost (per unit) of setting up machines, cost of preparing paper work that enters and controls the production of the order, etc. These costs, i.e., (a) and (b) are plotted and added graphically

The figure graphs the holding cost and ordering cost per year equations. The third line is the addition of these two equations, which generates the total inventory cost per year. The lowest (minimum) part of the total cost curve will give the economic batch quantity as illustrated in the next section. This graph should give a better understanding of the derivation of the optimal ordering quantity equation, i.e., the EBQ equation.

Thus, variables *Q, R, S, C, I* can be defined, which stand for economic batch quantity, annual requirements, preparation and set-up cost each time a new batch is started, constant cost per piece (material, direct labor and overheads), inventory carrying charge rate per year, respectively

.

Some assumptions have been made for calculating economic batch quantity. They are ;

- Demand is known and constant within a certain period of time.
- Unit cost of the inventory item is constant.
- Production time is known and constant.
- Setup cost is constant and does not change.

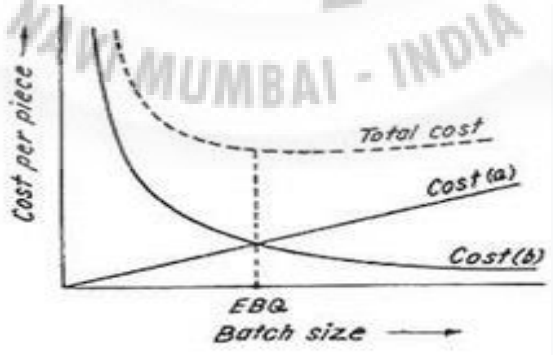


Fig. 7.15. Economic Batch Quantity (*EBQ*).

Cost per piece v/s Batch size Chart

Various cost involved in finding the EBQ are:

1. Set up cost
2. Holding cost
3. Batch costing

Set up cost :

Setup cost is those costs incurred to configure a machine for a production run. This cost is considered a fixed cost of the associated batch, so its cost is spread over the number of units produced. Setup costs include the following

1. Labor to position tools and materials next to the machine.
2. Labor to configure the machine
3. Scrap cost of test units run on the machine.

Holding cost:

Holding costs are those associated with storing inventory that remains unsold. These costs are one component of total inventory costs, along with ordering and shortage costs. A firm's holding costs include the price of goods damaged or spoiled, as well as that of storage space, labor, and insurance.

Minimizing inventory costs is an important supply-chain management strategy. Inventory is an asset account that requires a large amount of cash outlay, and decisions about inventory spending can reduce the amount of cash available for other purposes. For example, increasing the inventory balance by $10,000 means that less cash is available to operate the business each month. This situation is considered an opportunity cost.

Holding Cost Reduction Methods:

One way to ensure a company has sufficient cash to run its operations is to sell inventory and collect payments quickly. The sooner cash is collected from customers, and the less total cash the firm must come up with to continue

operations. Businesses measure the frequency of cash collections using the inventory turnover ratio, which is calculated as the cost of goods sold (COGS) divided by average inventory.

For example, a company that has $1 million in cost of goods sold and an inventory balance of $200,000 has a turnover ratio of 5. The goal is to increase sales and reduce the required amount of inventory so that the turnover ratio increases.

Another important strategy to minimize holding costs and other inventory spending is to calculate a reorder point, or the level of inventory that alerts the company to order more inventory from a supplier. An accurate reorder point allows the firm to fill customer orders without overspending on storing inventory. Companies that use a recorder point avoid shortage costs, which is the risk of losing a customer order due to low inventory levels.

The reorder point considers how long it takes to receive an order from a supplier, as well as the weekly or monthly level of product sales. A reorder point also helps the business compute the economic order quantity (EOQ), or the ideal amount of inventory that should be ordered from a supplier. EOQ can be calculated using inventory software.

Example of Holding Costs

Assume that ABC Manufacturing produces furniture that is stored in a warehouse and then shipped to retailers. ABC must either lease or purchase warehouse space and pay for utilities, insurance, and security for the location. The company must also pay staff to move inventory into the warehouse and then load the sold merchandise onto trucks for shipping. The firm incurs some risk that the furniture may be damaged as it is moved into and out of the warehouse.

Batch Costing:

Batch costing is another form of job costing. Under this method, homogeneous products are taken as cost unit. A batch consists of a specific number of products or units or articles. The number varies from one batch to another. Hence, batch cost is used to determine the cost per unit or article per unit.

The company may want to get lower cost of production. If so, the cost per unit will also be low. For which, the company has to work out Economic Batch Quantity in the line of Economic Order Quantity. The cost procedure in batch costing is very similar to job costing. Hence, production order number is allotted to each batch.

Definition of Batch Costing;

CIMA defines batch costing as:

that form of specific order costing which applies where similar articles are manufactured in batches either for sale or for use within the undertaking.

The batch cost is defined as:

aggregated costs relative to a cost unit which consists of a group of similar articles which maintains its identity throughout one or more stages of production.

Application of Batch Costing :

The Batch Costing Method is followed in the industries where production is carried on in large size homogeneous products. Such type of products are produced and stored. Products are produced from the same type of raw materials and in the same process. But the volume of production is determined well in advance ie Economic Batch Quantity.

It is applicable to industries like nuts and bolts, medicine, shoes, books, drugs, computers, read made garments, laptop, radio, biscuits, spare parts of two wheeler, components and in all concerns where production is made in batches.

CHAPTER NO: 4

CALCULATION AND CONCLUSION

NAVKAR FITTING AND FORGING PVT.LTD INDUSTRIES

CALCULATION:

For the calculation purpose we have considered 2 products which accounts for more than 75% of manufacturing. Because of high demand of this product the profit from this product is highest. Products are :

1. 90 degree ELBOW of Cast steel.
2. Tee joint of Cast steel.

Calculating EBQ for 1st product i.e. 90 degree ELBOW :

Product specification : 90 degree elbow. (6 " std 40)

Material : Carbon steel

Product cost :480 Rs

Annual demand : 1000 units

Set up cost :

	SET UP TIME (IN MINS)	SET UP COST (IN RS)
1 – LABOUR COST FOR INSPECTION : visual appearance and dimension check	4	5
LABOUR TO CONFIGURE MACHINE. A - Set up Mandrel . B - Assemble pipes in ram of Mandrel C - Set up shot blasting machine	10	11
3 - LABOUR TO POSITION	5	6

TOOLS AND MATERIAL . TRAVELLING IS DONE BY EOT : A - From mandrel to herbert lathe machine B - From lathe to shot blasting machine C - From sbm to coating section D – Coating to dispatch	7	8
TOTAL	26	30

Total Set up cost per batch : 30 Rs

INVENTORY COST DETAILS

1- Interest on locked up capital = 6%
2- Cost of storage space : rent and other maintainance cost with part of salary of shop co-ordinator = 4%
3- Inventory maintainance cost = 3%:
4- Damage and deteroitation cost: = 4%
5- Pilferage cost = AROUND 0-1 %:
6- Insurance cost = 1%

Total Inventory holding cost : 20% i.e 96 Rs

ECONOMIC BATCH QUANTITY = $\sqrt{\frac{2DS}{C}}$ = $\sqrt{(2x1000x30)/96}$ =25

Where,

S is Setup cost

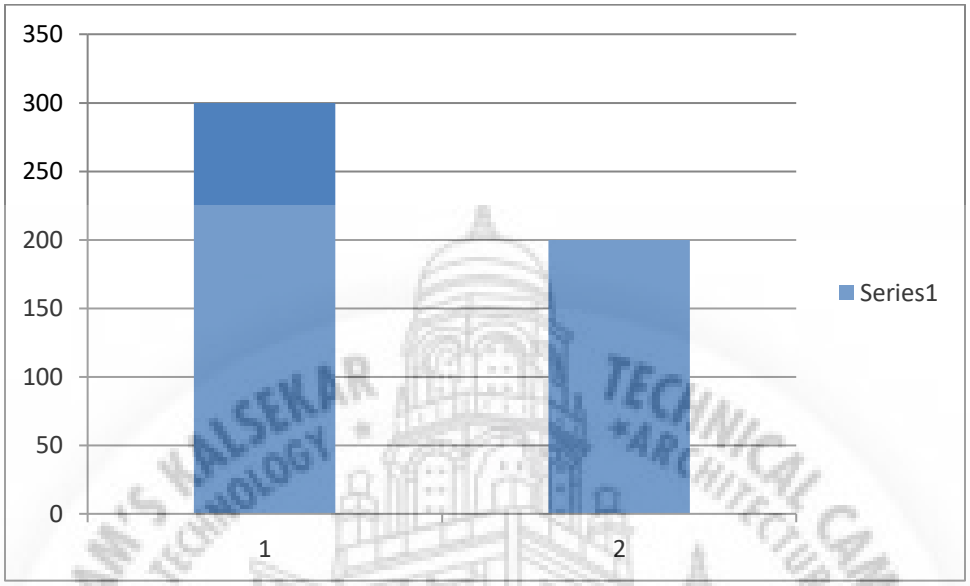
D is Annual Demand

C is Inventory holding cost

EBQ = 25

Product per Batch before application of EBQ was 28

Product in each batch saved = 28 – 25 = 3 product



The above graph indicates product per batch before and after introduction of ebq

1. Before introduction of ebq
2. After introduction of ebq

No. of batches to fulfill the annual demand of 1000 products are:

1000/25 = 40 batches/setups

Annual saving after the implementation of EBQ :

Annual Saving = Product in each batch saved x No, of batches x Product cost

= 3 x 40 x 480

Annual saving = 57,600 Rs

Similarly, Calculating EBQ for 2nd product i.e. Tee joint :

Product specification : Tee joint .

Material : Carbon steel.

Product cost : 200 Rs

Annual demand : 2400 units

SET UP COST DETAILS :

	SET UP TIME (IN MINS)	SET UP COST (IN RS)
1 – LABOUR COST FOR INSPECTION : visual appearance and dimension check	3	10
2 – LABOUR TO CONFIGURE MACHINE A – Set up heat treatment furnace B – Set up shot blasting machine	15	50
3 - LABOUR TO POSITION TOOLS AND MATERIAL Travelling is done by eot : A - From arc cutting to open coal furnace B - From open coal furnace to and fro press machine for First forming , notch making , branch expanding ,sizing C - From sizing process to furnace D - From furnace to herbert lathe machine E - From lathe to shot blasting machine F– From sbm to coating section Coating to dispatch	12	40
TOTAL	60	100

Total Set up cost per batch : Rs 100

INVENTORY COST DETAILS

1- Interest on locked up capital = 2%
2- Cost of storage space : rent and other maintainance cost with part of salary of shop co ordinator = 2%
3- Inventory maintainance cost = 1%

4- Damage and deteroitation cost = 1%
5- Pilferage cost = negligible
6- Insurance cost := negligible

Inventory holding cost: 6 % i.e Rs 12

ECONOMIC BATCH QUANTITY = $\sqrt{\frac{2DS}{C}}$ = $\sqrt{(2x2400x100)/12}$

=200

Where,

S is Setup cost

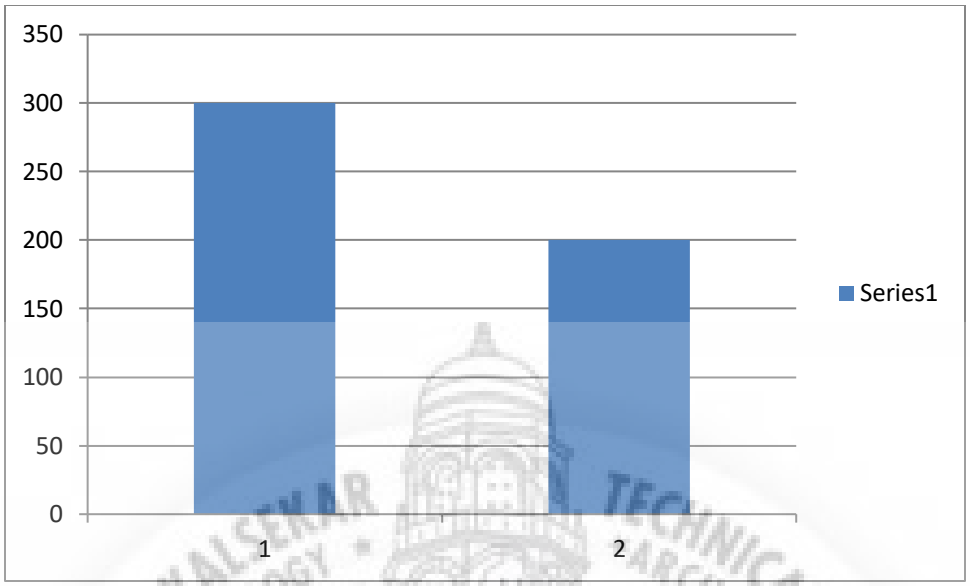
D is Annual Demand

C is Inventory holding cost

EBQ = 200

Product per batch before application of EBQ = 300

Product in each batch saved = 300 – 200 = 100



The above graph indicates product per batch before and after introduction of ebq

1. Before introduction of ebq
2. After introduction of ebq

No. of batches to fulfill the annual demand of 2400 products are:

2400/200 = 12 setups

Annual saving after the implementation of EBQ:

Annual Saving = Product in each batch saved x No, of batches x Product cost

= 100 x 12 x 200

Annual saving = 2,40,000 Rs

CONCLUSION AND JUSTIFICATION :

The calculation shows the effect of EBQ model due to which effective cost per batch has decreased. The table show the comparison of product produced and their cost before and after the implementation of EBQ model.Gains through EBQ model are tremendous it should be properly exercise in industries, so that volume of the product can be increased also the cost associated with this product can be decreased.

The cost involved should be optimum and should be **MINIMUM INVENTORY COST**

1 – **PRODUCT 90 DEGREE ELBOW**

ANNUAL DEMAND : RS 1000 , SET UP COST : RS 30 , INVENTORY HOLDING COST : 20% I.E RS 96

NO. OF SETUPS	BATCH QUANTITY	SET UP	CARRYING COST	MNIMUM INVENTORY COST
36	28	30 * 36 = 1080	14 * 96 = 1344	1080 + 1344 = 2424
40	**25**	**30 * 40 =1200**	**12.5 * 96 = 1200**	**1200 + 1200 =2400**
34	30	30 * 34 =1020	15 * 96 = 1440	1440 + 1020 =2460

CONSIDERING NO MINIMUM STOCK I.E SALES DONE IS 100%

FOR EG : (28+0/2)= 14. Where i/p qty is 28 ,o/p qty is 0

2 – **PRODUCT TEE JOINT**

ANNUAL DEMAND : RS 2400 , SET UP COST : RS 100 , INVENTORY HOLDING COST : 6% i.e RS 12

NO. OF SETUPS	BATCH QUANTITY	SET UP	CARRYING COST	MNIMUM INVENTORY COST
24	100	24*100 =2400	50* 12 =600	3000
12	**200**	**12*100 =1200**	**100*12 =1200**	**2400**
8	300	8*100 =800	150*12 = 1800	2600

CHAPTER NO: 5

BENEFITS AND LIMITATIONS

4.1 Benefits of EBQ Model:

(1) The economic batch quantity ensures the production of goods in the required quantity to meet the demand.
(2) The economic batch quantity will help to reduce the quantity of inventory.
(3) The economic batch quantity will reduce the machine getting-up time.
(4) The optimum batch size will reduce the machine set-up costs.
(5) The economic batch quantity will also reduce the clerical costs.

(6) The production of goods in batches is undertaken in economic batch quantity, there will be the economies of large-scale production. If goods are produced in a batch, there will be reduction in cost of production per unit and more profits for the concern.

:

4.2 LIMITATIONS OF EBQ MODEL :

The disadvantages of planning a large batch are that there is higher tied-up capital, also storage costs of product inventory are higher too.

The EOQ formula inputs make an assumption that consumer demand is constant. The calculation also assumes that both ordering and holding costs remain constant. These assumptions make it difficult or impossible to account for unpredictable business events, such as changing consumer demand, seasonal changes in inventory costs, lost sales revenue due to inventory shortages, or purchase discounts a company might get for buying inventory in larger quantities.

CHAPTER NO: 6

SUGGESTION FOR IMPLEMENTATION OF 5S

INTRODUCTION

5S is a workplace organization method that uses a list of five Japanese words: *seiri* (整理), *seiton* (整頓), *seisō* (清掃), *seiketsu* (清潔), and *shitsuke* (躾). These have been translated as "Sort", "Set In order", "Shine", "Standardize" and "Sustain".[1] The list describes how to organize a work space for efficiency and effectiveness by identifying and storing the items used, maintaining the area and items, and sustaining the new order. The decision-making process usually comes from a dialogue about standardization, which builds understanding among employees of how they should do the work.

In some quarters, 5S has become **6S**, the sixth element being safety(Safe).[2]

Other than a specific stand-alone methodology, 5S is frequently viewed as an element of a broader construct known as *visual control*,[3] *visual workplace*,[4] or *visual factory*.[5][6] Under those (and similar) terminologies, Western companies were applying underlying concepts of 5S before publication, in English, of the formal 5S methodology. For example, a workplace-organization photo from Tennant Company (a Minneapolis-based manufacturer) quite similar to the one accompanying this article appeared in a manufacturing-management book in 1986.

ORIGIN O 5S:

5S was developed in Japan and was identified as one of the techniques that enabled Just in Time manufacturing.[8]

Two major frameworks for understanding and applying 5S to business environments have arisen, one proposed by Osada, the other by Hiroyuki Hirano.[9][10] Hirano provided a structure to improve programs with a series of identifiable steps, each building on its predecessor. As noted by John Bicheno,[11] Toyota's adoption of the Hirano approach was '4S', with Seiton and Seiso combined.[*verification needed*]

Before this Japanese management framework, a similar "scientific management" was proposed by Alexey Gastev and the USSR Central Institute of Labour (CIT) in Moscow.

Each *S*

There are five 5S phases. They can be translated from the Japanese as "sort", "set in order", "shine", "standardize", and "sustain". Other translations are possible

Sort (seiri 整理) :

Seiri is sorting through all items in a location and removing all unnecessary items from the location

Goals:

- Reduce time loss looking for an item by reducing the number of items.
- Reduce the chance of distraction by unnecessary items.
- Simplify inspection.
- Increase the amount of available, useful space.
- Increase safety by eliminating obstacles.

Implementation:

- Check all items in a location and evaluate whether or not their presence at the location is useful or necessary.
- Remove unnecessary items as soon as possible. Place those that cannot be removed immediately in a 'red tag area' so that they are easy to remove later on.
- Keep the working floor clear of materials except for those that are in use to production

1S – a red tag area containing items waiting for removal

Set in order (seiton) :

Seiton is putting all necessary items in the optimal place for fulfilling their function in the workplace.

Goal :

Make the workflow smooth and easy.

2S – simple floor marking

Implementation:

- Arrange work stations in such a way that all tooling / equipment is in close proximity, in an easy to reach spot and in a logical order adapted to the work performed. Place components according to their uses, with the frequently used components being nearest to the workplace.
- Arrange all necessary items so that they can be easily selected for use. Make it easy to find and pick up necessary items.
- Assign fixed locations for items. Use clear labels, marks or hints so that items are easy to return to the correct location and so that it is easy to spot missing items.

Shine (seiso)

Seiso is sweeping or cleaning and inspecting the workplace, tools and machinery on a regular basis.

Goals:

- Improves the production process efficiency and safety, reduces waste, prevents errors and defects.
- Keep the workplace safe and easy to work in.
- Keep the workplace clean and pleasing to work in.
- When in place, anyone not familiar to the environment must be able to detect any problems within 50 feet in 5 sec

3S – cleanliness point with cleaning tools and resources

Implementation:

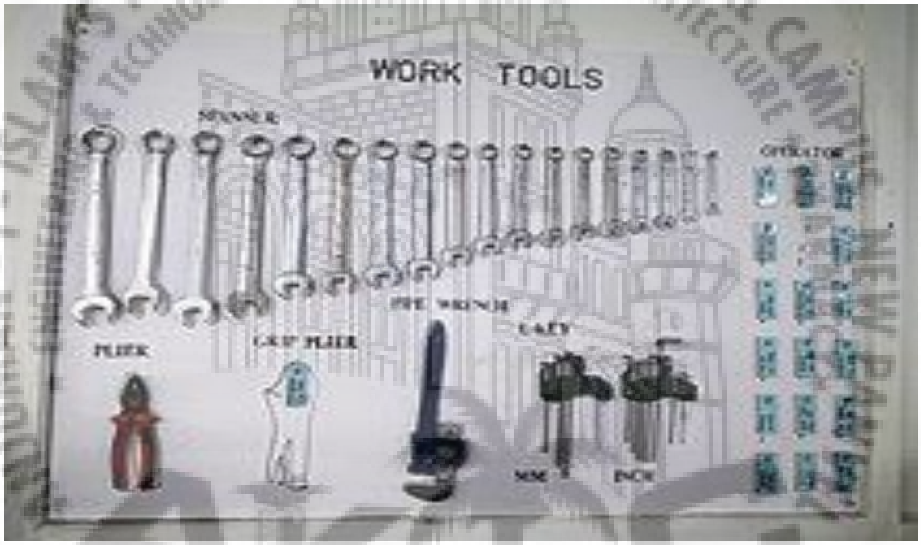
- Clean the workplace and equipment on a daily basis, or at another appropriate (high frequency) cleaning interval.
- Inspect the workplace and equipment while cleaning.

Standardize (seiketsu):

Seiketsu is to standardize the processes used to sort, order and clean the workplace.

Goal:

Establish procedures and schedules to ensure the repetition of the first three 'S' practices.



Procedures and schedules to ensure the repetition of the first three 'S' practices.

Implementation:

- Develop a work structure that will support the new practices and make it part of the daily routine.
- Ensure everyone knows their responsibilities of performing the sorting, organizing and cleaning.
- Use photos and visual controls to help keep everything as it should be.
- Review the status of 5S implementation regularly using audit checklists

Sustain/self-discipline (shitsuke) :

Shitsuke or sustain the developed processes by self-discipline of the workers. Also translates as "do without being told".

Goal:

Ensure that the 5S approach is followed.

Implementation:

- Organize training sessions.
- Perform regular audits to ensure that all defined standards are being implemented and followed.
- Implement improvements whenever possible. Worker inputs can be very valuable for identifying improvements.
- When issues arise, identify their cause and implement the changes necessary to avoid recurrence.

6.1 AIM/PURPOSE OF STUDY/OBJECTIVE :

AIM:

The goal of a 5S program is to get products closer to operations and workers, organized and labeled to eliminate wasted time and materials

PURPOSE OF STUDY:

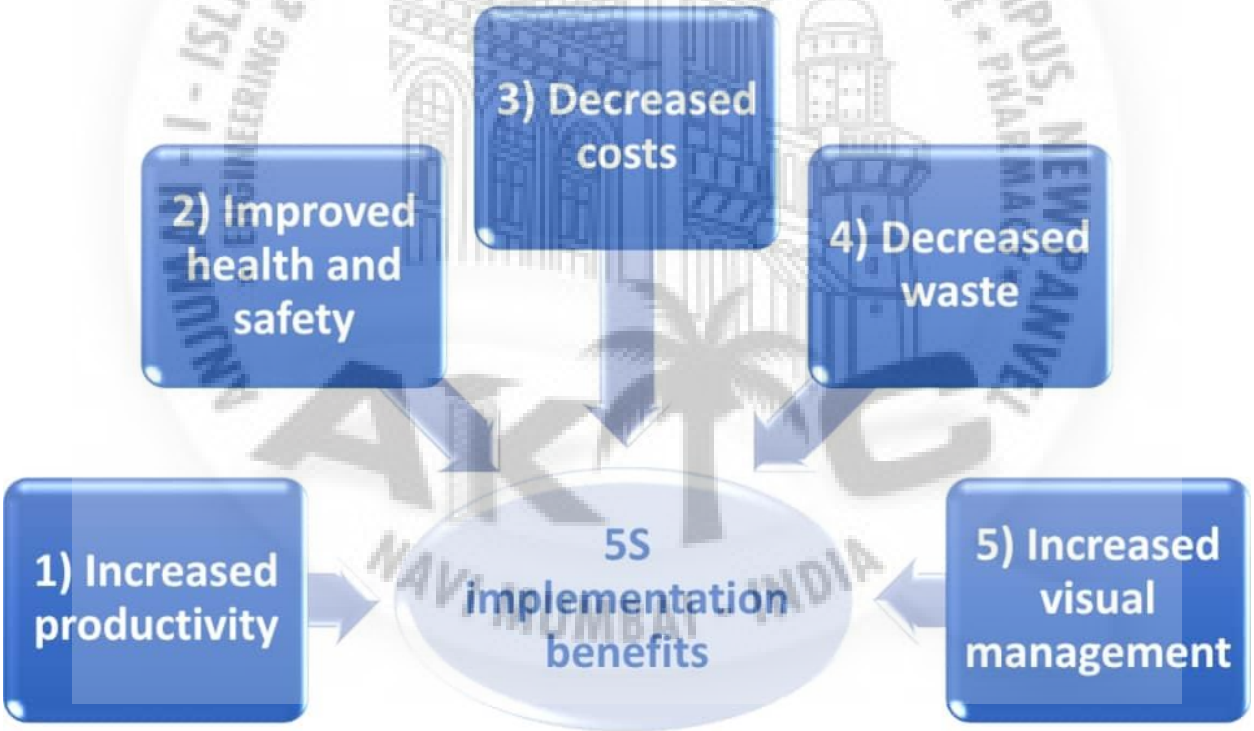
At NAVKAR FITTING AND FORGING Industry the final product is kept improperly. There was an urgent need to implement 5s to prevent from any further damage of the product .There was no proper rules and regulation for the management of final product inventory .There was also an issue of sanitization which may certainly lead to health related] problem to the workers .So these are the following reason we decided to suggest the industry with 5s as it is perfectly suited to the industry which can finally lead to improve of productivity and social benefit of the industry.

Improper management of final product at Navkar industry

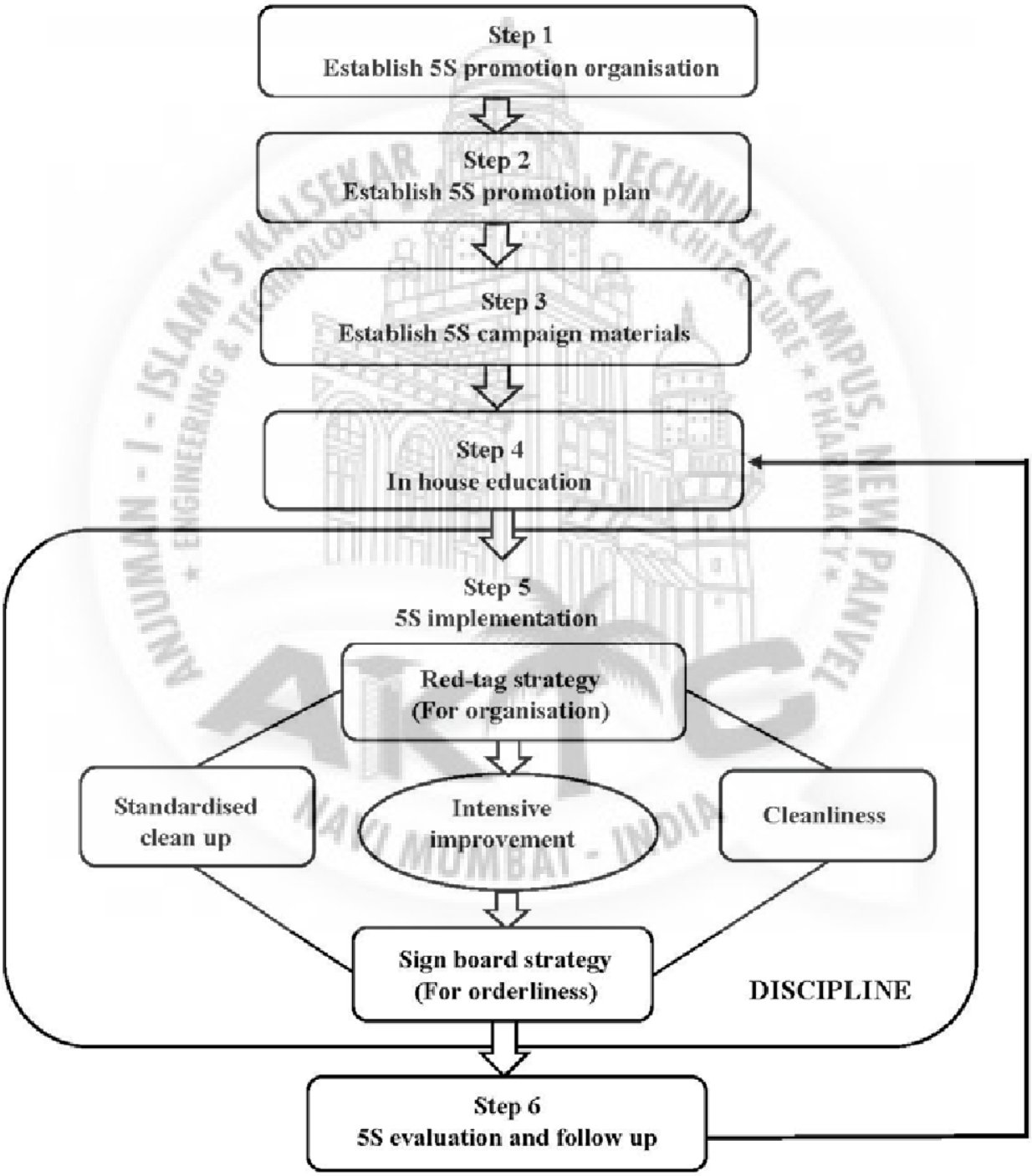
As the above photos clearly indicates that there is an improper management of final product .So hence the implementation of 5s was ideal in this case

OBJECTIVE:

- Productivity: 5S increase the productivity of the organization .Specially, it works in both personal and working life. The face of an undisciplined office becomes discipline because of 5S.
- Safety: When a man follows the 5S them it increases the safety issue of the organization.
- Reduced Waste: 5S teach to clean up the process by arranging the materials in discipline way .Unwanted materials are reduced from the place by 5s methods.
- Worker Commitment: Workers commitment increases after the application of 5s in an industry.



6.2 Steps used in 5S Implementation:



CHAPTER NO: 7

EXPECTED OUTCOME

The Expected outcome after the application of EBQ Analysis in NAVKAR Fitting and Forging pvt.ltd would be as follows:

- Improve product and raw material Storage capacity.
- Awareness about total cost investing of product.
- Use space efficiently.
- Proper and efficient material handling and manufacturing process is achieved.
- Ultimately increase in Profit.

Reducing cost

Space Ut

CHAPTER NO: 8

TOTAL COSTING OF THESIS

The total costing of thesis includes:

- Black book : 500 rupees.
- Travelling cost : 400 per head.
- Miscellaneous cost : 100 per head.

Grand total cost : 2500 rupees

CHAPTER NO: 9

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