A Case Study on Optimization in Total Operation Time by Using Maynard Operation Sequence Technique

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Abstract: This case study seeks to analyse the internal work flow in an Assembly line of the manufacturing unit, An objective of the study is to carry out MOST for the product, to reduce or eliminate the idle and / or down time of operations in addition to improvements of the current working methods. The main objective of this study is to reduce the operation time against the existing operation time. Maynard Operation Sequence Technique (MOST) study through capture the workflow activities using systematic and descriptive workflow data block for the value adding, value engineering and methods engineering analysis. Thus through the process redesign and process flow analysis, material handling and work flow are improved. Consequently, it has been possible to reduce the production cycle time to cater the higher level of demand with shorter takt time maintaining the current level of manpower. This research shows benefit associated with the implementation of the lean program. This case study shows a manufacturing industry case study.

Keywords*: Operation time, Idle time, MOST, Productivity*

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1. INTRODUCTION

Lean manufacturing is a philosophy derived from the Toyota Production System (TPS). TPS is base on waste elimination. Which beliefs in customer satisfaction through continuous improvement (Womack et al. 1990, 1996)[2].The research study was carried out in a manufacturing industry. The objective is to Optimization of Total operation time for assembly line. For this, to know Operation time losses or Ideal time necessary.

- To explore the Existing operation time by collecting the data from the Assembly line.
- To identify the problems faced by the companyregarding Ideal time and Utilize the time.
- To propose Maynard Operation Sequence Technique which can Optimize total operation time, Increase the utilized time and Reduce ideal time.

2. MOSTMETHODOLOGY

MOST can be applied to any type of work for which a method can be defined and described. It was designed to be much faster than other work quantification techniques because of its simpler structure. It groups together into predefined sequences the basic motions that frequently occur. MOST uses a structured approach, it develops structured data, it is a progressive technique. The technique is thoroughly proven, highly respected and used around the world. MOST is a powerful analytical tool to measure every minute spent on a task.

Generally, 9 steps are used for applying basic MOST methods such as:

1. Selection of Job
2. Select the Operator for study
3. Record details of activity and conditions of Work
4. Observation of each parameter Phases
5. Parameter Indexing
6. Addition of all the parameter Index values of activity
7. Convert the total of Index values into TMU
8. Convert the TMU value in corresponding time (Hours)
9. Convert the time from hour into Minutes

Thus, brief description of why MOST is important for an organization includes: accurate work standard, capacity analysis and manpower planning, workplace design and job activity analysis for re-organization and allocation for work balancing, cost estimating for existing and new processes.
Implementation of MOST technique for production and assembling in automation sector
The main Process Steps of Carrying Out Work Measurement are as follows :

1. Obtain and record all available information about the job, the worker and the surrounding conditions likely to affect the execution of the work.
2. Record the complete description of the method, break it down into elements.
3. Measure with a stopwatch and record the time taken by the worker to perform each element of the operation.
4. Assess the rating of the worker.

5. Extend the observed time to "basic time" by factorizing the actual time (observed time) by the assessed rating.
6. Determine the allowances (e.g. personal allowances, relaxation allowances, allowances for the working conditions etc.) to be made over and above the "basic time" for the operation.
7. Apply those allowances on the "basic time".

Thus, determine the "standard time" for the operation.

3. GENERAL OVERVIEW OF LITERATURE REVIEW

Tarun Kumar Yadav (2)use methodology starts from a suitable assembly system selection and there after decides suitable cycle times, parallel workstation requirements, and parallel line implementation for the type of assembly system being selected. They suggested Work measurement is a systematic procedure for the analysis of work and determination of time requiredperforming key tasks in processes, it is typically based on time standards for manual tasks. A. N. M. Karim, H. M. Emrul Kays, A. K. M. N. Amin and M. H. Hasan(3) show sustain in business under the current global situation of fierce competition a needs to reduce or eliminate the idle and/or down time of operations in addition to improvement of the current working methods.They studied was conducted through application of Maynard Operation Sequence Technique (MOST) in the rear window assembly section to capture the workflow activities using systematic and descriptive workflow data block for the value adding, value engineering and methods engineering analysis. Consequently, they has been possible to reduce the production cycle time to cater the higher level of demand with shorter takt time maintaining the current level of manpower.Mehvish Jamil, Manisha Gupta, Abhishek Saxena and Vivek Agnihotri (1) reported highlights a methodology developed forstandardization in the process activities by using Maynard's Operation Sequence Technique and minimization of fatigue among the workers in manufacturing line by using Ergonomics.Thus, this research use they like Ergonomics as the work study and Maynard Operation Sequence Technique (MOST) as the time study method. Yoshihiro Mizutania, Takayuki Sakai b and Hiroyuki Hamadaa (4) show they delineate the method that conducts production in one-twentieth (1/20) of usual lead time, which is revolutionary short, is able to respond to the needs of the users concerning delivery, among QCD (quality, cost and delivery). Peter Stelth (MSc)and Professor Guy Le Roy (PhD) (7) reported CPM, a technique for analyzing projects by determining the longest sequence of tasks through a project network Organizations today are also increasingly using virtual project management teams. Therefore, CPM and CCM process are even more complicated than in the past. They need to increase profits and revenues has forced many establishments to try to optimize their resources.

4. CASE STUDY

Terminology used:-

Normal time- Normal time is the time required by a qualified worker, working at a pace that is ordinarily used by workers to complete a task by following a prescribed method and without interruptions. The result of a MOST analysis is normal time.

Actual time- It is time taken by the operator to do the work.

Idle time- It is time period in which the operator is idle and has no work to do.

Station(#)- It is an area where a particular part is assembled.

The practical analysis of the case study was done by applying the technique on the production lines at Company. It was applied on the assembly line which involved a large number of operators and data was taken and properly analyzed.

Below is the tabular representation of normal vs actual time.

Sr. No.	Station No.	Actual Time (sec)	Normal Time (sec)
1	#101	619	353.9
2	#102	341	300.6
3	#103	734	507.6
4	#104	896	347.4
5	#105	355	333.6
6	#106	550	221.4

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7	#107	653	274
8	#108	700	318.5
9 (a)	#109	813	171.5
9 (b)	#110	811	172.2
10	#111	795	88.08
11	#112	747	309.1
12	#113	180	63.36
13	#114	Nil	Nil
14	#115	533	233.6
15	#116	95	62.28

Table.1 Actual Time Vs Normal Time Calculation

Below this graph gives us on overview of normal time vs actual time for the full assembly line.

	Actual Time (Sec.)	Normal Time (Sec.)
Total Time	8822	3757.12

Table.2 Total time calculation

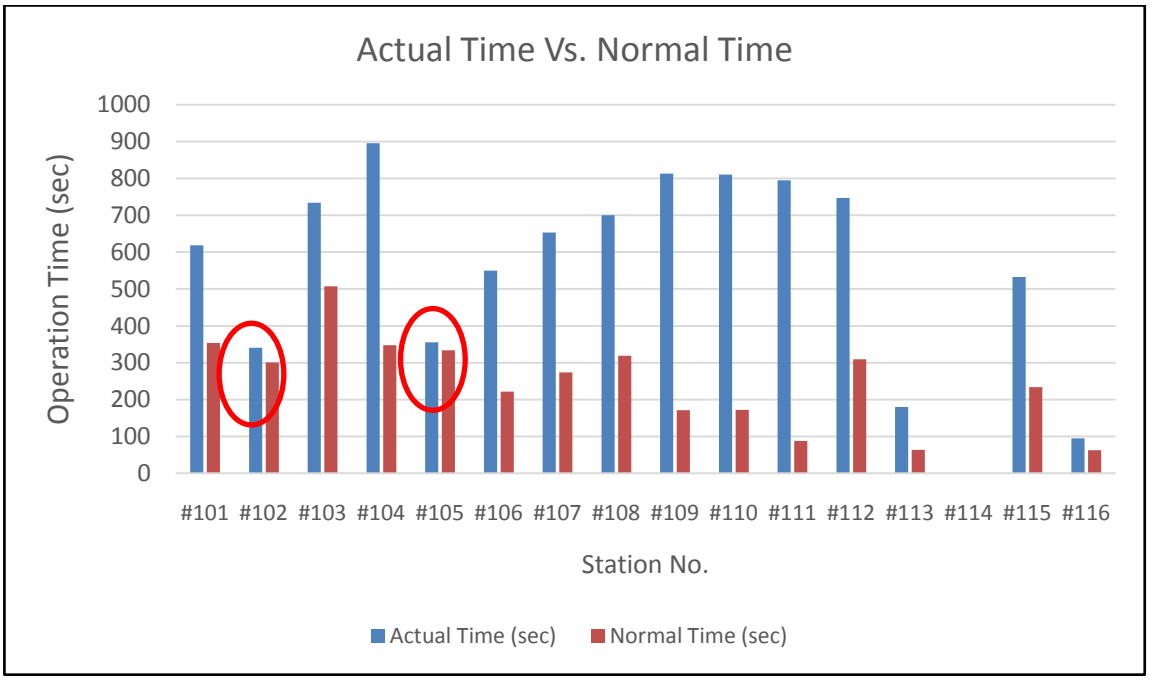

Fig.1 Graphical representation of assembly line

Now some of the stations are discussed where a considerable amount of time effort was saved and productivity was increased.

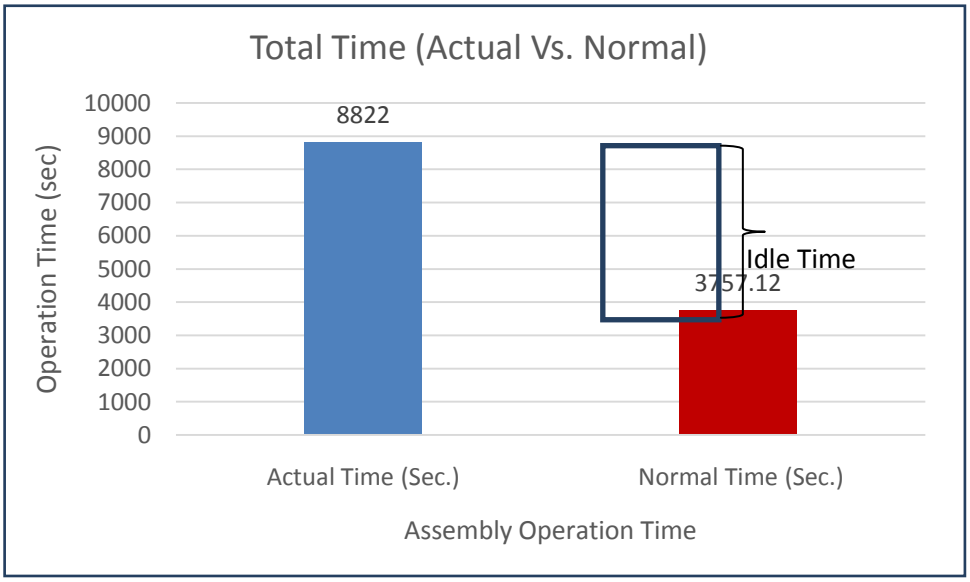

Fig.2 Graph B/W Actual Total time and Normal Total time

•Lean implementation through kaizen and development of MOST:-

Kaizen shows a lead role in improving the productivity and quality of the products. Kaizen is a strategy to include concepts, systems, and tools within the bigger picture of leadership involving people and their culture all driven by the customer. TheBrainstorming analysis of MOST revealed the following major Idle time as operators movement and their skill, poor process, delay in component transfer and transfer time for which the proposed lean solutions are suggested as follows. Table 2 and Figures 2 and 3.

Sr. No.	Station No.	Actual Time (sec)	Improved Time (sec)
1	#101	619	564
2	#102	341	317
3	#103	734	689
4	#104	896	810
5	#105	355	345
6	#106	550	503
7	#107	653	610
8	#108	700	644
9 (a)	#109	813	759
9 (b)	#110	811	746
10	#111	795	732
11	#112	747	696

12	#113	180	180
13	#114	0	0
14	#115	533	495
15	#116	95	89

Table.3 Actual Time Vs Improved Time Calculation

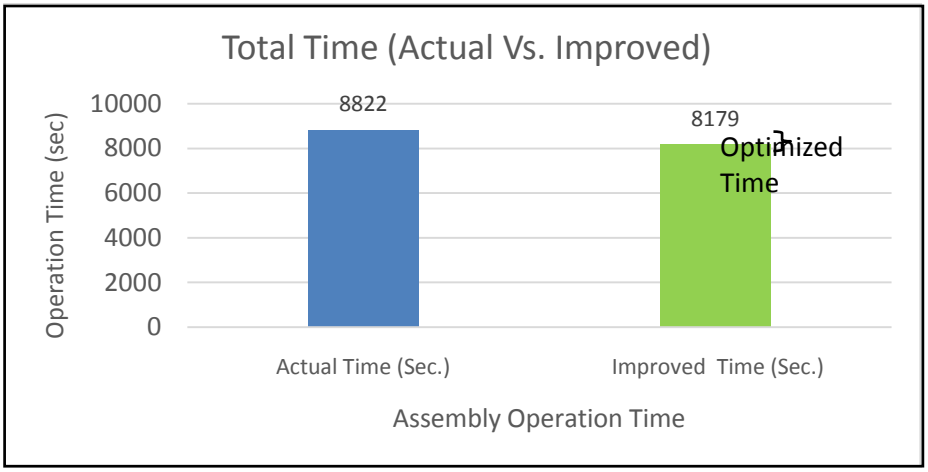

Fig.3 Graph B/W Actual Total time and Improved Total time

As seen from the graph an idle time of 643 sec was eliminated and a manpower of 1 people was saved. The Idle time was eliminated by this MOST technique. The MOST technique was applied on all assembly stations eliminating idle time but these were some of the major stations where tremendous results were achieved.

5. CONCLUSION

A lot of manpower,time and effort was saved and productivity was increased,a total manpower of 1 is saved per shift by implementation of layout of door line through the salary of 1 operator Rs. 1.20 lacs could be saved annually by considering the above analysis in the case study mentioned in this paper.Thus with the help of MOST method it is possible to achieved major times reduction in the manufacturing of the product in terms of increase in productivity up to 15.32% through the kitting improvement, kaizen improvement, 5S improvemment, oprator skill improvement training then all through also increase monthly average product manufacturing 25 to 29 and saved Rs. 4 lacs per shift in terms of manufacturing improvement and same profit per shift.

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