APLLICATION OF VALUE ENGINEERING IN MANUFACTURING INDUSTRY – A CASE STUDY OF MANISH ENGG. WORKS

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ABSTRACT

In this current competitive automotive world, cutting down the cost & improving the function for the same cost is the key in winning over the competition. This paper presents the fundamental idea of Value Engineering and Value analysis that can be implemented to any component to optimize its value. It promotes people to think and use their creative thinking to effectively convey the information with each other to improve their effectiveness and the profit of the Company. A case study is discussed of a product in which the shape of raw material of the product is changed for implementing the value engineering methodology. In another case study by changing the number of fixture by value engineering concept.

KEYWORDS

Value Engineering (VE), Value analysis (VA), Manufacturing Industry, Forging, Fixtures, Robotic arm/Gantry.

INTRODUCTION

Value engineering (**VE**) is the study of product designs and systems before the presentation of final production drawing. Value is basically nothing but the ratio of function to the cost. Value Analysis (VA) is used to analyse and evaluate existing product to reduce cost and improve the function. It involves a current product being analysed in poor areas in design procedure at various stages right from manufacturing to distribution and operation. At each stage the overall effect of any change in cost or function is considered. This will reduces the cost and improvement in the effectiveness of function. Value Analysis exercises use a plan which step-by-step, methodically evaluates the product in a range of areas. These include costs, function, alternative components and design aspects such as ease of manufacture and assembly. The purpose of value engineering is to help, maintain or increase profitability in spite of increasing costs and competition.

MANISH ENGG. WORKS

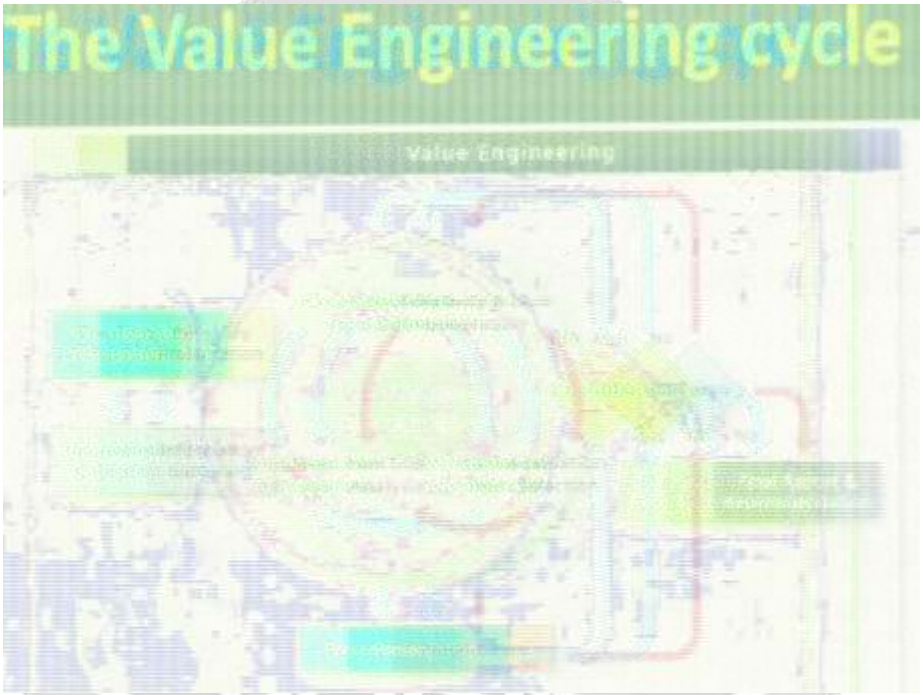
Established in the year 1998.Manufactures Heavy sheet metal and Tubular welded sub-assemblies for automobile industries. Aurangabad based company having basic infrastructure for manufacturing of sheet metal press parts and CNC+VMC turned components, welded/fabricated assemblies/surface treated components. Some of the products are Crank pin, Sleeve gear, Lay shafts, Starter clutch, Yoke components, Shaft assemblies, Bracket assemblies, etc.
All the observations of the case study are taken from MANISH ENGG. WORKS, under the guidance of Mr MANISH RAWKE (CEO).

THE ELEMENTS OF VALUE ENGINEERING

The value engineering has five major elements:

- Information: In this phase the scope of the study for critical information is established and the necessary information about costs and other functions are collected from reliable sources which are analysed and prepared by the manager, or may be by the engineer or designer .In this phase every team member should put their expertise about the information collected from reliable sources.

- Speculation: At this phase the team is formed and made familiar with the problem and the result of the analysis. Each member is allowed to speculate freely and to use his ability to create alternative ideas for performing the required function at lower cost compare to other ideas.
- Evaluation: When all ideas have been recorded, each idea is reviewed in terms of profitability and briefly explained. An analysis of the relative cost of each alternative is made on the basis of assumptions. The team then make a systematic assessment of the overall advantages and disadvantages of each alternative idea.
- Development: The selected idea or ideas will be completely examine by the design engineer. In the case of an existing product, assembly or component, the value engineering manager will introduce the idea through presentations and, if necessary, arrange further team meetings to deal with any difficulties which arise during development stage.
- Presentation: The team makes a formal written summary of their outcome accompanied with a presentation to clients, users, and designers. Value engineering project data is systematically maintained and recorded for future studies to reduce the work load, and also reference for design and other departments.



Value engineering / Value Analysis of process to improve raw material yield.

Initially the job was made with the Bar route .In which the gross raw material required is more. Time required to pre machine the raw material is also more. Due to which the cost for production is also high. To improve raw material yield conventional process is replaced by forging process for the same component .The comparison of before value engineering and after value engineering is as follows

Particular	BAR ROUTE	FORGING
		

GROSS WEIGHT	3 KG	1.8 KG
TIME REQUIRED FOR MACHINING PROCESS (PER JOB) • PRE MACHINING • CNC MACHINING	 10 MINS 8 MINS	 NOT REQUIRED 6 MINS
COST OF MACHINING • FORGING COST (14RS/KG) • PRE MACHINING (1RS/MIN) • CNC MACHINING (3RS/MIN) • TOTAL MACHINING COST (A)	 10 RS 24 RS 34 RS	 25.2 RS 18 RS 43.2 RS
RAW MATERIAL COST (66 RS/KG) (B)	198 RS	118.8 RS
TOTAL COST (A+B)	232 RS	162 RS
QTY PRODUCE PER HOUR	3.3 UNITS	10 UNITS

OBSERVED BENEFITS OF VALUE ENGINEERING/VALUE ANALYSIS

- Raw material yield is achieved gross wt 1.80 kg instead of 3 kg.
- 70 Rs are saved per component.
- Improve in production qty. forging batch 100 nos in one shift.
- Pre machining time is eliminated.
- Less raw material removal which leads to better tool life.

Value engineering / Analysis of fixture improvement for productivity improvement.

On VMC Machine single component fixture has following limitations

- Loading/unloading cycle of each component by operator results in less production.
- Separate operator for each machine is required.
- Fatigue to operator.

PARTICULAR	**Single pc Fixture**	**Multiple pc Fixture**
		
INITIAL COST	60 THOUASND PER FIXTURE	2 LAKHS PER FIXTURE
TIME FOR MACHINING	220 SEC PER PIECE	750 SEC FOR 4 PIECE
QTY PRODUCE PER HOUR	16.6 UNITS	19.2 UNITS

OBSERVED BENEFITS OF VALUE ENGINEERING/VALUE ANALYSIS

- Loading/unloading time reduced hence production improvement.
- One operator can handle 2 machines at a time.
- Fatigue of operator is reduced.
- Man power requirement reduced .
- Tool changing time is reduced due to multiple fixtures

Value engineering / Analysis possibility of loading/unloading by gantry or robot.

Limitations of manual loading/unloading

- Yield of shift is less (lunch time, tea time, other misc. down time)
- Fear of absenteeism
- Skilled operator required.

Suppose Industry having 50 CNC machines. To operate these 50 machines 50 individual operators are required, which increases the man power and labour cost. For skilled worker minimum basic wage is ₹407.69, for semiskilled it is ₹380.77, for unskilled it is ₹361.54 (Rates are according to government of Maharashtra till 31 December 2017). Then for 50 workers it is approx ₹5,70,000 per month. To operate such modern machine the operator should be properly trained which requires additional cost as well as time. To avoid this use of gantry or robotic arm is beneficial.

Before VE After VE

The robotic arm/ gantry cost nearly 10 to 15 lakhs. If robotic arm is installed between two machines it can handle both machine simultaneously with greater efficiency. In such condition one operator can handle 4 machines simultaneously without any physical work or fatigue. If this arrangement is done for shop floor, the required robotic arms will be 25 and operators will reduced to only 12 to 13. For this initial high investment is required but in long term it will reduce the cost and time of labour.

OBSERVED BENEFITS OF VALUE ENGINEERING/VALUE ANALYSIS

- High productivity with less rejections.
- Labour cost reduces to $1/4^{th}$.
- 24 hrs production can be achieved without any break.
- Less manual interference leads to decrease in the error.
- No fear of absenteeism.
- Non skilled worker can also operate robotic arm.
- Accurate and precise work can be done.

CONCLUSION

Value engineering is concept which accepts the present demand of customers according to the priority, aspirations and psychology .It does not reduce cost of products, services or systems by reducing the function of product but enhances their values through cost avoidance by improving the function.

- The process modification for raw material reduces the weight and material requirement which reduces the cost.
- The modification in work holding i.e fixture increases the production rate and leads to reduction in cost per component. This also reduce the cycle time of component.
- Modification in work handling i.e robotic arm/gantry reduces the requirement of labour and leads decrease its cost. This also helps to decrease the rejection.

Value engineering is executed for single product in this case and substantial reduction in cost is achieved. Value engineering results in elimination of unnecessary cost by avoiding the unwanted machining of component. Value engineering is highly customer orientated, which focus on those qualities of the product/service that satisfies customer needs. Cost reduction is achieved by eliminating functions which are unable to supply specific advantages to satisfy customer requirements/needs.

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