Fine Blanking Plant Layout Improvement Using Systematic Layout Planning

Sachin Devendra Sugandhi[1], Ajay Bharule[2]

Abstract: ***The objective of this research is to optimize fine blanking plant layout which manufactures precision automotive parts. For this the systematic layout planning theory (SLP) is used. In this study, brake caliper bracket manufacturing process is studied. The detailed study of the plant layout includes spaghetti diagram analysis, operation process chart, and activity relationship chart has been investigated. The new plant layout is designed and actually implemented with obtained results mentioned below. Compared with the present plant layout, the new plant layout significantly decreased the distance of material flow, which has direct effect on material handling cost and manpower management. Also tool changeover time is significantly reduced; Thereby SMED Concept implementation is possible. This also contributes in Lean Manufacturing Methodology.***

Keywords: Fine Blanking, Plant Layout, SLP, Spaghetti Diagram, Machine Relationship Chart, Single Minuit Exchange of Die (SMED), Lean – Manufacturing

1. Introduction

The production process today needs to be equipped with the ability to have lower cost with higher effectiveness. The plant layout is one way to reduce the cost of manufacturing and increase the productivity. Also to increase good workflow in production route. Efforts are made to reduce the motion waste in the shop floor. A poorly designed process results in overuse of manufacturing resources (men and machines). There are no perfect processes in manufacturing. Generally, process improvements are made regularly with new efficiencies embedded within the process. Continuous process improvement is a critical part of Lean Manufacturing.

The above Research is carried out at M/s Mudhra Fine Blanc Pvt. Ltd. Chennai. Mudhra Fine Blanc are one of the esteemed company in the field of fine blanked precision automobile parts manufacturing, which include sprockets, cam shaft sprockets, brake calipers bracket, Gear sectors for seat height adjusters, various Valve plates, Door locking strikers, latches & Pawls, Friction Discs, Brake assembly components, Seat Belt Locking Clips etc.

The layout of the plant plays vital role for the efficient working of the system. To satisfy the different part families it‟s very difficult to have common layout which can satisfy the need. So we have to arrive at certain point where maximum need should be satisfied by the layout for effective working.

For this Systematic Layout Planning (SLP) Plays very vital role, clearly showing the relationship among the available machines and to show the work flow the spaghetti diagram is most helpful.

With this background and technical analysis for feasibility for possible layout solution is found out and changes were made at the plant.

1.1 Problem Definition

The following problems associated with the factory layout were detected:

1. Improper flow of material through the shop floor
2. Tool Storage and Raw material storage stored far away from Fine Blanking Press
3. Excessive expenses detected for material handling
4. Tool Changeover time is more than actual it should take

1.2 Constraints

There are some constraints associated with the factory construction and machine„s layout which is not Economical at all.

1) Fine Blanking Press cannot be moved from its foundation.
2) Vibro-Finishing Machines Can‟t be shifted due to water supply & Drainage system

2. Tools Used

Tools used to carry out optimization were AutoCAD for layout drafting according to actual scale. The plant overall dimensions and machines dimensions were measured and plotted in autocad. This autocad drawing was used to generate the spaghetti diagram or string diagram, which shows the schematic flow of material in plant. From this the total distance moved by the product in its production phase was calculated.

Now, with the help of SLP technique [1] the relation chart was prepared and analyzed with constraints mentioned above.

These relations were used to plot the new layout in AutoCAD and the new layout was derived.

3. Current Layout

Current layout shows the Process flow for manufacturing of caliper bracket.

Where: F/B: Fine Blanking

W I P: Work in Progress
FG: Finished Goods

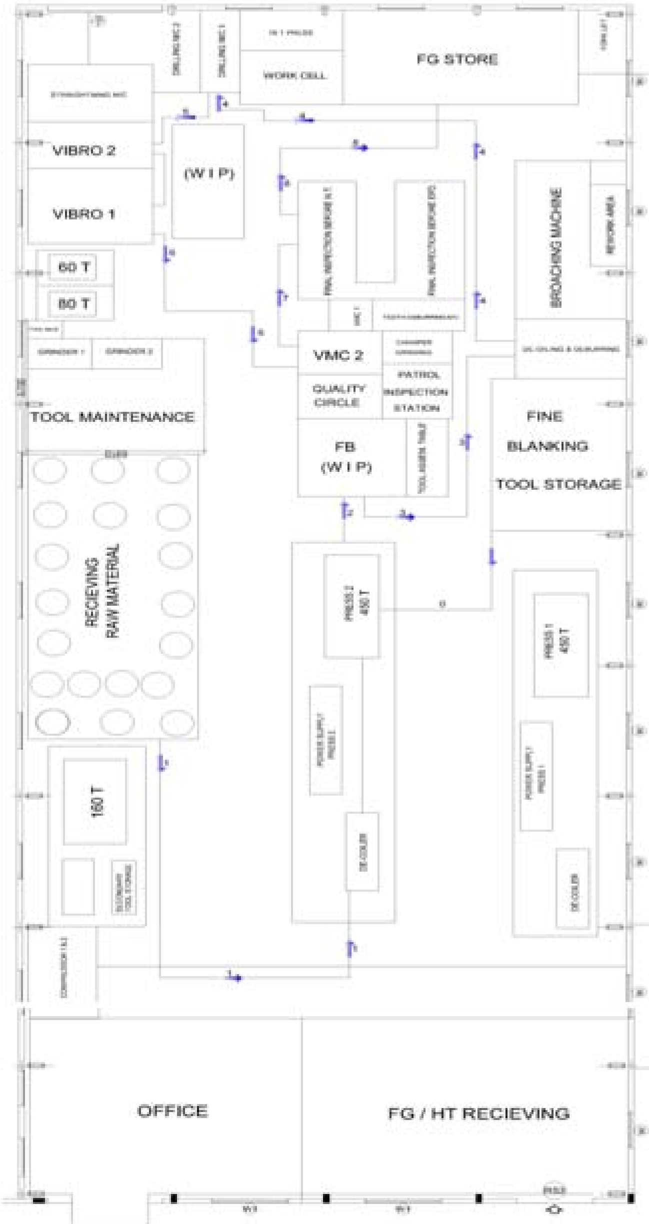

Figure 1: Current Layout & Process Flow

In current layout the material movement path is as shown. The spaghetti diagram [5] is plotted showing the routes followed by material while movement on floor. And this distance was calculated as a distance moved by the material.

The calculated distance was found out to be 116 meter.

4. Systematic Layout Planning

The best way to improve the plant is to apply SLP method [1] [3] [5] to make the work flow continually by arranging the important sequence of the manufacturing. The relationship of each activity in closeness was considered to make the relationship of each activity.

The closeness indexes are defined as:

A = absolutely close
E = especially important
I = important
O= ordinary closeness
U= unimportant

Based on this the relation, chart was plot for each process to another process as shown in figure 2.

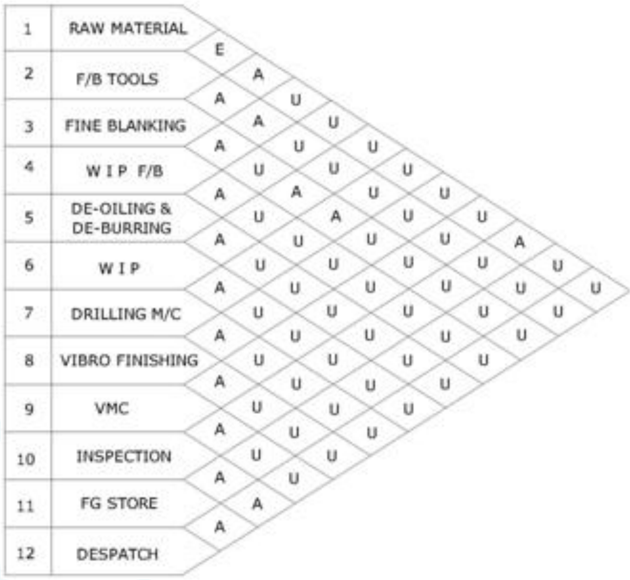

Figure 2: Relation Chart

The relation chart clearly shows the closeness relation between the process and the important elements of the plant.

According to relation chart [1] the raw material storage and fine blanking press must be as near as possible, but in current layout raw material is stored much far from the fine blanking press. So these sorts of deficiencies were identified in the plant post analysis.

Keeping in mind the constraints the plant resources and facilities were re allocated.

It can be seen clearly the raw material storage is brought near to the fine blanking press to facilitate easy loading & unloading also less material handling resources are used.

Tool storage area moved from right to left of the plant to have easy access to tool and load into machine, this significantly reduced the overall time required to change the tool.

Again spaghetti diagram was plot for material flow and the distance is measured, which found out to be 71 meter.

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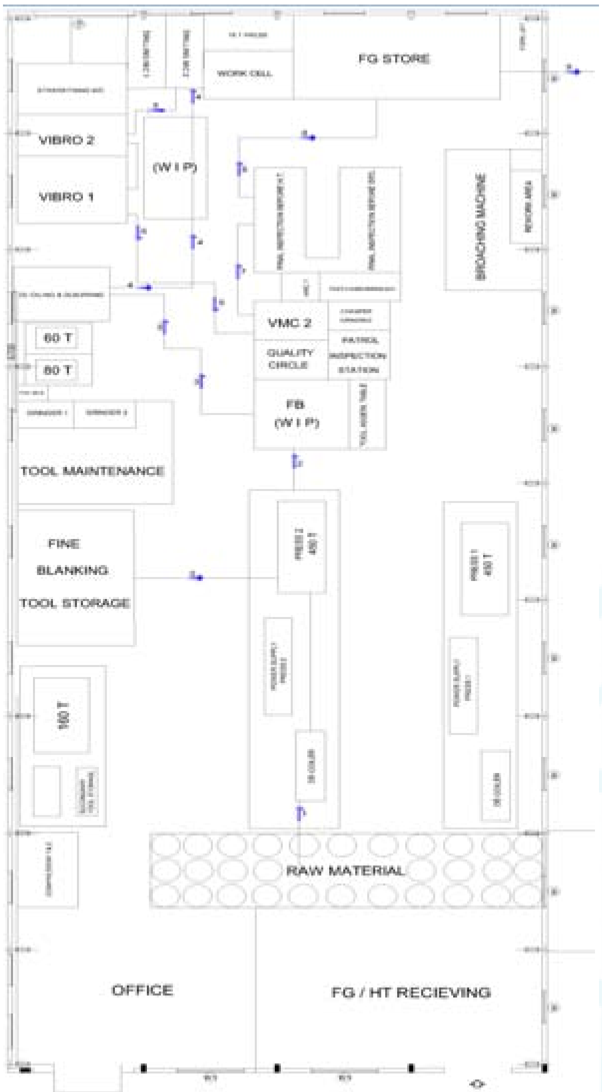

Figure 3: Improved layout & process flow.

5. Outcomes

1) Tool change over time significantly reduced.

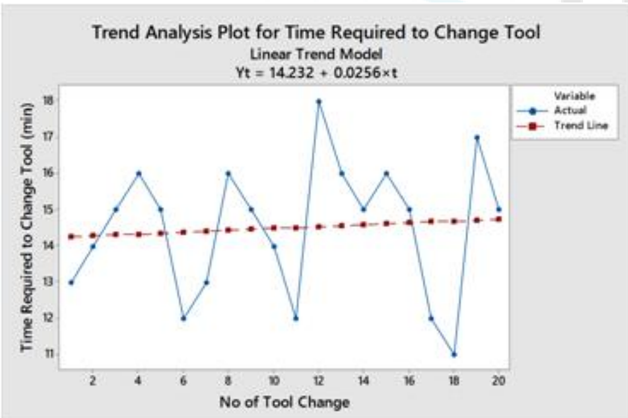

Figure 4: Shows Before improvements the tool changing time & trend line

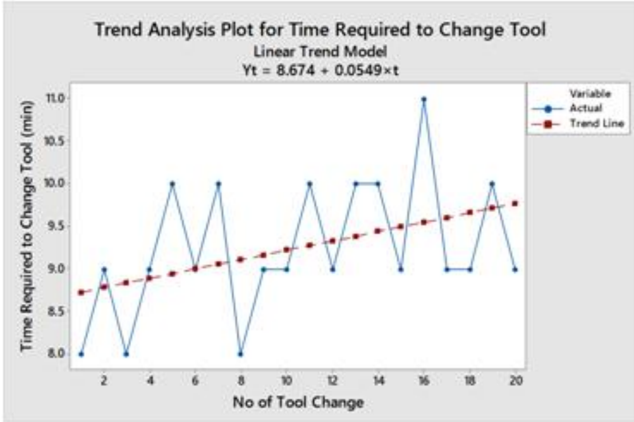

Figure 5: After Improvements

The average time to change tool was 14 min and maximum time required was 18 min.

Figure 5 shows the tool changing time & trend line after improvements. Here the average time is reduced to 8.7 min and maxi-mum time recorded is 11 min.

2) Reduced material movement distance [1]

The material movement at old plant was 116 meter for product

At new improved plant the material movement was 71 meter for same product. 38.79% improved layout.

3) Cost reduction.
   a) No need of extra labor at load unloads area.
   b) Forklift usage reduced and fuel saving of Rs. 2000 per month.

4) Better space utilization.
5) Improved material handling efficiency.

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