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Value Analysis in Galvanization Process: A Cost Reduction approach

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Abstracts - In a free enterprise system, with competition at full play, success in business over the long term hinges on continually offering the customer the best value for the price. Competition, in other words, determines in what direction one must go, in setting the value content in order for a product or a service to be competitive. This best value is determined by two considerations: performance and cost. Value analysis helps in identifying unnecessary costs of any product by focusing on the product function. Using creative ideas invariably minimizes unnecessary costs even if it does not eliminate them totally. This paper addresses the application of value analysis concepts for cost reduction in the galvanization process. By this paper we can see that how we can use value analysis concept for solving the problem of any type with the best suitable option of reducing the cost of galvanization to the best possible extent. In short, Value analysis is versatile and a systematic way solve to many problems related to any aspect of manufacture, such as quality, production, maintenance, parts availability and many others. It directly contributes to improvement of operating performance and reduced costs.

Keywords: Cost reduction, Value analysis, Galvanization

1. Introduction

Over the years, it has been generally recognized that an acceptable product must serve the customer's needs and wishes to the degree that be expects. That he expects. That is to say, the product must have performance capability. In recent years, it has been clearly noticed that the cost of product must be such that the customer can buy the product at competitive prices, while leaving adequate difference between customer's cost (selling price) and production cost to assure a continuing healthy business. Keeping appropriate performance, while securing appropriate cost, introduces the value concept [3].

There are many techniques for achieving cost reduction, but each of them is relevant to only certain specific applications. For instance, operations research techniques are excellent for solving problems related to distribution, resource optimization, and so on. Flow process charts are ideal for -the study of a process and the fixing of delays, but do not help in product development. But Value analysis is the most powerful [4].

It is highly versatile and may be applied for cost improvement in practically all areas - product, process, services and systems. Unfortunately, the versatility of Value analysis has not been fully exploited. Unlike other cost reduction methods, which do not focus on the function of the product nor demonstrably use a systematic approach, Value analysis is highly systematic. This is the first difference. Secondly, Value analysis calls for a team approach, bringing together the talents and expertise of different People from various disciplines, whereas other cost reduction methods mayor may not involve & team [3].

2. Methodology

We have adopted the technique of value analysis for reducing the cost of galvanization. We followed the various stapes in value analysis for reducing the cost. Following steps are followed [2].

Steps Followed

1. The orientation phase
2. The information phase
3. The function phase
4. The creative phase
5. The evaluation phase
6. The presentation phase
7. The implementation phase
8. The follow up phase

2.1 Orientation Phase

The aim of this phase is to Identify & define the problem. M/S metal man is producing galvanized steel sheets for a no of years. They are concerned about the steadily increasing cost of galvanization. They want to improve the cost performance in galvanizing area without in any way affecting the quality of final product.

The problem is increasing cost of galvanization of steel sheets.

2.2 Information phase

The aim of this phase is to collect all the relevant information regarding drawing, technical specification, mfg processes, detailed cost break up, perforation/failure report, quality, procurement & production problem. In short it consists of:

1. Collect – data from different sources
2. Identify – facts
3. Assimilate – facts into required from

Process Description

1. Raw material comes in from of hot rolled coils of steel (1.2- 2mm thick)
2. Pickling – in these progress the HR coils dipped into HCL solution to remove scales and loose oxides from the surfaces. The process is carried out at room temperature.
3. Degreasing – ids his sheets are treated with alkali solution (NAOH) to remove dirt and grease picked from cold roll mill.
4. Annealing – the sheets are heated in a furnace in reseeding atmosphere of ammonia (NH**3**). At about 900 °C in the first zone in furnace. Then temperature is only reduced to 750 °C is the second zone. In finely to 480 °C in the last zone this is done so that the sheets are not oxidized as they come out from the furnace, before dipping in zinc bath.

Finally when zinc is coated the sheets are cooled down and cut to require lent hot CTL (cut to length) machine.

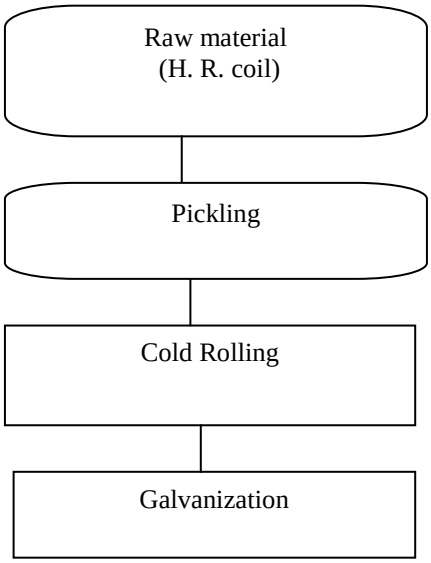

Figure 1. Flow Chart for Galvanization (H.R.Coil)

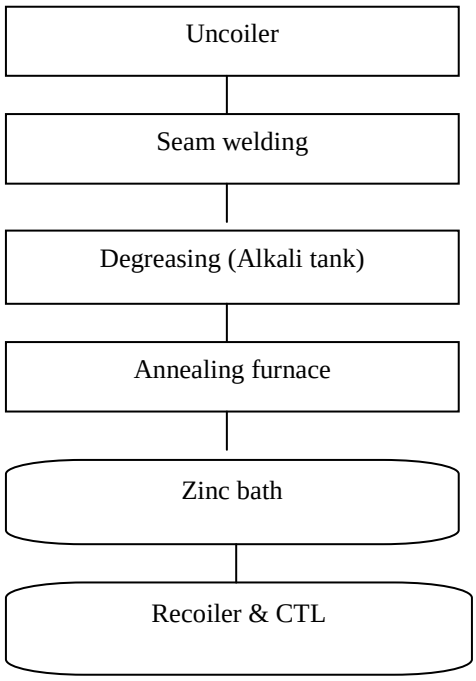

Figure 2. Galvanization process flow

Table 1. Cost breakup of galvanization process

Area	% Cost
Zinc	84
Fuel	12
Pickling	3.4
Cost of tin, lead antimony, Aluminum, etc.	0.5
Total	100

Table 2. Consumption of Zinc

Area	Consumption (%)
Coating sheets	87
Lost in dross	10
Other losses	3
Total	100

Table 3. Consumption of major items per tonne of galvanized sheets

Description	Amount
Zinc	70 kg
Tin	0.04 kg
Antimony	0.04 kg
Lead	0.14 kg
Aluminum	0.14 kg
HCL	25 kg
Fuel	20 L

Table 4. Cost of Total Process

Item	Present cost (Rs./tonne)
Pickling acid	225
Fuel	700
Zinc	4920
Lead	8
Antimony	6
Tin	14
Aluminum	15
Total	5888

2.3 Function phase

This phase involves analysis & identification of functions. It can be represented as:

1. List – components of the hardware
2. Prepare – description of functions of each component
3. Establish – cost of essential functions
4. Estimate – worth of each essential functions
5. Determine – value improvement potential

Table 5. Function-cost analysis for Galvanization process

Item	Present cost(Rs.)	Function
Acid	225	Pickling to remove loose oxide
Zinc	4920	Provide protective coating
Tin	14	Provide shining
Lead	8	Spangle formation
Antimony	6	Enlarge spangle
Aluminum	15	Provide brightness & adherence

Table 6. Function – cost – worth analysis

Function	Cost (Rs)	Worth	Basis

1. Pickling	225	185	Use inhibitor DBS (0.1%)
2. Provide coating			
a. Cost sheet	4295	4295	Zinc coating of 275 g/sq m
b. Remove excess	625	0	40 g/sq m excess
2. Heat furnace	700	104	Use propane
3. Improve brightness & nucleate spangle	43	43	Process requirement no better substitute could be through off

Value potential = cost – worth = 5888 – 4627 = Rs 1261/ tone

2.4 Creative phase

In this phase all possible alternatives & ideas are generated by application ofbrain storming & creativity techniques. In short consists of :-
1. Conduct- Creative problem solving sessions
2. Generate – Ideas, combine/rearrange them so as to accomplish basic function

Proposed Alternatives/Ideas

1. Modification of existing system.
2. Changing the process to Electro galvanization.
3. Changing the process to Sherardizing.

Modification of existing system

Zinc coating: - use coating measurement gauge to avoid over coating.
Annealing furnace: - use ceramic pot instead of steel pot
Pickling: - Use inhibitor dibenzylsulphoxide (DBS) to reduce acid consumption.

2.5 Evaluation phase

In this phase, ideas / alternatives generated during certain phase are evaluated. In order to objectively evaluate and decide upon the priority for implementation six criteria are decided & are given weightage accordingly

Table 6 Rating of criteria

Criteria	weightage
A State of art	1
B Cost of development	3
C Probability of implementation	2
D time of implementation	1
E Potential cost benefits	5
F. Safety	6

Table 7 Decision matrix

	Criteria / weightage					
Proposals	**A**	**B**	**C**	**D**	**E**	**F**
	1	**3**	**2**	**1**	**5**	**6**

	10	10	10	8	6	8	
I.	10	30	20	8	30	48	148
II.	4	4	5	5	8	8	
	4	12	10	5	40	48	119
III.	3	2	2	2	8	8	
	3	6	4	2	40	48	103

Since **''Proposal I''** has the highest score in the decision matrix among the three proposals, so it is selected for presentation and approval for implementation.

Identify	Criteria	Points
A	**State of the an**	
	➢ **Off the shelf**	**10**
	➢ **New technology**	**01**
B	**Cost of development**	
	➢ **No cost**	**10**
	➢ **high cost**	**01**
C	**Probability of implementation**	
	➢ **Easy to implement**	**10**
	➢ **Difficult to implement**	**01**
D	**Time For implement**	
	➢ **Extremely short**	**10**
	➢ **Extremely long**	**01**
E	**Potential cost benefit**	
	➢ **Large saving**	**10**
	➢ **No saving**	**01**
F	**Safety**	
	➢ **Safe**	**10**
	➢ **Most unsafe**	**01**

2.6 Presentation phase

In this phase the selected alternative is presented to decision maker for approval & implementation.

2.7 Implementation phase

As a result of all the above phases a specific, definite & tangible solution acceptable to all is reached.

Calculation of saving

Saving = value potential + cost of zinc saved (by reduction in dross) + cost of zinc saved (by reducing vaporization)

Table 8 Saving in form of dross and vaporized zinc

Item	Before (Kg/tonne)	After (Kg/tonne)	Reduction (%)	Zinc Saved (Kg/tonne)
Dross	7	3.5	50	3.5

Vaporized zinc	2.1	1.4	33	0.7

Saving = 1261 + 4.2 x 70= Rs 1555/tonne

2.8 Follow up phase

This phase is the last stage which compares the results with original expectations (Auditing) & suggest corrective in the approach for the nest project.

Total savings = value potential + zinc saving
= 1261 + 294
= Rs 1555/ tone of galvanized sheets
Production volume = 100 tonne of galvanized sheets/day
Total savings/day = 1555X100 =Rs. 155500

3. Conclusion

We thoroughly analyzed the galvanization process at metal man industries and we were successful in reducing the cost of galvanization to the best possible extent by application of value analysis. We worked out there possible alternatives that is modification of existing system, changing process to elctrogalvanising, changing process sherardizing under name proposal I, II, III respectively for reducing the cost. Than all the three alternatives are evaluated on the basis of criteria decided. Proposal (I) came out as the best among the three and it suggested for implementation, that will lead to saving as mention below.

Total saving = value potential + zinc saving
= 1261 + 294
= Rs 1555/tonne of galvanized sheets
Production volume = 100 tonne of galvanized sheets/day
Total saving/day = 1555X100 = Rs.155500

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Vitae

Sunil jauhar is a Research Scholar in the Department of applied science and engineering at Indian Institute of Technology Roorkee. He received his Master of Engineering in Industrial Engineering and Management from Visvesvaraya National Institute of Technology, Nagpur (MH) India. He has over 1.5 years of teaching experience at his parent institute Shri G.S. Institute of Technology and Science, Indore (MP), India. His research

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