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Development of Low-Cost Lean Analysis Tool for Motion Study

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Abstract:
A new technology and cost reduction process is useful in the lives of others, which will contribute to the industrial community. This paper presents the development of low-cost lean analysis tool beneficial for small and medium scale industries. Austerity production or austerity formation is simply called "lean", a procedure for reducing expenditures over the amount of expenditure spent on other resources, except for the purpose of the creation of the customers. Lean Processes is a single integrated solution to measure, identify and eliminate process waste, to improve operation efficiency, reduce cost and document processes. Lean Processes is a complete video-based measurement solution for those involved in Continuous Improvement, Lean Manufacturing, Industrial, Manufacturing and Process Engineering, Ergonomics, Kaizen and 5S initiatives. Video Time and Motion enables accurate documentation of any task while simultaneously isolating the non-value-added work content. In this project, Timer Pro results are compared with the Excel Macro lean analysis tool – Reduce Costs and Document Processes.

Key Word*: Lean Manufacturing;Continuous Improvement; Motion Study; Ergonomics.*

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I. Introduction

A lean organization understands customer value and focuses its key processes for its increase as an ongoing process. The ultimate goal is to provide perfect value to the customer through a perfect value creation process that has zero waste. For many, lean refers to the set of tools that assist in the identification and steady elimination of waste. With elimination of waste, quality improves while production time and cost are reduced. The core idea is to maximize customer value while minimizing waste. In Simple language, lean means creation of more value for customers with fewer resources. A lean organization understands customer value and focuses its key processes and its continuous enhancement. Elimination of waste along entire value streams, instead of at isolated points, creates processes that need less human effort, less space, less capital, and less time to make products and services at far less costs and with much fewer defects, compared with traditional business systems.

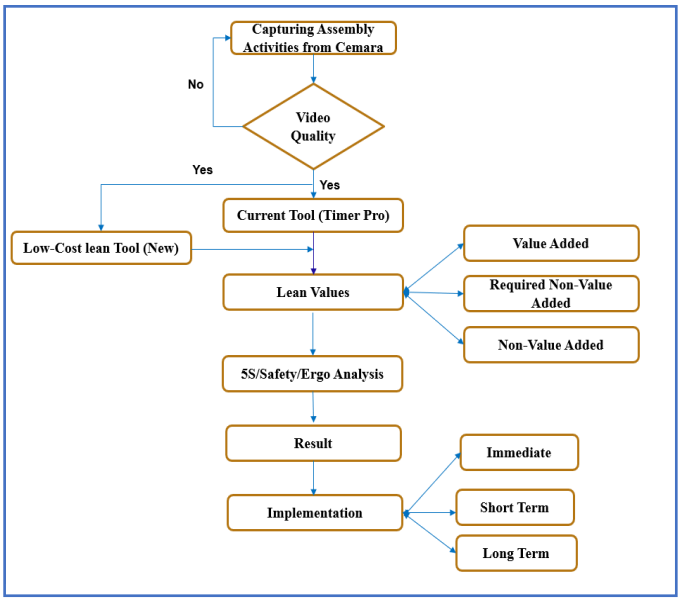

Fig. 1 Methodology of analysis the lean tool processes

Companies have the ability to respond to changing customer desires with high variety, high quality, low cost, and with very fast throughput times. Also, information management becomes much simpler and more accurate. In this paper we present a low-cost lean analysis tool for medium and small-scale industries flexible automation. Low-Cost lean tool is one of the most dynamic methodologies that always looks for improvements in all business processes. In Lean, all business processes are critically examined for the purpose of identifying waste and value-added activities and taking steps to eliminate them. Fig. 1 shows the methodology of analysis the lean tool processes.

II. Lean Tool Development Process and Lean Analysis

The focus is on reducing waste in all business processes. The result is reduction in cost and lead-time and an increase in quality. In this, project explores the principle of Lean analysis as applied to project management processes. This will be an introduction to the advantages of applying Lean tools and techniques to Projects.

Lean tool Processes are as follows,

Value Added

These activities are those which adds value to a business and Customer profit. Value Added activities help in converting a product from a state of raw material to a finished product in the least possible time, at minimum cost.

Fig. 2 illustrates the aims at completing a business activity correctly the very first time and helping the business to deliver the product.

Fig. 2 Flow chart in Value Added

Non-Value Added

Fig. 3 illustrates activities that do not add any value to the product or service but are an inherent part of the process. Customers are not willing to pay for such services. These activities prove to be a burden on the organization and affect its efficiency. Valuable resources in the organization are engaged in completing these activities despite the such activity is slowing down the progress of the organization.

Fig. 3 Flow chart in Non-Value Added

There are several examples of Non-Value-Added activities found commonly among different organizations and Some of the most commonly found are:

1. Process steps which are not needed.
2. Unnecessary movement of goods or resources within or outside the organization.
3. Unnecessary paper work within or in between departments which is not required.
4. Rework due to defects found in products.

Required Non-Value Added:

Activities not creating any value, but which cannot be eliminated based on current state of technology or thinking as shown in fig. 4.
Necessary (due to non-robustness of process, currently required; current risk tolerance).

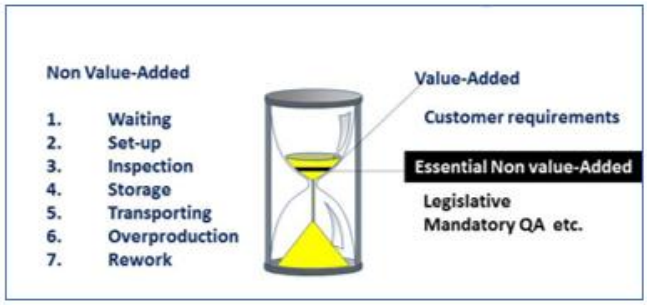

Fig. 4 Flow chart in Value Added

III. Result

Low-Cost LEAN tool development processes:

Low-Cost lean tool simply called as DELTA-T. The DELTA-T processes consider categories mentioned below,

- Video Based Time and Motion Study.
- Video Based Lean, Kaizen and 5S analysis.
- Ergo and Safety -Analysis

The following Fig. 5 shows the DELTA-T Log-in Page. In this page password protecting an entire workbook of an Excel macro file has been indicated.

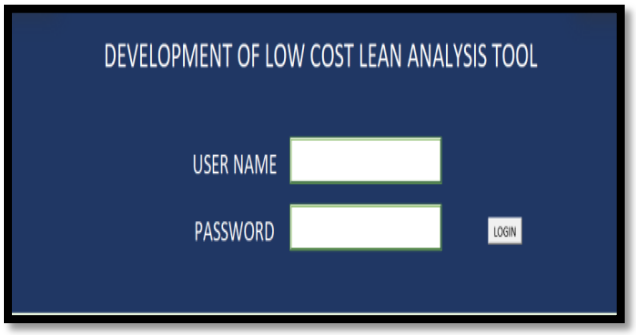

Fig. 5 DELTA-T Log-in Page

Fig. 6 shows the DELTA-T home Page. This home page contains Video records, identify value added, non-value added and Required non value added, lean,5S, process improvement opportunities. Eliminate manual activities and developed automation for creating Pie Chart, Bar chart in this tool. DELTA-T has additional option to Export report after studied assembly activities.

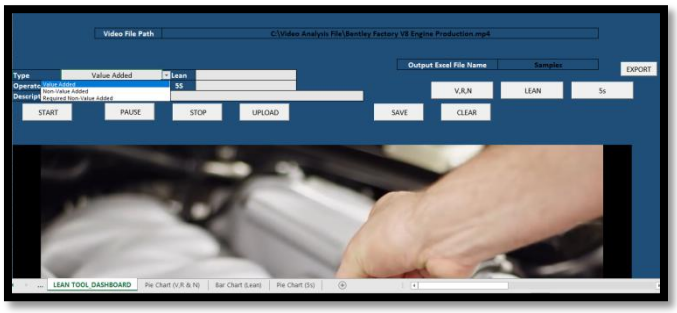

Fig. 6 DELTA-T Home Page

Fig. 7shows the DELTA-T Input missing Pop-Up message. This displays of a message or information asks user for input.

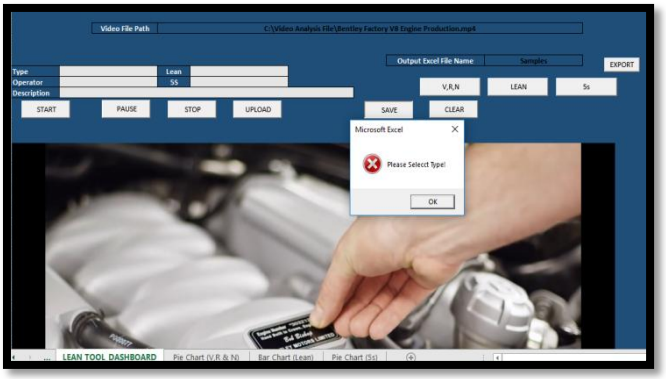

Fig. 7 DELTA-T Pop-Up Message

Lean Analysis:

A. Analysis-1

The main objective of this analysis is optimizing the Piston and connecting rod's assembly process and identifying Values and Lean using with TELTA-T.
Part information, Cycle time and Operator information

Part: Piston-Con Rod Sub Assembly
Process: Assembly
Video Time: 20 Minutes
No of Operators :1

Here is a list of deliverables after a study of Piston and Connecting rod sub-assemblies,

1) Time elapse Video – All operations – 20 minutes report
2) Value Added activities
3) Non-Value-Added activities
4) Required Non- Value-Added activities

The Piston-Conn Rod assembly activity has shown in fig. 8

Output of Piston and Connecting rod elapsed time for each values and percentage described in the following table 1.

As per the studies Value added: 8 Minutes (40%)
Required Non-Valueadded: 7 Minutes (35%)
Non-Valueadded 5Minutes (25%)

Fig. 8 Piston-Con Rod Assemble

TABLE I
piston and conn-rod assembly

Piston & Con Rod Assembly									
Day & Shift	No.Of Operators	V	R	N	Break	V%	R%	N%	Break
Day1, Shift 1	1	8	7	5	0	40%	35%	25%	0

Fig. 9 shows the Piston and Connecting rod Values output after analyzed assembly process activities.

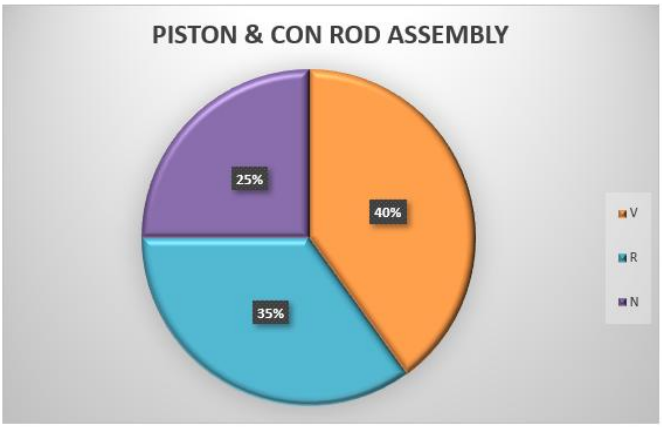

Fig. 9 Piston-Con Rod Assembly – Values Pie Chart

Output of Piston and Connecting Rod assembly elapsed time for each value-added activity are shown in fig. 10.

Fig. 10 Piston-Con Rod Assembly – Value Added Activity

Output of Piston and Connecting Rod assembly elapsed time for each Non value-addedactivity are shown in fig. 11.

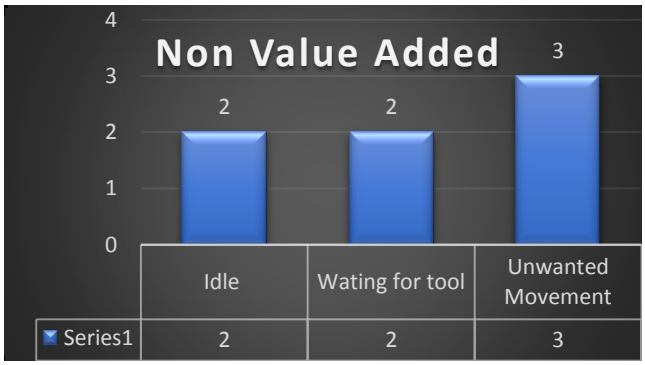

Fig. 11 Piston-Con Rod Assembly – Non-Value-Added Activity

Output of Piston and Connecting Rod assembly elapsed time for each Required Non value-added activities are shown in fig. 12

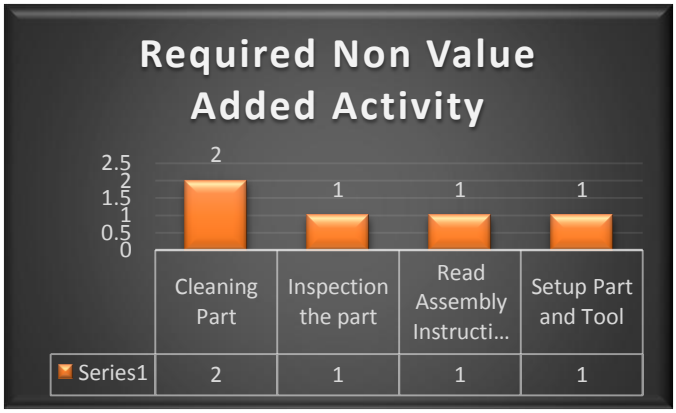

Fig. 12 Piston-Con Rod Assembly – RNVA Activity

IV. Discussion

Observation:

The following activities were observed during the assembly activities on Piston Connecting rod.

1) Elimination of Unwanted movement.
2) Avoidance of discussing to other operators.
3) Need for additional tool for the assembly Zone.

V. Conclusion

In this paper we have introduced development of low-cost tool and lean implementation emphasizes on the importance of optimizing work flow through strategic operational procedures while minimizing waste and being adaptable. Flexibility is required to allow production leveling using tools DELTA-T. Lean aims to enhance productivity enough simplification of the operational structure to understand, perform and manage the work environment.

The challenge in moving lean to services is the lack of widely available reference implementation to allow the examination of how the direct application of low-cost manufacturing tools and practices can work and the impact.

Comparing Lean Analysis Tool with Timer Pro – Lean Study Results:

Compared lean study results for actual tool and Low-Cost lean tool

Compared Lean Analysis Development Cost as shown in fig. 13

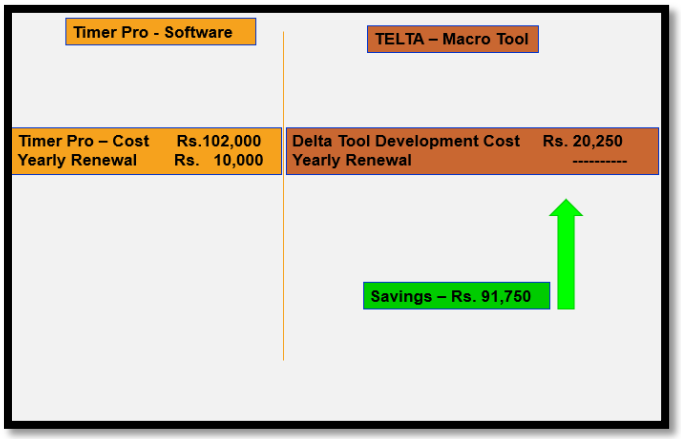

Fig. 13 Cost Comparison

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