

Case Study on the Concept of Value analysis in Sheet Metal

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ABSTRACT

Value engineering & value Methodology is a basic concept used in Automobile sector to increase the production of company and eliminate unnecessary process so that the profit can be maximized. Production is increases today but the demand of goods is also increases. So the idea of reducing the total manufacturing cost of running part & also reducing the amount of their wastage like scrap of parts, Quality Issue & other Rejection of parts. In this case study we use Value analysis of parts so that a group produces the same parts at the cheaper cost from their competitors in market

Keywords: Value Analysis, Value Engineering, Pareto Graph, Cause & Effect Diagrams.

1. INTRODUCTION

Value Engineering is a concept that uses all the tools of an industry to increase the net profit of a company like quality management, SPC, MSA etc. The overall wastage in manufacturing of product can be eliminated by using Value Engineering. To increase the value of an item we can use VE as an orderly and creative method VE is a structured problem solving process that is based on functional analysis understanding something with such clarity that it can be described in two words, the active verb and measurable noun abridgement. For example, the function of a pencil is to "make marks". This then facilitates considering what else can make marks. From a SPRAY CAN, lipstick, a diamond on glass to a stick in the sand, one can then clearly decide upon which alternative solution is most appropriate. The Value Analysis technique was developed after the Second World War in America at general Electric during the late 1940s. Since this time, the basic VA approach has evolved and been supplemented with new techniques that have become available and have been integrated with the formal VA process. Today, VA is enjoying a renewed popularity as competitive pressures are forcing companies to re-examine their product ranges in an attempt to offer higher levels of customization without incurring high cost penalties. In parallel, many major corporations are using the VA process with their suppliers to extend the benefits of the approach throughout the supply chain. Businesses, big and small, will therefore benefit from understanding and applying the VA process. It is likely that those companies that do not take the time to develop this capability will face an uncertain future as the lessons and problems of the past are redesigned into the products of the future.

2. NEED OF PRESENT WORK

In Automobile sector competition is increasing rapidly, now the most important factor for a plant to maintain the Quality system, because without maintaining Quality of Product an organization cannot stand in this time among all competitors. If Quality of the product is low or Reject at customer end then all parameters of plant related to its value is goes on increasing which result is loss and continue loss. So the first aspect is that while at the time of product development a system is made in this way that the production of part is smooth and in low time consuming. In this all the parameters of like Rejection status and other cost related data is collect and finalized. In the initial time various works is done in this system by improving the product cycle and changing this product cycle and other concept like raw material changing like. The present work aim is to improve the profit of an organization.

3. METHODOLOGY USED IN CONCEPT

In the process of value analysis in an organization we have to take help of many tools which are useful to simplify the concept and result is better control in the process of product planning and Quality Level internal as well as external end.

- **ROLE OF KAIZEN/POKA YOKA-**

KAIZEN-The Sino-Japanese word "kaizen" simply means "good change", with no inherent meaning of either "continuous" or "philosophy" in Japanese dictionaries or in everyday use. The word refers to any improvement, one-time or continuous, large or small, in the same sense as the English word "improvement" Kaizen is a daily process, the purpose of which goes beyond simple productivity improvement. It is also a process that, when done correctly, humanizes the workplace, eliminates overly hard work and teaches people how to perform experiments on their work using the scientific method and how to learn to spot and eliminate waste in business processes. POKA YOKA is a Japanese term that means "mistake-proofing". A poka-yoka is any mechanism in a lean manufacturing process that helps an equipment operator avoid mistakes (poka). Its purpose is to eliminate product defects by preventing, correcting, or drawing attention to human errors as they occur.

- **STATISTICAL PROCESS CONTROL-**

SPC is used in value analysis concept to study the existing process capability that how much percentage our product is running in right way all process capability of the process is get by using this process after getting the information regarding the process capability one get idea that how much work to done in this field to improve the level. An advantage of SPC over other methods of quality control, such as "inspection", is that it emphasizes early detection and prevention of problems, rather than the correction of problems after they have occurred.

- **SINGLE MINUTE DIE EXCHANGE SYSTEM**

The essence of the SMED system is to convert as many changeover steps as possible to “external” and to simplify and streamline the remaining steps. The name Single-Minute Exchange of Dies comes from the goal of reducing changeover times to the “single” digits. However, the power of SMED is that it has a lot of other effects which come from systematically looking at operations

- **LABOUR PRODUCTIVITY**

To calculate Labors productivity means we have to find out our productivity ratio with respect The term ‘Labour Productivity’ is generally defined as “the ratio of physical amount of output achieved in a given period to the corresponding amount of labour expended It may be true that any business organization all wage payments are directly or indirectly based on the skill and productivity of the workers, therefore labor productivity is considered as the most important factors in productivity computations.

$$\text{Labour Productivity} = \frac{\text{Total Sale of plant}}{\text{Total labour cost}}$$

- **PART PER MILLION (PPM)**

Part per million (PPM) is used to measure the rejection status on monthly basis. One part per million (ppm) denotes one part per 1,000,000 parts, one part in 10^6 , $1/1,000,000 * 100\% = 0.0001\%$ (or $1\% = 10,000$ ppm), and a value of 1×10^{-6} . This is equivalent to one drop of water diluted into 50 liters.

$$\text{INTERNAL REJECTION PPM} = \frac{\text{Total number of pieces reject}}{\text{Total Production of Plant}} \times 1000000$$

- PARETO ANALYSIS**

The concept of pareto analysis is used to identify the part which is the most critical issue at customer at and due to which rejection is increasing. Then after identify that critical part we take that part into the study of value analysis.

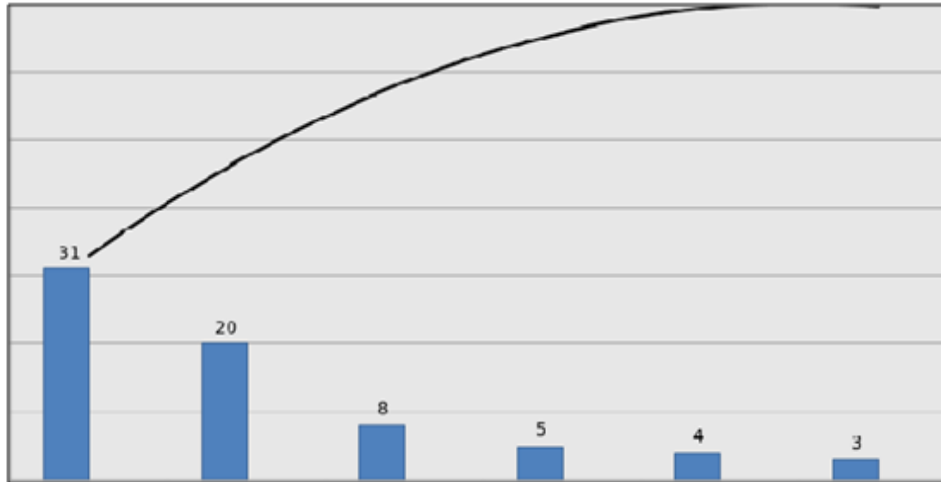


Fig- An overview model of Pareto Analysis Chart

- FISHBONE DIAGRAM**

FISHBONE diagram is also known as the “cause and effect Diagram” in this context the phase of value analysis is depend after analysis the part from the Pareto chart on which we have to apply the concept of value analysis .in this concept a team of member study the Best possible method to short out the problem and getting the appropriate solution regarding this concept. In this the method of 4M is used to getting the best possible method to solve the problem and what is the cause of the problem is also identified in this aspect.

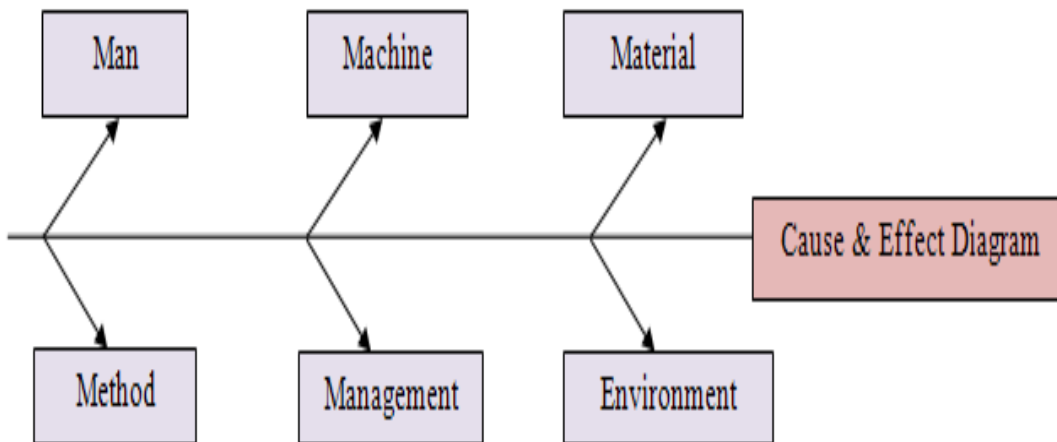


Fig- Fishbone Diagram

- USE VALUE ANALYSIS METHOD**

Every industry in current competition have to decide their objective level in order to satisfy customer and to achieve yearly Audit satisfaction status by customer & government also. Some objective are given by customer like customer Rejection PPM status and some it decide itself like internal rejection and rework status.

Company Objective Sheet using Various Parameters

| Company Objective Measurable Sheet | | | | | | | | | | | |
|------------------------------------|--------------------------|-----------------------|-------------|-------|----------------------------------|------------------|--------------------------|---------|-----------------|----------------------|----------------|
| Sl. No. | Parameter to be Measured | Method of Measurement | Observation | | Target (YTD)/Observation of 2014 | | | Trend | Reviewed Period | Ref. Doc. Name & No. | Responsibility |
| | | | 2012 | 2013 | Target (Jan 14 - Dec 14) | Observation 2014 | Target to be Measured as | | | | |
| 1 | Customer Rej | PPM | 4025 | 4398 | 2000 | 3858 | Cummulative | Monthly | Monthly | Trends | HOD QA |
| 2 | Supplier Rejection | PPM | 19043 | 14808 | 7000 | 27463 | Cummulative | Monthly | Monthly | Trends | HOD QA |
| 3 | Rejection Rework | PPM | 25000 | 39426 | 10000 | 15000 | Cummulative | Monthly | Monthly | Trends | HOD PRESS SHOP |
| 5 | In House Rejection | PPM | 2000 | 2800 | 1500 | 3200 | Cummulative | Monthly | Monthly | Trends | HOD PRESS SHOP |
| 6 | PDI Rejection | PPM | 3711 | 921 | 500 | 1050 | Cummulative | Monthly | Monthly | Trends | HOD QA |
| 7 | Cost Of Poor Quality | % of sales | 1.75 | 0.95 | 0.8 | 1 | Cummulative | Monthly | Monthly | Trends | HOD QA |
| 8 | Kaizen | Nos | 5 | 7 Nos | 5 Nos per month | 4 | Total Nos | Monthly | Monthly | Trends | HOD QA |
| 9 | Logistic Cost | % of sales | 2.01 | 1.89 | 2.00 | 2.22 | Cummulative | Monthly | Monthly | Trends | HOD DISPATCH |
| 10 | Delivery as Per Schedule | % | NA | 97.28 | 100 | 97.77 | Avg | Monthly | Monthly | Trends | HOD DISPATCH |
| 11 | Machine Break Down | Hours | NA | 1516 | 20 hr/M (240 Hr) | 24.7 (297) | Avg | Monthly | Monthly | Trends | HOD MAINT. |
| 12 | Die Break Down | Hours | 18 | 28.66 | 25 | 25 | Avg | Monthly | Monthly | Trends | HOD TOOL ROOM |
| 13 | OEE-PRESS SHOP | % | NA | 58.47 | 78% | 63.73% | Avg | Monthly | Monthly | Trends | HOD PRESS SHOP |
| 17 | Supplier Audits | As Per Plan | | | | | | | | | Concern HOD |
| 18 | Training | As Per Plan | | | | | | | | | |

INTERNAL REJECTION DATA

To understand or locate the area where lots of improvement require we get the last four month rejection data of plant with their causes so that we can get the most critical issue of shop due to which part continue reject and Plant Rejection PPM goes beyond the set objective it may be a possibility the Part which reject at customer end also reject due to these internal failure.

| Sr. No | Part Name | problem | Oct-14 | Nov-14 | Dec-14 | Jan-14 | Total |
|-----------------|--------------|-------------|--------|--------|--------|--------|-------|
| 1 | Control Box | Hole Crack | 750 | 825 | 628 | 950 | 3153 |
| 2 | Gear Bracket | Hole Out | 658 | 745 | 625 | 897 | 2925 |
| 3 | Sheet panel | Hole Miss | 425 | 215 | 180 | 198 | 1018 |
| 4 | Fan bush | crack | 185 | 225 | 210 | 157 | 777 |
| 5 | Mount lock | Blank short | 145 | 97 | 25 | 119 | 386 |
| Total Rejection | | | | | | | 8295 |

4. IMPLEMENTATION PHASE FOR IDENTIFY PROBLEMS

As per implementation of VE phases we find out the critical area where we have to apply the concept. First we use Quality circle method to reduce the Control Box Quality issue. The main objective of VE is to eliminate the Rejection/Improve Quality but without use too much investment.



• **PROBLEM UNDERSTANDING**

Our problem is of Hole Tapering /cut in parts. This Problem can be shown below with the help of following figures.



Fig- Not ok part (Hole Puncher /Crack)

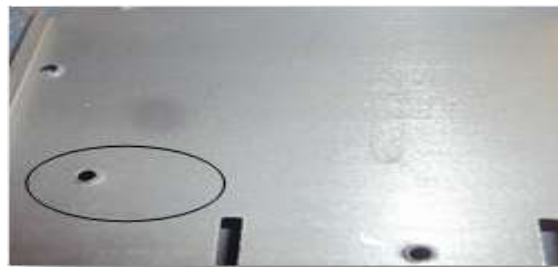



Fig- Ok part (Hole condition ok)


5. COUNTERMEASURE OF PROBLEM

In this phase we go through the Quality circle Brain storming process .A team is formed from concerned department which study the potential cause which is identify in the previous phase of project. After doing **why-why analysis** the further step is taken to eliminate the problem.

| COUNTERMEASURE | Changes made in Process | STATUS |
|----------------------|--|--------|
| Punch changed | Punch shape change as shown. Now punching & embossing done in one step after doing why-why analysis of Quality Circle. | OK |



BEFORE



AFTER

Fig- Countermeasure of Problem Occurred

6. PROCESS FLOW DIAGRAM

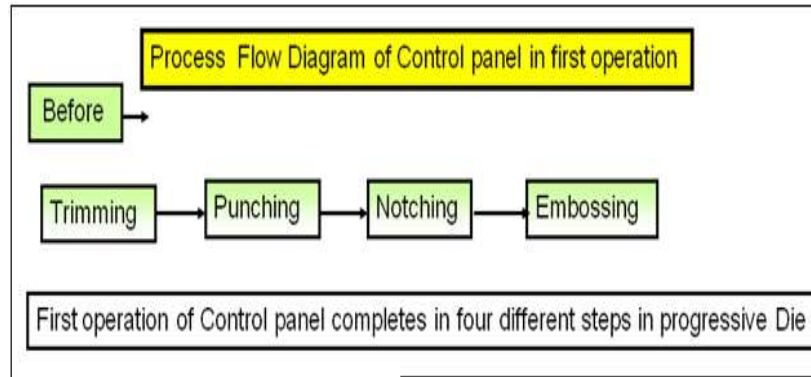


Fig- Process Flow Diagram before Implementation

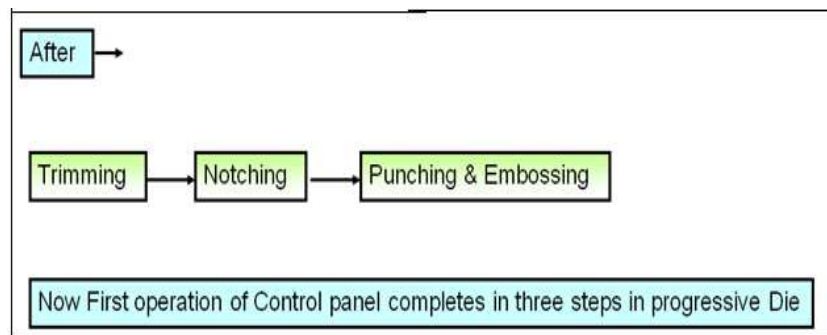


Fig- Process Flow Diagram after Implementation

7. CONCLUSION

This is the final phase of VE project in this phase we calculate the overall saving of the project and discuss regarding the problem on which we work & also gathered the data on a table known as cost cutting calculation sheet.

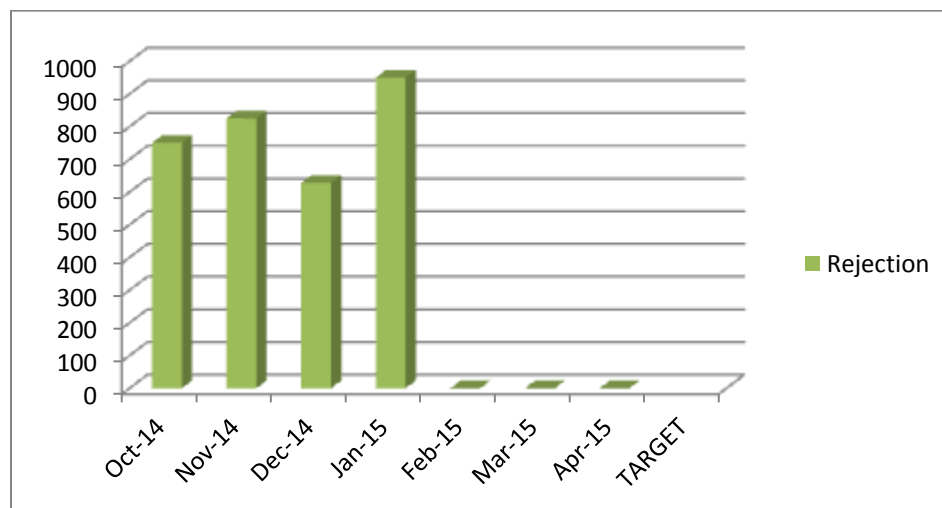


Fig- Internal Rejection Trend after completion of project

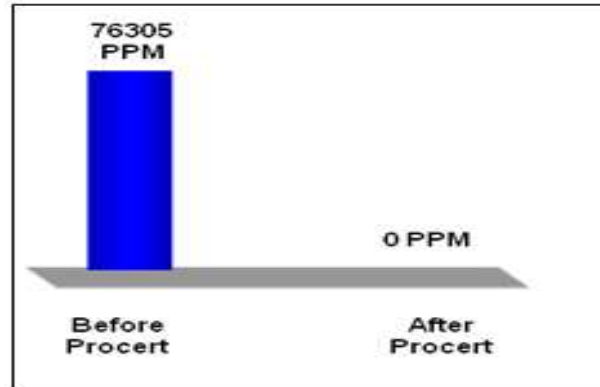


Fig- Improvement in Trends

Table- Saving v/s Investment Calculation of Project

| Saving v/s Investment Calculation of Project | | |
|--|--|---------|
| A) Saving of Project by Rejection control | Current PPM | 1548 |
| | After PPM | 0 |
| | PPM saved | 1548 |
| | Monthly Production of Part | 10000 |
| | Rejection Saved | 950 |
| | cost of component | 254 |
| | Saving-Monthly | 241300 |
| | Saving-Yearly | 2895600 |
| B) Investment in Project | Punch cost | 4500 |
| | Punch Hard Process Cost | 2200 |
| | Estimate time | 20 days |
| C) Time Lost | Total Rework time in Hrs | 0 |
| | Total Rework time in Mins | 0 |
| | Man Hour lost | 0 |
| | Total Rework Cost | 0 |
| D) Net Saving Monthly | Total Saving-Rework cost-Investment in project in Rs/- | 234600 |

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REFERENCES

- [1]. Miles, L.D., "Techniques Of Value Analysis And Engineering" ,Mcgraw-Hill, 1972
- [2]. Donald E. Parker, "Value Engineering Theory", Lawrence D. Miles Value Foundation
- [3]. Fallon, Carlos, "Value Analysis", Lawrence D. Miles Value Foundation.
- [4]. Ginger Willingham, CVS, "Value Analysis: Universal Applicability, Limited Usage, Value World", July/Aug/Sept., 1990
- [5]. Habibollah Najafi, Amir Abbas Yazdani, Hosseinali Nahavandi, "Value Engineering and Its Effect in Reduction of Industrial Organization Energy Expenses", International Journal of Social, Behavioral,educational, Economic, Business and Industrial Engineering Vol:4, No:2, 2010
- [6]. Shrikant Kallurkar, Mr Mahadeo A. Chougule, "Use of Value Analysis Technique for Cost Reduction in Production Industry – A Case Study", International Journal of Engineering Science And Technology (IJEST)-ISSN : 0975-5462 Vol. 4 ,2094,05 May 2012
- [7]. Mr Mahadeo A. Chougule, "Application of Value Engineering For Cost Reduction A Case Study of Universal Testing Machine", International Journal Of Advances In Engineering & Technology, July 2012.Issn: 2231-1963
- [8]. Robert Sproule, David Pfeiffer "Concept of Value Analysis", Project Management, Tata McGraw- Hill Publishing Company Ltd.1972
- [9]. Society of Japanese Engineering," GUIDEBOOK FOR VE", Value Engineering Manual, January 1, 2004
- [10]. Fang-Lin CHAO, Chien-Ming SHIEH and Chi-Chang LAI, "Value Engineering in Product Renovation"
- [11]. Hisaya Yokota, "Why Problems Cannot Be Solved and Why VE Is Effective?"
- [12]. Mcdowell, T., "Value Management: Surviving", In the Millennium Via Diligence Rewarded Management Accounting, 1996.
- [13]. Cooper, R. and Slagmulder, R., "Target Costing and Value Engineering Productivity Press",Portland , OR, USA (1997).
- [14]. Jay Mandelbaum& Danny L, "Value Engineering Handbook, IDA paper P-4114, pp. 37,54,73,2006
- [15]. John H. Fasal, Practical Value analysis Methods, Hayden Book Company
- [16]. Gage E.L., Value Analysis, McGraw-Hill Book Company
- [17]. Heller, Edward D., "Value Management: Value Engineering and Cost Reduction, Addison- Wesley"1981
- [18]. Mudge, Arthur E., "Value Engineering", 1981, Society of American Value Engineers.
- [19]. Succesful Program Management, Sharpening The Competitive Edge, Value Engineering Part II, SAVE Innovative Change, 101 Case Histories
- [20]. Ridge, Warren J., "Value Analysis for Better Management", Aamerican Management Association
- [21]. B. D. Perry, "Commonalities for a Strong Value Engineering Programme", Value World Oct/Nov/Dec ., 1989.
- [22]. R.V. Gopalkrishnan, Practicing Value Management, Value World, Apr/May/June, 1990.
- [23]. Jagannathan G., "Value Analysing Time", INVAVE, VE Journal for INVEST, Vol I, No.2, January, 1979
- [24]. Jagannathan G., "Model of VE - A Case Study from Tata Steel", INVEST Proceedings,1990