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Implementation of Value Engineering In Rooftop Extractor

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Abstract - This paper presents the basics of Value Engineering and its different phases that can be implemented to a product for its optimization. Value Engineering can improve the product cost by reducing the unnecessary costs associated with the product. Efforts have been put into the articulation of the paper to make it coherent which can be easily perceivable. A case study has been discussed in this paper involving roof exhausters which are used for circulation of air in most of the industries. The material is chosen such that the cost is reduced without affecting the quality of the product. Through the application of Value Engineering profits are maximized without hindering the reliability of the product. With the effective utilization of the technique the final outcomes comes out to be a successful showcase of value engineering.

Keywords – Value Engineering, FAST Diagram, Value Analysis , Functional Analysis, Cost Reduction

I .INTRODUCTION

This paper mainly throws light upon cost reduction of rooftop extractor which is used for circulation of air in many industries. Here we use value engineering as a tool to increase the efficiency of the product with lowered cost but having the same function**.**

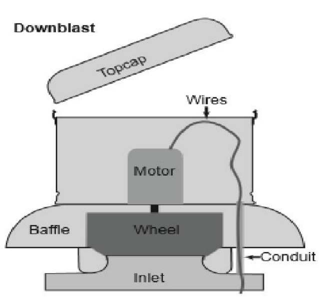

Fig1.1 Existing Product

Fig 1.2 New Product

II. INTRODUCTION TO VALUE ENGINEERING

Value Engineering is a technique for determining the manufacturing requirements of a product/service; it is concerned with its evaluation and finally the selection of less costly conditions. Lawrence D. Miles established the Value Engineering in the monograph of "Techniques of Value Analysis and Engineering" in 1947. In the monograph he pointed out that success of a free enterprise in the overall long-term competition lay in continuously selling the best value to customers and evoking expected price, and the best value is function and cost. Value Engineering can help to determine the best scheme that meets all the needs of the customers with the lowest cost. Since 1978, the theory of Value Engineering was introduced into China; it has been widely adopted by many companies and made great economic benefits. With 35 years practice, the theory and methodology of Value Engineering has been recognized by the academic community, especially the business circles, which has been one of the significant methods to improve product quality, reduce product cost. However, in India, VE is mostly associated to any alternative design with the intention of cost cutting exercise for a project, which is merely one of the initial intentions of the VE. This paper outlines the basic frameworks of Value Engineering and presents a case study showing the cost reduction of Value Engineering in a "**ROOF TOP EXTRACTOR**".

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The practice of VE doesn't imply that there may be intentional "Existing plating," conscious neglect of responsibility, or unjustifiable error or oversight by the design team. VE simply recognizes that social, psychological, and economic conditions exist that may inhibit good value. The following are some of the more common reasons for poor value: Wrong beliefs, insensitivity to public needs or unfortunate experience with products or processes used in unrelated prior applications. Lack of information, usually caused by a shortage of time. Too many decisions are based on feelings rather than facts. Habitual thinking, rigid application of standards, customs, and tradition without consideration of changing function, technology, and value. Reluctance to seek advice, failure to admit ignorance of certain specialized aspects of project development. Risk of personal loss, the ease and safety experienced in adherence to established procedures and policy.

Over specifying, costs increase as close tolerances and finer finishes are specified. Many of these are unnecessary negative attitudes, failure to recognize creativity or innovativeness. Poor human relations, lack of good communication, misunderstanding, jealousy, and normal friction between people are usually a source of unnecessary cost.

III. INTRODUCTIONN TO VALUE ANALYSIS

VE is an organized way of thinking or looking at an item or a process through a functional approach. It involves an objective appraisal of functions performed by parts, components, products, equipments procedures, and services; and so on anything that costs money. Value methodology is commonly applied under the names Value Analysis (VA), Value Engineering (VE), and Value Management (VM). These terms can be used interchangeably with value methodology throughout the places according to the need of the situation. [6] Value Analysis is an effective tool for cost reduction. Value analysis defines basic function as anything that makes the product. A function that is defined as basic cannot change. Secondary functions also called supporting functions describe the manner in which basic functions were implemented. Secondary functions could be modified or eliminated to reduce product cost. As value analysis progressed to large and more complex products and systems, emphasis shifted to upstream product development activities where vale analysis can be more effectively applied to a product before it reaches production phase. However, as products have become more complex and sophisticated, the technique needed to be adapted to the systems approach that is involved in any products today. As a result, value analysis evolved into the "**FUNCTION ANALYSIS SYSTEM TECHNIQUE**".

IV. LIFE CYCLE COSTING

Life-cycle costing is a methodology used for facility acquisitions that employs a comprehensive economic analysis of competing alternatives. The analysis compares initial investment options and identifies least-cost alternatives for a project or acquisition over its serviceable or useful life span. Life-cycle costing examines the associated ownership costs of competing alternatives by discounting both the positive and negative cash flows throughout the facility's service life. In value engineering all alternatives can be compared using life-cycle costing because the alternatives for each project component are defined to satisfy the same basic function or set of functions. When the alternatives all satisfy the required function, then the best value alternative can be identified by comparing the first costs and life-cycle costs of each alternative.

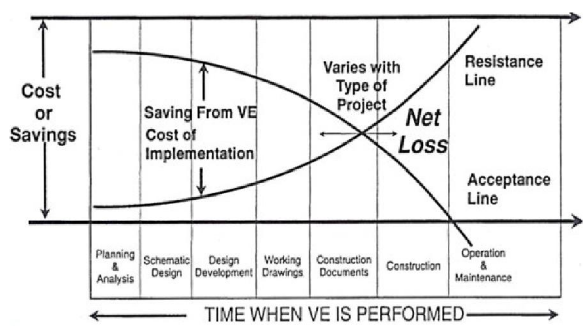

Fig 3: Life-Cycle Costing

The concept of economic analysis, which is used in life-cycle costing, requires that comparisons be made between things similar in nature. In value engineering all alternatives can be compared using life-cycle costing because the alternatives for each project component are defined to satisfy the same basic function or set of functions. When the alternatives all satisfy the required function, then the best value alternative can be identified by comparing the first costs and life-cycle costs of each alternative.

V. ROADBLOCKS TO COST EFFECTIVENESS

The practice of VE doesn't imply that there may be intentional, conscious neglect of responsibility, or in justifiable error or oversight by the design team. VE simply recognizes that social, psychological, and economic conditions exist that may inhibit good value.

The following are some of the more common reasons for poor value:

i. Lack of information, usually caused by a shortage of time. Too many decisions are based on feelings rather than facts.
ii. Wrong beliefs, insensitivity to public needs or unfortunate experience with products or processes used in unrelated prior applications
iii. Habitual thinking, rigid application of standards, customs, and tradition without consideration of changing function, technology, and value.

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iv. Risk of personal loss, the ease and safety experienced in adherence to established procedures and policy.
v. Reluctance to seek advice, failure to admit ignorance of certain specialized aspects of project development.

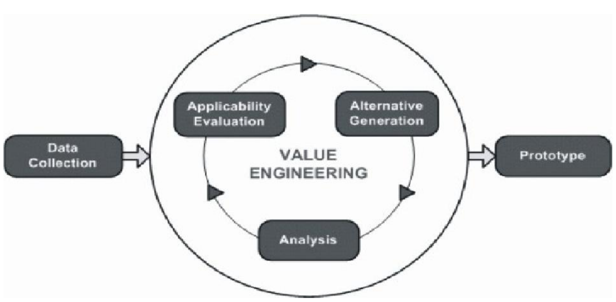
VI. APPLICATION OF VALUE ENGINEERING

Value Engineering can be applied universally, i.e., to everything materials, methods, processes, services, etc., where it is intended to bring about economics. One should naturally start with items where the maximum annual saving can be achieved. This immediately suggests that items whose total annual consumption in Rupees is high should receive top same manner, scarce materials, imported priorities in the application of Value Analysis. In the materials, or those difficult to obtain should also receive the attention of the value analyst. Bearing this in mind, Value Analysis can be systematically applied to categories of items, such as those listed below in order to bring about substantial cost reduction.

i. Capital goods plant, equipment, machinery, tools and appliances
ii. Raw and semi-processed material, including fuel.
iii. Sub contracted parts, sub assemblies components.
iv. Purchased parts, components, sub-assemblies, etc.
v. Maintenance, repairs, and operational items.
vi. Packing materials and packaging.

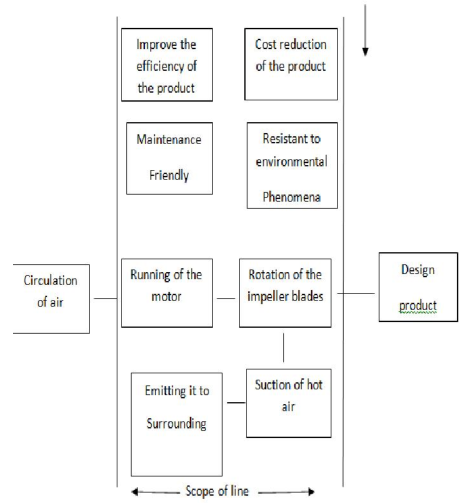
VII. VALUE ENGINEERING JOB PLAN

7.1 Information Phase:
Familiarization and to determine the true needs of the project. Areas of high cost or low worth are identified.
7.2 Creative Phase:
Creative designs are generated and the type of material is reviewed.
7.3 Judgemental Phase:
Design and material are analysed and the best design and material are selected for further development.
7.4 Development Phase:
The product is developed based on the design and tests are conducted to meet the required needs.
7.5 Presented Phase:
The summary of the new product is explained based on the reduction of cost.



VIII. FAST DIAGRAM

How? Why?



IX. CASE STUDY

9.1 Type of material used in parts:
9.1.1Existing vs New Product

Existing product		New Product	
Component name	Material	Component name	Material
Top cap	Stainless steel	Main dome	Aluminum
Motor	Mild steel	Motor	Mild steel
Motor plate	Mild steel	Outer ring	Mild steel
Baffle	Stainless steel	Impeller blade	Aluminum
Outer ring	Stainless steel	Base	Mild steel
Wheel assembly	Aluminum	Figure guard	Mild steel
Base	Stainless steel	Bolts	Mild steel
Bird screen	Fiber glass	Parallel clamp	Mild steel
Conduit	Galvanized steel	Air guide	Mild steel
Bolts	Stainless steel		
Spacer	Stainless steel		

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Posts	Stainless steel	

9.2 FUNCTIONAL ANALYSIS
9.2.1 Existing v/s New
9.2.1.1 Existing Product

Sl No	Part	Function		Part		Assembly	
		Verb	Noun	Basic	Secondary	Basic	Secondary
1	Top cap	Covers	Internal parts	x		x	
2	Motor	Drives	Material	x		x	
3	Motor plate	Hold	Motor		x		x
4	Baffle	Guides	Material	x			x
5	Outer ring	Covers	Parts	x		x	
6	Wheel assembly	Pulls	Material	x		x	
7	Base	Support	Frame	x		x	
8	Bird screen	Covers	Wheel assembly	x		x	
9	Conduit	Guides	Material	x		x	
10	Bolts	Hold	Material	x		x	
11	Spacer	Hold	Base	x		x	
12	Posts	Hold	Base	x		x	

9.2.1.2 New Product

Sl No	Part	Function		Part		Assembly	
		Verb	Noun	Basic	Secondary	Basic	Secondary
1	Main dome	Covers	Internal parts	x		x	
2	Motor	Drives	Material	x		x	
3	Outer ring	Covers	Parts	x		x	
4	Impeller blades	Pulls	Material	x		x	
5	Base	Support	Frame	x		x	
6	Figure guard	Covers		x		x	
7	Bolts	Hold	Material	x		x	
8	Parallel clamp	Hold	Main dome	x		x	
9	Air guide	Guides	Material	x			X

9.3 COST ANALYSIS
9.3.1 EXISTING V/S NEW

9.3.1.1 Existing Product

Sl no	Part	Quantity	Cost(in Rs)
1	Top cap	1	2500
2	Motor	1	5000
3	Motor plate	1	250
4	Baffle	1	3000
5	Outer ring	1	2500
6	Wheel assembly	1	1000
7	Base	1	3000
8	Bird screen	1	150
9	Conduit	1	1000
10	Bolts	4	560
11	Spacer	4	150
12	Posts	4	50
Total			19160 /-

9.3.1.2 New Product

Sl no	Part	Quantity	Cost(in Rs)
1	Main dome	1	1950
2	Motor	1	3000
3	Outer ring	1	2500
4	Impeller blades	1	2000
5	Base	1	2800
6	Figure guard	1	400
7	Bolts	12	1680
8	Parallel clamp	4	450
9	Air guide	1	1200
Total			15980 /-

9.4 Cost Analysis w.r.t Weight % Each Component:
9.4.1Existing v/s New Product
9.4.1.1Existing

Sl no	Parts	% cost
1	Top cap	13.04
2	Motor	26.09
3	Motor plate	1.30
4	Baffle	15.65
5	Outer ring	13.04
6	Wheel assembly	5.21
7	Base	15.65
8	Bird screen	0.78
9	Conduit	5.21
10	Bolts	2.92
11	Spacer	0.78
12	Posts	0.26

9.4.1.2 New product

Sl no	Part	% cost
1	Main dome	12.20
2	Motor	18.77
3	Outer ring	15.64
4	Impeller blades	12.51
5	Base	17.52
6	Figure guard	2.50
7	Bolts	10.51
8	Parallel clamp	2.81
9	Air guide	7.50

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X. RESULT

- Comparing Existing and new products surplus parts are reduced.
- Some of the parts of Existing product is completely stainless steel whereas the parts of the new product are made of mild steel and is powder coated which makes it more resistant to environmental phenomena.
- Total cost of Existing product = 19,160/-
  Total cost of new product = 15,980/-
  Difference amount = 3,180/-

XI. CONCLUSION

Using value engineering and value analysis parts of the Existing product like baffle is eliminated and by increasing the diameter of the top cap the cost of the new product is increased but the function continues to remain the same there by efficiency is increased.

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