

Methodology for Optimisation of Raw Material

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Abstract -- The purpose of this paper is to present the importance optimisation of raw material cost in manufacturing industries and identify the factors that influence the selection of proper method or techniques to optimise the raw material cost in various manufacturing industries. The paper discusses the reasons for applying optimisation techniques for raw material cost and problems faced by them during the implementation. The paper begins with an overview of scenario of manufacturing industries, what are the challenges and opportunity in optimisation of raw material cost and its implementation in organisation. The motivating factors for the companies to apply optimisation techniques and challenges faced by companies in implementing techniques are discussed. This paper will direct leaders on what is optimisation of raw material cost? How it is organized? What are the benefits how it is to be monitored? Evaluation and monitoring plays an important role in improving optimisation activities with new implantation for regular problems in manufacturing industries to minimise the raw material cost.

Key words: *Optimisation, Methodology, Resources, Inventory, Program Implementation, PDCA.*

INTRODUCTION

Optimisation of raw material is very important in various aspects. It is one of the most decisive factors for the quality and cost of a product. Roughly speaking, half of the quality of a product is determined by the characteristics of raw materials in the current production technology. Use of proper raw material is critical for producing high quality at a minimal cost.

In manufacturing industries there are number of optimisation techniques are available to minimise or optimise the cost of production like Inventory Control Tools, Value Stream Mapping, Lean Manufacturing, Cost of Quality and many more frame works it can be possible through raw material, wedges, inventory, transportation, investment, resources, minimising waste, minimising over production, maintenance, etc. But raw material and wedges covers more than 65% of production cost which can be minimise by various techniques. This paper will discuss about the importance of raw material cost and how to optimise the cost of raw material by using Plan-Do-Check-Analysis (PDCA) which is rarely used for optimisation of raw material cost.

PROFILE OF INDIAN MANUFACTURING INDUSTRY

The Indian economy is firmly on the path of steady growth. Even during the last decade when other countries were in the grip of a massive slowdown, India continued to enjoy a comfortable economic position. This recent

sput in growth is propelled by radical reforms such as the removal of restrictions on foreign investment and industrial de-licensing. Tailoring the EXIM policy to promote exports and aligning the import duties to meet WTO commitments further contributed to this development. This trend is expected to continue over the next five years, driven by a favourable business policy environment in terms of tax cuts, broadening tax base, and reduced interest rates.

With a size of US \$ 22 billion, the engineering sector exports stood at US \$ 6.6 billion in 2014-15 and imports at US \$ 4.9 billion the same year. Indian engineering manufacturing sector employs over 4 million skilled and semi-skilled workers. The engineering manufacturing sector comprises of heavy engineering (70%) and light engineering (30%).

India's growing integration with the global economy and the government's recognition that infrastructure needs to be overhauled are likely to ensure that the trend rate of growth increases in the next decade.

CRITICAL ISSUES FOR GROWTH

The primary reason for Indian manufacturing not being competitive enough is the significant presence of small-scale unregistered manufacturing units across the entire spectrum, even in classically scale and capital-intensive segments. Such unregistered manufacturing accounts for 23 per cent of the total capital employed and 84 per cent of the workforce. Even the registered manufacturing sector is highly skewed towards low scale. Eighty-five per cent of factories in India have less than USD 200,000 invested in plant and machinery. While this is not to belittle the value of small and medium enterprises, in India, a large number of such enterprises have been created because of artificial market distortions. The deliberate fragmentation of units has been detrimental to competitiveness.

The other important reasons for the Indian manufacturing being not competitive enough include:

- Poor quality of transport infrastructure across all sectors including port facilities (where productivity is among the lowest in the world), surface roads, railways, airports and waterways.
- High cost of power. Industrial power continues to be among the most expensive in the world. It is about 50 per cent more expensive than in China.
- High cost of capital: It continues to be 10-12 % against international average of 6-8 %.

The Government has to play a crucial role in providing the industry with a favourable investment climate in terms of better infrastructure support, institutional finance at affordable rates of interest, and designing fiscal policies aimed at promoting accelerated growth of the manufacturing sector. In particular, special efforts are needed to upgrade infrastructure facilities.

At the same time, the manufacturing firms should concentrate on internal changes aimed at improving efficiency and reducing costs.

study identifies the difference in labour productivity across multiple sectors between India and China from 10% in TV assembly to 360% in footwear.

Following imperatives are required at firm level:

- Upgrading manufacturing technology levels
- Redesigning organization structures to enhance accountability and responsiveness
- Enhanced emphasis on attracting and retaining talent
- Evolving product-mix strategies, explicitly factoring in the opportunities in export markets
- Re-engineering core processes to dramatically improve efficiency and drive business value
- Enhancing quality focus and customer orientation.

IMPORTANCE OF RAW MATERIAL

A raw material, also known as a feedstock or most correctly unprocessed material, it is a basic material that is used to produce goods, finished products, energy, or intermediate materials which are feedstock for future finished products. As feedstock, the term connotes these materials are bottleneck assets and are highly important with regards to producing other products. An example of this is iron ore which gives steel raw material and a feedstock used in the production of screws, nut and bolts, various machine parts, automobile industries, equipment for food and pharmaceutical industries, etc.

The term "raw material" denotes materials in minimally processed or unprocessed in states; e.g., raw latex, crude oil, cotton, coal, raw biomass, iron ore, air, logs, or seawater i.e. "any product of agriculture, forestry, fishing and any other mineral that is in its natural form or which has undergone the transformation required to prepare it for internationally marketing in substantial volumes."

So it is very important to optimise the cost of raw material by maintaining the quality of raw material. Here is the important result of literature survey which give the huge gap analysis in technique used to optimisation of raw material.

METHODS USED FOR OPTIMISATION OF RAW MATERIAL¹⁹¹

After analysis of literature survey, it was found that cost of raw material was achieved by various tools and techniques.

The Value Stream Mapping or Value Engineering was found to be used 15% of times in which they have examine the importance of cost control and cost reduction methods how to use in time of difficult business climate which give better result in raw material cost reduction.

Similarly 23% of time papers are based on frame work of cost reduction which defines the process to control waste minimisation and what are the main stages to achieve cost saving and how to adopt cost saving culture across the organisation for raw material, level-up the minimum or maximum inventory, to understand the importance of raw material selection criteria and also defines the completion market of manufacturing industries and how to achieve profit margins and raw material resourcing strategies for future.

Inventory planning was mostly used techniques of cost reduction which is about 24% from analysis. It gives the overall ideas about inventory control and supply chain management in various manufacturing industries which achieve raw material cost and results in profits in final product.

Lean manufacturing is also one of popular methodology for cost reduction whose quantity was found to be 14%. In which they have used number of Lean tools and techniques like Just in Time (JIT) manufacturing, Supply Chain Management to control the flow of raw material for production process, Quality Function Deployment, KAIZEN for continuous improvement, and their applications, principles and analysis process in various service industries, back offices, function, and many more manufacturing industries it defines how to identify the problems through Lean methods and their implantation

There were some miscellaneous techniques like improvements in Human Resource (HR) management through training programs, motivation towards quality and cost reduction, improvement programs towards energy efficiency, resources management and combined quality of such literature papers was found to be around 19 %

But the Plane Do Check Act (PDCA) analysis was very rarely used techniques for cost reduction around 5% and it defines the simple steps toward the achievement and it leads to profit.

The total picture of literature review is show in below with graph analysis.

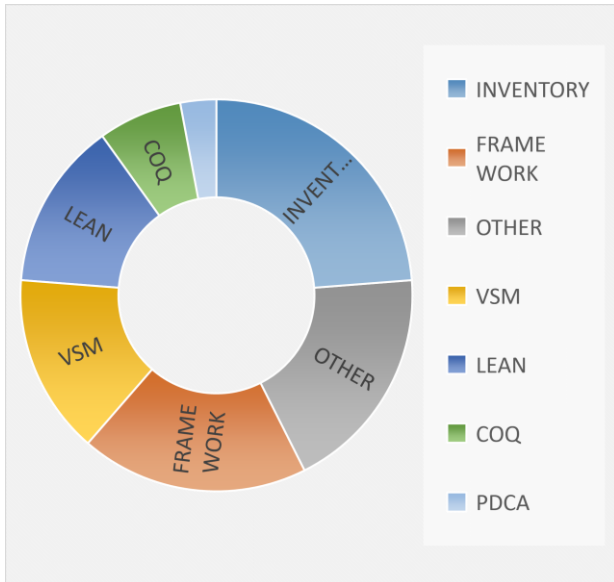


Fig. 1: Contribution of Methods Used for Optimisation of Raw Material Cost

From this analysis it can be concluded that major gap as in PDCA analysis which is rarely used around 5% for cost reduction through raw material.

PDCA (Methodology for optimisation of cost through Raw Material)

(A) PLAN: - (Assessment of reduction potential)

In every cost reduction technique, it is important to review the status of functioning before going for any modification on same time we decided to check the past scenario of production for company in focus. The following important steps were taken to check the method of purchasing of raw material.

1. Past Scenario data collection

In these step we have decided to take complete analysis of past scenario which will help to improve or to make a changes for achieving the cost reduction programme. The following points were going to guide the previous status.

- a) Methods of purchasing
- b) Inventory of Parts / Components
- c) Methods of production
- d) Total Cost measurements.
- e) Estimation of delivery time
- f) Methods of Designing
- g) Checking for bill of material and purchasing methods

2. Listing out areas of cost reduction

After analysis of past scenario, it is very important to list out the areas of cost reduction in valve which will give the direction and guideline for a selection of specific area for optimization of cost.

3. Selection of areas of cost reduction

In valve manufacturing industries we have seen that valve is an assembly of number of parts. From among themselves we will select the important and efficient parts from listed areas.

4. Resources Required

To accomplish the project requirement, it is very important to plan the resource management. This includes the following steps.

- a) Management approval
- b) Vendor capacity
- c) Storage facility
- d) Financial support

5. Budget Allocation

Finalise the budget of project on basis of past scenario which will gives the clear idea about financial requirement of project and develop the details of budget and present in front organisation for approval.

(B) DO: - (Development of reduction program)

You need a multidisciplinary team to attain significant cost reduction. Support from the top helps greatly. You will encounter resistance to the cost-reduction effort and there are risks associated with cost-reduction activities, but these issues can be overcome by following steps.

1. Selection of areas of cost reduction

This is the very important and difficult part of the project in which selection of parts or material that, where is the possibilities of optimisation of cost? This step will clear the areas of cost reduction,

2. Standardization and modification in design

Quality is the prior concept of profit, and for that standardization is the basic fact. It is process of implementing and developing technical standards based on the consensus of different parties that includes firm, users, interest groups, standard organisation and government's standardisation can help to maximise compatibility interoperability, safety, repeatability, or quality. On the basis of standardisation plan required modification in the design of ordering material or bill of material eg. Supposed previously organisation is ordering part with finished goods then we can try for in house machining if possible it may save the cost of machining.

3. Prepare drawing for standard and trim components

After standardisation if necessary then prepare drawing for standard and trim components which helps to clear out about changes in the parts or show the comparisons through drawing.

4. Order and compare quotations with different vendors

We can also make comparisons of vendor by ordering quotations from different-different vendors and compare it for quality and prices. Then try for negotiate the quotation.

5. Development and Valuation of vendor on basis of quotation.

Vendor development is one of the popular techniques of strategic sourcing, which improves the value we receive from suppliers. Vendor development can be defined as any activity that buying firm undertakes to improve a supplier's performance and capabilities to meet the buying firms supply needs. Then evaluate the vendor as per requirement of quality and final quotation from vendor.

6. Inventory management of standard component.

Inventor or stock refers to the goods and material that a business holds for the ultimate purpose of resale or repair.

Inventory management is a science primarily about specifying the shape and placement of stocked goods. It is required at different locations within a facility or within many locations of a supply network to precede the regular and planned course of production and stock of materials.

7. In house machine shop layout by group technology

Group technology or GT is a manufacturing technique in which parts having similarities in geometry, manufacturing process and/or functions are manufactured in one location using a small number of machines or processes. GT is based on a general principle that many problems are similar and by grouping similar problems, a single solution can be found to a set of problems, thus saving time and effort.

(C) CHECK: - Calculation of business case and estimation of effect.

Calculation of business case and estimation of effect is the step for taking final decision for implementation of project, which discuss and results the effect of project on cost of raw material. In this we can make a comparison with past scenario of material order. Then you can calculate the effective saving through following steps.

1. Testing and coordination
2. Prioritization of methods and parts
3. Comparison with past scenario
4. Mapping with graph

(D) ACT: - Program implementation

System implementation generally benefits from high levels of user involvement and management support. User participation in the design and operation of information systems has several positive results. First, if users are heavily involved in systems design, they move opportunities to mould the system according to their priorities and business requirements, and more

opportunities to control the outcome. Second, they are more likely to react positively to the change process. Incorporating user knowledge and expertise leads to better solutions with following steps.

1. Organization of program management
2. Setting-out new Bill of Material
3. Implementation of cost reduction program
4. Assessment of efficiency

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