

Today's World: Lean Manufacturing Environments and Cost Management

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Abstract: This paper will help to identify the interrelationship factor of cost management in lean production system. Standard overhead costs are sum up of expected direct labor & machine hours. In-fact major problem of cost is not direct labor or material, but the cost allocation. Before direct labor was a huge expense for the organizations, but now usually all works is done by robots and electronics instruments, so direct labor cost is almost less than 8% of the total costs. But in opposite side overhead cost is higher than before because extensive usage of machineries. As shown in Table 1 and 2, any changes in a product mix can mislead and extra addition any other product costs, if direct labor saving took for product B, so product A will bear extra cost of overhead because of changes in product B, in-fact no changes in product A process. The most advanced level in the lean production is "Four Wall" Transfer to finished products and vendor receipts. The control requirements of four walls are: Continuous product flow, short lead time and few scrap.

Keywords: Cost Management, Lean Manufacturing, Schedule Performance, Value Added Activities, Poor Quality

1. Introduction

Lean manufacturing idea first time developed by the Mr. Henry Ford. On the assembly line of Model T Automobile, he used the idea of continuous flow. And in Model T Automobile manufacturing he set very tight standard of productions. And there he experienced really very little wastage. But ultimately problem was the process flexibility, because Henry Ford's manufacturing was not flexible and for the final products the manufacturing process did not accept change and modification easily. So again and again the assembly line was producing similar thing. In Henry Ford process was not on pull base, but he set level of products on the push base process. So in the result many finished goods (automobiles) inventories were piled-up. And he bears a big loose [1]. But all experts are agreed on that's "Henry Ford bear loose because of inflexibility of the system and it was the major big problem". Because many manufacturers used this idea of Henry Ford's but they did not face any major

issues.

In the time of industrial revolution the cost management was introduced. To understand the manufacturing cost of products, but problems faces when products was manufactured in one date (period) and then sell in the next (period) date so the first date (period) cost was carrying till the products was sold [2-4]. But after few decades costing came to be the part of accounting system. For Managing the operations & valuation of the inventory, cost data is also utilize. Cost Management task advanced to be

- a Valuation of Inventory
- b Performance measurements & analysis
- c Product Pricing & Costing

Traditional costing system why distort to the products' cost. Because it was using single, volume based cost driver. Usually this costing system allocate factory overhead on the base of usage of labor (direct) on the products. That's why it creates lots of problems and inaccuracy in the costs of products. Traditional system of costing problems, it was

following an assumption that's product cause cost. Every time whenever products manufactured, that's cost incurred (it's assumed). But for some direct cost this assumption is workable, but these assumptions become invalid when any actions (activity) do not directly work on the units of products. Cost directly allocate to the products in traditional system of costing, Rather than cost assign first to activities and after this transfers from activities to the units of product. So in the end of period information does not display over the cost report "why it's spend" [5].

For every department the traditional system of costing has some or one indirect costs. In the traditional system of costs is depend over one indirect cost driver usually, and usually indirect cost based on financial. In the costing system basically costs of total, number of products manufactured divided in the several products. So ultimately by using this traditional system of costs, one (or some time other) products bear all the costs.

In this research paper, interrelationship of Cost management Task in Lean Productions nowadays. Traditional system of cost data classification was suitable for costing accounting, but for strategic information and for managing the business may be misleading [6].

Market can control the price of products, for the costs understanding of the products are require understanding the existing product mix effects and also products mix changes effects. Actual cost of products we can calculate but it's become very difficult when many products are manufacturing at different rates and moving simultaneously among different products units, so by standard cost, products are controlled and measured.

2. Standard Costs

In the cost account standard costing are a vital part, usually it's associated with manufacturing concerns costs of direct labor, production overhead and direct material. Assigning actual cost for direct labor, direct material & production overhead to product, this means cost of goods sold (COGS) will start the amount of standard costs, not actual costs of the products, but manufacturer will pay the cost of actual as result of difference between actual cost and standard costs and it's called variances [7-9]. By the variances between standard cost and actual cost, management becomes aware for the upcoming forecast and they can find the reasons of variances. Usually standard costs are over than actual costs, but if its actual cost is more than standard costs, it's an alarming situation some times and management takes appropriate decision as per the situation requirement.

- A. Variances are unfavorable if the actual cost is more than standard costs. And if variance is unfavorable (and all other things are same or constant no change) so organization profit will less than planned profits.
- B. Variances are favorable if the actual cost is less than standard costs. And if variance is favorable (and all other things are same or constant no change) so organization profits will be more than planned profits.

If the visibility will be increase, means if data sharing will be fast and accounting systems can report variances fast, than organization's management can take immediate actions and sooner can find out the problems [9-10].

The cost of overhead (fixed) is depend on period of time. But the cost of overhead (variable), direct labor and material is totally depending of manufacturing units. As per the accounting rule cost of inventory are expense when the inventories are sold. Customer driven cost and products driven cost both can be controlled by activity-based system.

Standard overhead costs are covered by direct labor (expected) or hours of machine (expected). But the critical problems of standard cost are not the direct material or labor, but the allocation of the costs [11]. The direct labor was a big expense before, but now mostly work has been done by new electronic instruments so direct labor cost is not more than 8% of total cost. But overhead cost is higher because usage of extensive robots and machineries.

Product mix or any special changes with a product will mislead the cost of other products. As shown in Table 1 and 2, when the cost of indirect will be same and the direct labor savings took for product B, so product A will absorb extra cost of overhead in fact no change in the process of A product.

Table 1. Cost of Standard Preceding Direct Labor (Savings).

	A	B
Sales in Units (Annual)	3500	3500
Material Cost (Per Unit)	\$3.00	\$2.00
Direct Labor (Per Unit)	\$3.00	\$4.00
Overhead Cost (Fixed) = \$ 40000/ Year		
Direct Labor Cost (Estimated)		
A = 3500 X \$3.00 = 10500		
B = 3500 X \$4.00 = 14000		
Direct Labor Cost Total = \$ 24500		
Overhead Rate (absorption)		
	\$ 40000/24500 = 163 %	
Standard Overhead (unit calculation)		
Product A. \$3.00 X 163% = 4.89		
Product B. \$4.00 X 163% = 6.52		
Standard Cost of Products	A	B
Material	3	2
Overhead	4.89	6.52
Labor	3	4
Standard Cost Total	10.89	12.52

Table 2. Standard Cost After reducing the direct labor cost of Product "B" from 4 to 3.

Estimated Direct Labor Cost (Revised)		
A = 2,500 X \$3.00 = \$7500		
B = 2,500 X \$3.00 = \$7500		
Direct Labor Cost (Total) = \$15000		
Overhead Rate of Absorption (Revised)		
\$40000 / \$ 15000 = 267%		
Standard Unit Overhead Cost Calculation (Revised)		
Product A \$ 3.00 X 267% = 8.01		
Product B \$ 3.00 X 267% = 8.01		
Product Standard Cost	A	B
Material	\$3.00	\$2.00
Overhead	8.01	8.01
Labor	3.00	3.00
Standard Cost Total	\$14.01	\$13.01

3. Lean Standards

Lean (philosophy) is the method and in this systematic method used to reduce the elimination waste, increasing the quality, cost reduction and minimize the process (production) time [11-13]. As well as by the lean system management also doing value addition in directly, because one side if management are reducing waste by lean so it's also adding value in other perspective. Common lean tool which used are given below.

The problem of overhead allocation will be created, when the environment of manufacturing is based on lean manufacturing. The conversion cost based on direct material and Overhead.

$$\text{Conversion Costs} = \text{Direct Material} + \text{Overhead} \quad (1)$$

Conversion costs are distribution by the cycle time of every production unit. The concept of lean manufacturing need to standard (modified) for similar products, cellular production & flow through routings. One time if standards are created then it's easy to enhance it into previous (standard) system of job order costing. Activity based system need unraveling customer and product driven (costs). But modified standards systems have advantage over activity based system because they do not need separate product driven (costs) and customer driven (costs).

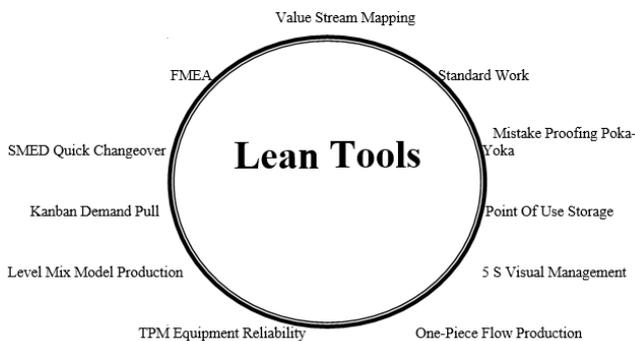


Figure 1. Value Stream Mapping.

4. Valuation of Inventory

The inventory valuation has all the cost of from day one till to ready product stage for sale. But administration and selling expenses are not included in inventory valuation. Usually companies use follow methods for inventory valuation First-in-First-out (FIFO), Last-in-First-Out (LIFO) and Weighted Average. Inventory valuation is very crucial because it direct effect in COGS (cost of goods sold) on the income statement. And income statement is the reflection of company financial position. The finished goods inventory valuation is depend on actual cost or standard costs. And if organization required being more strict control on inventory valuation so they also try to control over WIP (work in process). Material usually control by process costing or job order costing in manufacturing process [13-16]. Each order has a different and separate cost in job order costing. And

labor and direct material are used by operations, but overheads are depend on preset rate of standard cost to final products, positive and negative (variances) are move in to financial statement. If we look over process costing so it's comparatively easier then job order costing because each unit costs are divided by total cost for period of time by the units (number) produced. But if process costing has similar products continuous flow and little stable WIP (work in process).

5. Inventory Valuation in Lean Manufacturing

As in Table 3 Shown, the Lean production environment required standard (modified) and the process costing requirement are same as lean manufacturing. Lean production environment make same like process costing as much as possible. These able to use modified standards & conversion costs (time period) and collecting material (time period). Accumulate the costs, blanket order is possible to use. If the (WIP) work in process data is required means lead time in detailed WIP. At given checkpoints control is possible by back flushing. Job orders costing if recommended for the manufacturing (total process). Then modified standards will also helpful and can utilize to do the work more accurate and easily means with few complications.

Raw material & assumed work in process (value) is the value of the inventories. The raw material release is able to complete back flushing grounded on handover to finished products.

Table 3. Options of Costing.

	Costing of Process	Costing of Job Order	Costing of Lean Manufacturing
Cost Accumulation	Time Period	Shop Order	Shop Order / Time Period
Product	Related / similar	Un related/ Dissimilar	Related / Similar
Process	Repetitive Work Flow	Interrupted Flow	Repetitive Work Flow

“Four Walls” is the levels most advanced in lean inventory valuation are following.

- a Transfer to finished products
- b Receipts of Vendor

The four wall control requirements are following.

- a Product Flow – Continuously
- b Total Short lean time
- c Few rework & Scrap

6. Performance Measurements

Historically conventional standard cost (system) has completed as the job of inventory valuation in balance sheet. But it was not very much helpful for factory management. In the standard cost system the measurement tool is used are variance analysis. The standard costs and actual costs difference among usage of material, price of material,

overhead & labor.

The variance analysis in lean production environment some people consider it as an enemy. Because too much insist over price of material variance can be cause of poor quality and delivery issues [17]. As well as very much insist over labor variance can be the cause of lot sizes (large) and ignored schedules, poor quality and low attentions of labor in work.

7. Performance Measurements of Lean Manufacturing

The aim of lean production performance measurement is to increase the continuous flow of processing, maximization Projection of lead time and maximization of bottleneck output, eliminate non value added activities and costs, reduction the waste and also cost in noncritical production units. For example if you go to the very luxurious hotel and you give order of meal, but they surfed meal for you with error, so obviously you will not be happy and you will request from hotel manager to deduct this meal price from your bill. So ultimately your organizations customer also feel some time when are not happy and when your organization deliver goods with few error (unintentionally) so your customer become sad and they try to find another way or some time they find another organizations who can give them better service, so ultimately your organization lose the profitable customer, many experts are agree on that's "error is same like suicide". Conversion costs variance and material variances can be find out by variance analysis. As well as for every product the conversation variance costs can be calculated, if costing of job order required. If production area has process costing then conversion costs can be calculates by every production unit or by period. Between both checkpoints the conversion costs also can be calculate, if manufacturing area is using job order costing. There are many measurements are used in lean environment for example group productivity, lead time, costs of quality, reduction on in setup costs, inventory in days turns. But employee involvements in processes, education of employee, schedule performance, level of quality, service of customer are the major measurements, but these are non-financial measurements.

The latest approach to control the costs, to minimize the waste & non value added activities + costs is to identify the causes and activities which boost to costs. And usually the costs drivers are possible to control by the following factors.

- a Vendor
- b Locations of storage
- c Schedule Changes
- d Reworked Units/ Defects
- e Inspectors
- f Transportation
- g Over processing

8. Lean Cost Management Implementation

The detailed information is required for related reporting

requirements, analysis of variance and standard costs (traditional). But the simple is lean standard reporting related requirements and analysis of variance. Proceeding to lean cost management you should know [18]. That's your production process is depend on required concepts, review the operating practices and define the status of your current system, define the alternative of cost management, cost implication review, test models, cost management approaches – agreed documents. It will not converting to your cost system if you convert the manufacturing system but can cause of extra costs because of overloads (paperwork), for example if before was lot size 21 days and now is only 1 day then transaction need for purchase order control will be high approximately by 15 factor.

9. Conclusion

The variances analysis in lean manufacturing some experts consider it is an enemy, because too much insist over material price some time can be the cause of poor quality and delivery problems can occur frequently. And also too much reduction in direct labor variance can lead to the large lot sizes and less attention of labor in the work and ignored schedules. The basic objective of lean manufacturing is to increase the continuous flow of processing, maximization of bottle neck output, reduction to the waste and eliminate non-value added activities from the whole manufacturing process. In the lean manufacturing, many measurements are used commonly lead time, cost of quality, reduction in setup costs, inventory in days turn. But education of employee, schedule performance, employee involvements in process, level of quality and service of customer are the very key measurements, but these all are non-financial measurements. The new approach in lean manufacturing to minimize the cost and wastage + non value added activities are to identify the factors and causes which boost to the costs. And the major factors of extra costs and non-value added activates are; vendor, location of storage, schedule changes, inspectors and reworked units. These are the major factors which usually boost to the costs.

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