

**INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH
TECHNOLOGY****IMPLEMENTATION OF PERFORMANCE IMPROVEMENT TECHNIQUES – A
INDUSTRIAL CASE STUDY****Prof S.W. Sajjanwar^{*1} & Prof Chetan Choudhari²**^{*1&2}Asst. Professor, Jhulelal Institute of Technology, Nagpur

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ABSTRACT

In the present scenario of the globalization, where every company wants to be a world class manufacturer or to improve its organizational performance, it is quite essential to adopt proper improvement techniques which suits it. Every organization needs to be more productive and efficient in order to survive in the market. In the era of the globalization, the requirements of manufacturing or services firms are needs innovative approaches and ideas, replacing the conventional ones, need to improve quality, reducing cost, proper utilization of the resources, and increase in productivity, reduction in all types of waste etc. Depending on the various factors, how to choose the best for an Organization? What methodology or system fits the particular type of organization? Many process improvement methodologies appear to conflict with each other or at least one down play the contribution of other methodologies. As Title indicates, an attempt is made to implement some methodologies in various sections. The case study has been conducted in one of the reputed manufacturing company of india. Due to variety of products, a huge scope of improvement can be made in present system. Efforts have been taken in this direction, for the selection of project. The main objective of this project is to improve production capacity, to minimize inventory, cost, spacspace utilization, Labour cost and rejection iand defects by implementing performance imp improvement techniques like single piece flow, line balancing etc.

KEYWORDS: Phase change materials, Counter flow Heat exchanger, Effectiveness, storage system.**I. INTRODUCTION**

Since the early 1990s, globalization has driven business towards more rapid change as competition became 'border-less'[1]. In an attempt to manage this change, organizations have pursued formalized change programmers. The most popular initiatives employed by manufacturing organizations as organizational performance improvement techniques [2].

Now day's shorter products life cycle and increased demand for customization make it difficult to produce some products or traditional production lines. Often the best that can be done is to produce them in batch flow system that has been improved through the incorporation of line flow principals. This is one piece flow manufacturing. Traditional cells with irregular material flows are replaced by U-shape production lines within which flow is regular and paced by a cycle time and between which flow is controlled by pull signals[3]. This piece of research work addresses the selected number of the quality improvement programs. Amongst the montage of tools and philosophies it is essential to find the nectar of methodologies, their comparison or similarities with other powerful once. The section II of research paper highlights literature review of research on various methodologies. Section III tries to explain the some of the drawbacks of current system. Section IV mainly focuses on the methodologies such as single piece flow with their analysis. Section V gives the comparative study of analysis, whereas the section VI and VII gives the result discussion and conclusion.

II. LITERATURE

Single piece flow can be described as an ideal state of efficient operations, where batch sizes and lot production are replaced by working on one product at a time [3]. While not practical for operations which very low processing times and correspondingly high change-over times (both values defined by taken time), it is nevertheless a Lean Manufacturing goal to achieve single piece flow in every operation possible.

Achieving one-piece flow requires the elimination of waste. We remind the reader of the seven wastes [4, 5]:

Types of waste	Causes
Overproduction	Producing more product than needed
Inventory	Any supply in excess to produce product
Labor	Excess man power for single operation
Motion	Movement of people or machine which does not add value.
Transportation	Any material movement that does not directly support value added operation.
Defects	Making defective parts.
Extra processing	Any process that does not add value to product.

As a company reduces these wastes and strives for single piece flow, many other benefits follow. Some of these benefits include (i) improved quality and fewer defects (ii) reduced inventory (iii) less space required, (iv) enhancement of overall manufacturing flexibility, (v) makes the identification of future kaizens simpler, (vi) ensures a safer work environment, (vii) improves employee morale. We will review each of these benefits in more detail:

1. Improved quality and fewer defects: When batches and production is eliminated, there is less opportunity to manufacture defects. Since the batch size will essentially be one, there will not be mountains of inventory to count, move, store and eventually pick. Furthermore, single piece flow ensures that if there is a quality problem with a particular part, we are sure that the defect has affected just one part. We do not need to dedicate hours isolating and testing the parts in the production run to determine if they meet quality standards.
Of course, if a defect is caught in a single piece flow environment, this should not mean that we do not take the appropriate corrective actions to ensure that the problem is not ongoing as it may reoccur. At a high level, these steps include determining if standard work was followed and if so, what changes need to be made to the standard work document to ensure that the problem will never resurface again. Kaizen!
2. Reduced Inventory: Implementing single piece flow will require each operation to only produce what is needed by the next operation (the surgeon). When followed properly, the process will eliminate any opportunity to build ahead. Consequently, inventories will not be allowed to build up.
3. Requires less space: As inventory levels are reduced (see above), less space and manpower will be required to manage (receive, count, stock, store, pick and deliver) them. In addition, single piece flow usually requires creating manufacturing cells that squeeze machines as close together as possible so that a single operator can oversee many machines with the least amount of walking motion [3].
4. Enhances overall manufacturing flexibility: We know from our value steam maps that the less inventory in a value steam, the shorter the lead-time will be from customer order to product delivery. In a single piece flow environment, since we operate with less inventory, lead-times will also drop which will give us more time to react to customer orders (unless we pass off the lead-time gains to the customer).
5. Makes identifying future kaizens simpler: We have already discussed that in a single piece flow environment, defects and WIP inventories fall. As a result of this reduction, it will become easier to see production problems. After all, if a particular process can not keep up, if defective inventories build up next to a particular machine or if overall customer demand can not be met, this becomes obvious almost the minute it happens. These problems will dictate where to focus the next improvement activity.

Excel Control linkage Pvt. Ltd. was established in 1994 as an authorized assembler of cables and control levers under license from Tuthill Controls Group. Mechanical cables are a mechanical means of transmitting effort from one position to another by linear movement. They can be employed as a simple mechanical linkage or in conjunction with a control head or a lever control to make a complete remote control system. Some of the

clients of this company is Bharat Earth Movers Ltd. (BEML), Eicher Motors Ltd., Escorts Construction Equipment Ltd., Hindustan Motors Ltd ,L & T Case Equipment Ltd. , Mahindra & Mahindra Ltd. Etc.

III. SOME DRAWBACKS IN CURRENT SYSTEM

In the past 50 years, people have struggled to develop approaches to good management practices that would help companies become more profitable. Unfortunately, over the years a number of factors generally caused every one of these initiatives to fail. The various factor identified as possible reasons for the failure of the approaches to meet the expectations are cultural readiness, knowledge sharing capability and relationship balancing, learning capacity, performance management [6] and ineffective prioritization of the system. Here are some of the lacunas where current system launches complaints such as lack of consideration for human factors, lack of strategic perspective, relative inability to cope with variability, improper material handling, lack of planning, excessive labor for repetitive work etc. [8].The various methodologies used to recover these problems are Single piece flow, Just in time, Kanban, SMED, Kaizen etc. Amongst all methodology we are focusing on the single piece flow techniques to sort out the above problems.

IV. ANALYSIS OF CURRENT APPROACHES

The overall effects of the production system clearly improves production performance but the improvements is limited to certain areas.Table no.1-A provides a breaf information about the production capacity of the present system which is improved by implementing single piece flow technique and the improved results are noted in the Table no.A1.The comparison of cost associates before and after implementation is discussed in point B.The Table no.2-C and C1shows the reduction in inventory lies in shop floor.Table no.3 D and D1 shows the difference between the number of labors required for the operations.

Table No.1: A) Production Capacity

Month	Sep.	Oct.	Nov.	Dec.	Jan.
Monthly customer order.	8000	8500	8000	8400	8500
Monthly production	6500	6600	6500	6700	6600
Qty. Balance to produce.	1500	1900	1500	1700	1900
Per day production (NO/DAY)	250	254	250	258	254

Current status reveals that company produces 250 no. of cable in one shift. And our goal is to produce 320-330 cables/shift. To achive this we design cell in such a way that it can save time by 20-30 sec for making one cable .by making single line flow of cable to reduce flow of cable from 4 station to 1 station.(This can save approximately 28 sec per cable , which means approximately adding 80 cable in a shift)

Initially = 8hrx 60min x60sec= 28800 sec/250 cable= 115 sec for one cable

Plan = 8 x60x60= 28800sec/330cable = 87 sec for one cable

Saving in one cable is 28 sec.

Because of single line flow it is very easy to decide production target which is very difficult in batch production.As well as installing automatic outer and inner cutting machine, which require one manpower instead of two. This will save cost of one manpower in a day.Cost implication of automatic outer cutting machine is Rs. 600000

Cost of automatic outer cutting machine can be covered in 6 month. (Rs 60000/(200(cost of one manpower) x 26 days)= 11.5 which is approximate 12month

Following improved results obtained after implementation of Single piece flow.

Table no. A1) production capacity- after implementation of spf

Month	March	April	May	June	July
Monthly customer order.	8400	8300	8600	8400	8500
Monthly production	8300	8400	8300	8300	8300
Qty. Balance to produce.	100	100	300	100	100
Per day production (NO/ DAY)	320	324	320	320	324
Cost in Rs	30Sep	31Oct	30Nov	31Dec	31Jan
Inner Outer	201000	302000	352000	314000	213000
End finished cost	48000	69800	78000	58600	49100
Semi finished cost	22000	40000	65800	32000	45000
Total cost	27100	411800	495800	404600	307100

B) COST ASSOCIATE (250 CABLE/DAY)

- A) Man power cost 10 man/shift=200*10 Rs.2000/shift
- B) Machine cost 50,0000/(2year*12month*26days) Rs. 802/shift
- C) Overhead cost = Rs.1538/ Shift (standard company cost)
- D) Running cost of automatic outer cutting machine - 100.

$$\text{Total Cost} = (A + B + C)/250 \text{ (production per day)}$$

$$=17.36$$

Present cable cost is Rs 18. This includes man power cost, machine cost and overhead cost. We targeted benchmark of Rs 15 for one cable by installing automatic outer and inner cutting machine, which require only one manpower. This will save cost of one manpower in a day. So, Automatic machine cost per shift is = 60000/(2x12x26)= Rs 100 / shift Now machine cost will increase by Rs. 100 new machine cost is Rs. 902. Running, maintenance and electricity cost of automatic outer cutting machine is Rs. 150

$$\text{Total Cost} = (A+B+C+D)/330 \text{ (production per day)}$$

$$= (1800+902+1538+ 150)/ 320$$

$$=13.71 \text{ which is approximately Rs. 14.}$$

New production cost per cable is Rs which is lower than initial cost per cable Rs 18

Table No.3: C) Inventory Lies In Shop Floor

Cost in Rs.	30March	31April	30May	June	July
Inner Outer	223000	204000	205000	203000	218000
End finished cost	54800	46800	37800	36600	48600
Semi finished cost	8000	12800	14200	13600	7000
Total cost	285800	263600	257000	253200	273600

Current inventory cost is between Rs. 2.7 lakhs to Rs. 5 lakhs. This is 1.5- 3% of total turnover. (Turnover is 20 crore. (1.7 crore/ month) Out of 1.7 crore the raw material cost for one month is approx. 30% of sale value. The raw material value is Rs 5100000. So, Par day raw material consumption is = $5100000/26 = \text{Rs } 196000$. We targeted that cost on shop floor inventory should not more than one day production capacity, by proper planning and insuring all parts of BOM should be ready before issue of job card for production. This will help to reduce inventory in shop floor. And not executing next production order until first order finished and packed.

Table no. C1) inventory lies in shop floor (after implementation of spf)

Because of increase in production rate of cable from 250 to 320 in a day. A sale is also increase from 1.7 crore to 2.2 crore. This increase in sale which was not able to achieve in old production process.

(One cable cost is approx. Rs2600). Now production is increase from 250 to 320 numbers. Per day production is = $2600 \times 320 = \text{Rs } 832000$. This is total cost of cable, but raw material required is near about 30 percent as specified initially, therefore inventory for one day is approximately Rs. 250000. After doing modification in process, we were near to result for inventory is Rs. 250000 and last achieved result is Rs. 257000. Result is more satisfactory

Table no. 3: d) labor utilization

Months	Sep.	Oct.	Nov.	Dec.	Jan.
Monthly production	6500	6600	6500	6700	6600
Per day production	250	253	250	257	254
No of employee	10	11	10	12	10
Man power/shift	25	23	25	21	26

Current Cable production/manpower/shift average is 24 cables in one shift by one manpower. But monthly cable requirement is about 8500 no per month. For this we require 32 Cables productions in one shift by one manpower.

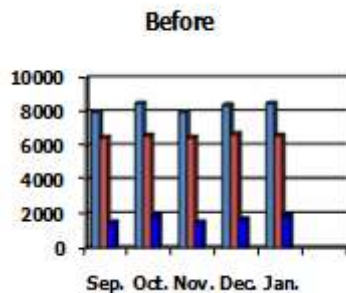
Table no. D1) labor utilization (after implementation of spf)

Months	March	April.	May
Monthly production	8300	8400	8300
Per day production	320	324	320

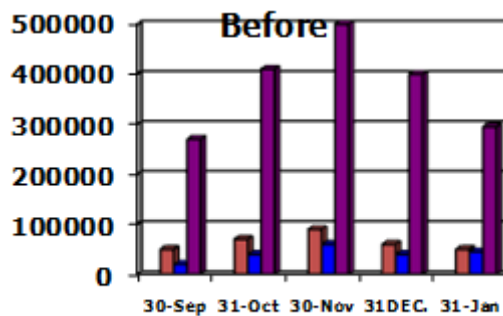
No of employee	9	10	9	
Man power/shift	35	32	35	

Production rate is increase from 250- 320 cables in a day by designing a cell in such a way that it saved time by 20-30 sec for making one cable .reduced movement of cable from 4station to 1 station.

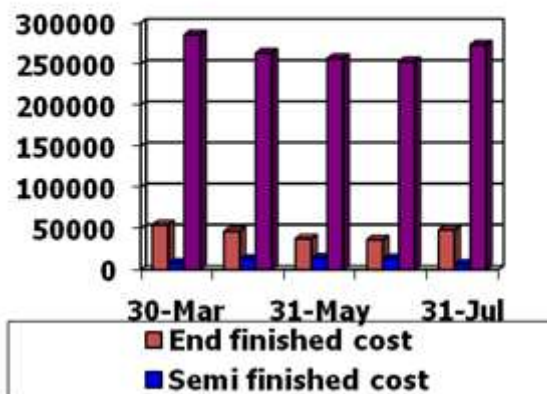
The graphical representation shows that before implementing single piece flow, it was not possible to satisfy the monthly customer order as per requirement, hence single piece flow helps to improve the production capacity of the present system



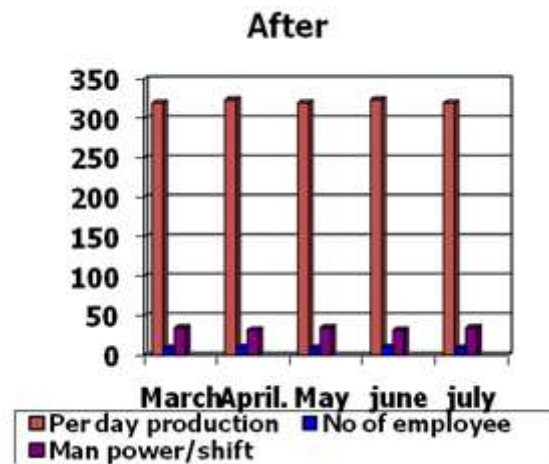
Graph No.1: Production capacity



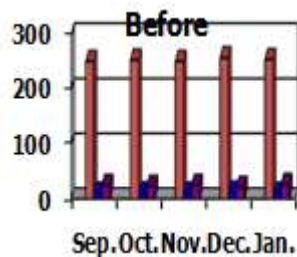
After



Graph No.2: Inventory



Graph No.3: Labor Utilization



V. CONCLUSION

Productivity improvement

1. Inventory reduction
2. Labor utilization
3. Effective space utilization
4. Cost saving
5. In this paper we have tried to implement single piece flow

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