LAYOUT DESIGN DEVELOPMENT BY USING DIRECT SUPPLY METHOD

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Abstract: The aim of this project is to study the layout design at sub – assembly instrument panel area of a company. The company is an industry for automotive products. In this study, it was found the at sub – assembly instrument panel area in the company was facing problems with achieve takt time 5.8 min per production. In order to overcome these problems, the workforce productivity was measured using work measurement method. The objectives of this study were to study the current layout design at instrument panel area, to purpose a new design layout and to optimize the utilization of the space in sub – assembly instrument panel area. Time study was used as the method for work measurement. New layout design was designed to increase the daily production in line and eliminate *muda* during handling the processes.

Keywords: *Work Measurement, Time Study, Muda*

1. Introduction

The company wants to achieve the new takt time as target setting in daily production which is 5.8 min per production after major arrangement of layout in Local Supply Parts (LSP) area. However, the company faces delays in certain area making it difficult for the company to reach its new target setting. One of these areas is sub – assembly instrument panel. The problem was distance travel by each team member was quite far and it is consuming a lot of time when still using *jundate* method. After that, increasing the touch number on the parts instrument panel upper and lower also happens during operation supply and installation because of the repetitions work by team members. The objectives of this study were to study the current layout design at instrument panel area, to purpose a new design layout and to optimize the utilization of the space in sub – assembly instrument panel area. Time study was used as the method for work measurement. Time study is one of the work measurement technique where time taken for worker to finish a task under certain condition is recorded.

2. Methodology

2.1. Time Study

Time study is used to dissect a procedure by competent workers with the aim of locating the most time-consuming productive routes. The time is usually estimated using snapback stopwatch technology because information collection is simpler, faster and used to generate accurate information. It allows the time of the part to be recorded conveniently on the timesheet without subtraction. This stopwatch method is using the speed rating. Speed rating is a tool to determine the fast and slow worker. Time study was conducted 10 times in before and after implementation.

2.2. P-D-C-A Cycle

The problem-solving method used in this study is PDCA. First, the Plan is to discuss the objectives of this project and the ways to achieve the objectives (Parissa, 2010). Time study was used for work measurement and productivity data was created for data collection and new layout design was designed. The second is Do which is implementation of new layout design for direct supply method. The third is Check which is set the time for data analysis and results obtained from after the implementation of new layout design. Lastly is Act where some changes were made to the new layout design until the it achieves the target takt time which is 5.8 min per production.

2.3. Observation

From observation, *genba* and *genchi genbutsu* method were used to investigate the problems at sub – assembly instrument panel area. Genba methods are quality circles and suggestion systems. In quality circle, a specialized team develops and design ideas concerning how to improve the company's performance (Manos, 2007). Suggestion systems encourage employees to submit suggestion for improving work process and customer satisfaction. Genchi Genbutsu as a Japanese term which mean "go and see for yourself" that practices their business. It's also used in cooperation with job rotation to make sure that they learn each task and get new information to make sure that they know all aspects of the business involves.in their assignment, they learn each task by doing it from scratch (Rene, 2013).

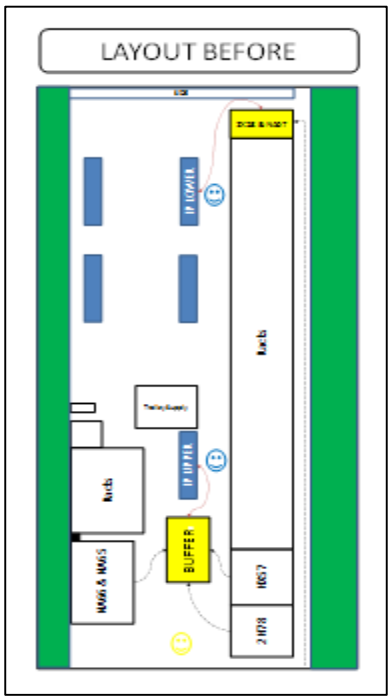

Figure 1. Layout sub - assembly instrument panel before implementation (Hashim, 2008)

Figure 1.0 shows that before implementation direct supply system, there have three team members that involve instrument panel upper and lower operation which is one team member from logistics as supply parts and two sub – assembly team members as installation. The problem was distance travel by each team member was quite far and it is consuming a lot of time. Total logistic team members need to walk for supply parts 25 meters. Total distance travels for sub – assembly team member's instrument upper and lower parts are 3.5 meters.

After that, increasing the touch number on instrument panel upper and lower also happens during operation supply and installation. This is because of the repetitions job scope by team members during handing the parts. For example, team member logistics supply instrument panel upper and lower to buffer. After that, team member sub – assembly pick up the parts for installation instrument panel upper and lower. Then, team member sub – assembly drop off to buffer when done installation and pick up again for supply to the line side. Therefore, four touch numbers detected during installation.

2.4. Data collection

The data of cycle time were determined by the work. The data collected 10 cycles time to measure team member job scope. This application applied during implementation whether before or after implementation. The stopwatch was used for data collection in this project.

3.0 Result and Discussion

The changes of supply method from *jundate* to direct supply method give more impact to current layout. Due of this method changes, new layout has been proposed. Comparison layout in sub -instrument panel area between before and after implementation show that the reduction 15.115 m^2 of space usage after implementing direct supply method. Figure 2 below show that the optimization usage of space happens in sub – assembly instrument panel area.

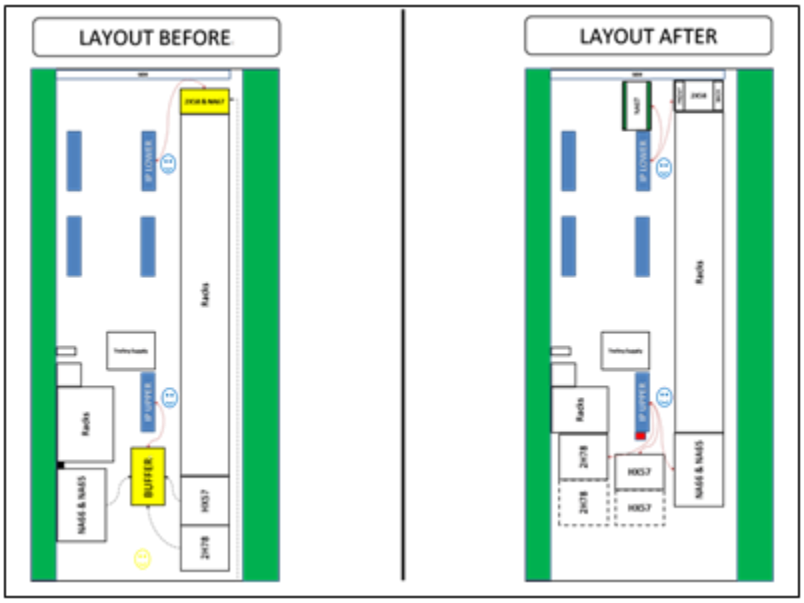

Figure 2. Comparison layout before and after implementation

As we can see the calculation of total reduction area at sub – assembly instrument panel upper and lower:

Total reduction area

= **Area before – Area after**

= 192.485m^2 – 177.37m^2

= **<u>15.115m^2</u>**

From this implementation, reduction of manpower from 3 team members involves to 2 team members as shown in Figure 2 by eliminate logistic in work element which is supply process. After that, it also reduces the distance travel by team members during handling the processes at sub – assembly instrument panel area. Team member need to take a walk only 1.8 meters from their home position and just spend 1.8 seconds in one-way travel. Compare with data before, team member needs to take a walk 3.1 meters from their home position and the time taken for the team member travel 5.8 second in one-way travel.

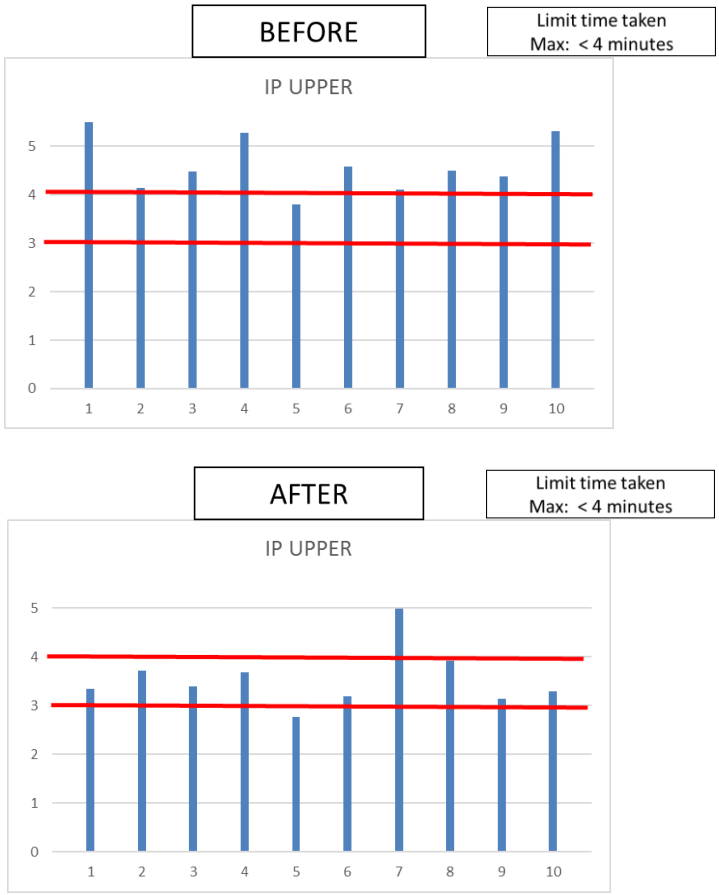

Figure 3. Comparison cycle time before and after for IP Upper

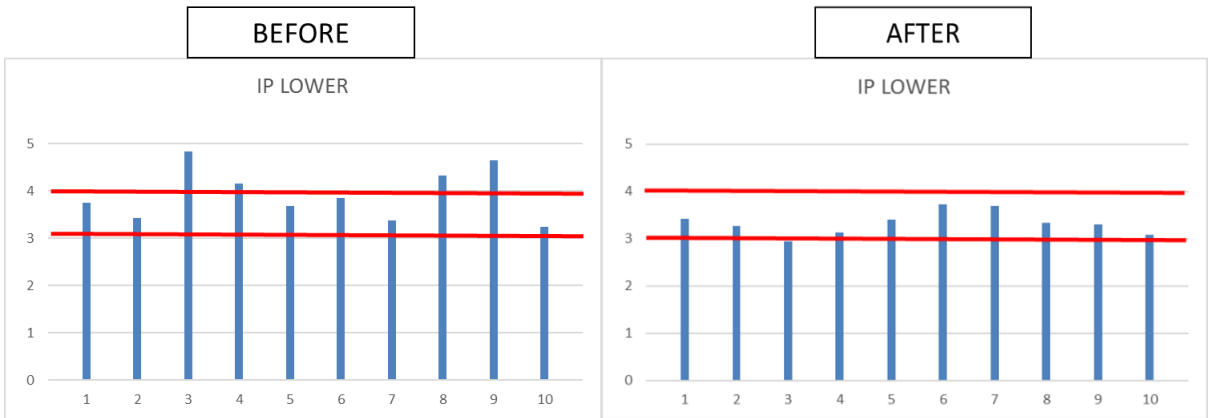

Figure 4. Comparison cycle time before and after for IP Lower

Figures 3 and 4 illustrate the graph of 10 cycles of time during Kaizen activities before and after implementing the direct supply method at sub – assembly instrument panel upper and lower with set up in acceptable ranging for implementation. To achieve takt time 5.8min per production instrument panel upper and lower need to follow the guidance ranging of cycle time for example, process assemble the instrument panel does not exceed the max level which is 4 minutes. As per figures 3.0 and 4.0 shown above, before implementation, the graph shows that data taken exceed from limit compare with after implementation. Its because of team member expand more time on travel during assemble the instrument panel upper and lower. After new layout come out, reduction of cycle time occurs and its give the advantages for implementation of direct supply method.

4. Conclusion

All the objectives of this project had been successfully achieved. According to study the layout design, waste (*muda*) detected at instrument panel area during operation and need to eliminate. For example, motion waste, time waste and space waste. With the purpose new layout design, it gives advantages for instrument panel area to changes the supply method form *jundate* to direct supply. By optimizing the space at instrument panel area, reduction cycle time and travel distance happen at instrument panel area. It also reduces overburden on team member. Implementation direct supply method at instrument panel upper and lower area gives more advantage to daily line production. Reduction cycle time and travel distance are the factors to this project as per show at the past chapter. By elimination non – value added process makes the operation smooth without have any repetition work and decrease the amount of touch point on the instrument upper and lower parts.

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