STUDY ON NEW IMPROVEMENT METHOD FOR ASSEMBLY BLOW PROCESS

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Abstract: This project is to study on new improvement method for assembly blow process. Assembly lines have a 1 section line place (Assembly Small Line) company shrinks the operation of Blow Operation at another place. For Blow have 2 division of operation its Assembly Blow & Injection Blow. For current plan, Assembly Blow shall transfer to place 1st followed by Inject Blow. The objective of this research is to implement optional manpower for variables parts on blow assembly process at b1, to study increase UPH by improved process line B4, to improved capacity study and capability by improved the process line B4. The data about optional manpower were collected by using this geometric symbols are in fact a common knowledge in Japan like we all understand in occident the meaning of a tick (done, correct, passed) and a cross (not good) that used an observation an interview to twelve employees of the company. From the result obtained, it was found that three employees were achieve maru and nine employees were achieved peke for legend. Another step for improved UPH by line B4 is a skip the process, performed by 'walk through' inspection at the standing workstation areas. Improved UPH by line B4 involved only to improve capacity study and capability by improved the process line B4. Capacity study is considered as capacity line utilization in a company. Capacity study function is to easy for company to know the balancing of line capacity to run another part or item. Capacity study plays a big role in a company. This capacity study has provided by production planning and control department. Inside the capacity study have a few data that importance to run the capacity study. The result of evaluation showed that the level of employee's performance was still good. Production planning and control management need to be provided so that it will have a great performance manpower and line utilization at workstations.

Keywords: *assembly, operation, blow*

1. Introduction

Blow molding is the business-relevant polymer production process used in hollow plastic goods manufacturing. It is the third most important plastics forming activity only behind injection molding and economic advantages particularly when compared with injection molding in the manufacture of plastic products. Some of the most popular benefits of blow molding is the ability to mold articles with curves re-entrant (walls built to turn inwards towards the center). It enables the molding of extremely complex and irregular shaped pieces. A plastic hot tube, known as parison or pre-form, starts with this process. Within a split mould with a hollow cavity the parison is set. The sides of the mold are then bound together, pinched and the parison tube screened. Air is pumped into the tube that extends the heat wall to cavity shape; the mold is refreshed with water that solidifies the resin to component size. The component will be removed from the mold after cooling and cut.

2. Literature Review

2.1. Auto Industry

Auto parts industry in Malaysia is a booming industry which encompasses areas of activities from car manufacturing to dealing with auto business with foreign countries (Adams & Ebert., 1978). Auto parts industry in Malaysia is one of principal producers and exporters of vehicle parts, components and accessories, which are widely accepted to most of the leading countries of world. Foreign countries like Japan, UK, Thailand, Taiwan, Singapore, Indonesia, are major importers of Malaysian auto parts. Leaders of automotive manufacturing companies like Mercedes, Suzuki, Ford, General Motors, Mazda, Nissan and Mitsubishi are using Malaysian automotive products and accessories such as seats, springs, and absorbers because of their high quality and competitive prices (Adams and Ebert, 1978).

2.2. Assembly Line

Assembly lines are flow oriented production systems which are still typical in the industrial production of high quantity standardized commodities and even gain importance in low volume production of customized products **(**Imaga**,** 2003). Among the decision problems which arise in managing such systems, assembly line balancing problems are important tasks in medium-term production planning. assembly line consists of workstations arranged along a conveyor belt or a similar mechanical material handling equipment (Scholl and Klein, 1999). The jobs are consecutively launched down the line and are moved from station to station. At each station, certain operation sare repeatedly performed regarding the cycle 9time (maximum or average time available for each work cycle). The decision problem of optimally partitioning (balancing) the assembly work among the stations with respect to some objective is known as the assembly line balancing problems (ALBPs). Manufacturing a product on an assembly line requires partitioning the total amount of work into a set of elementary operations named tasks. Performing a task takes a task time and requires certain equipment of machines and skills of workers. Due to technological and organizational conditions precedence constraints between the tasks have to be observed. These elements can be summarized and visualized by a precedence graph.) The originally define assembly line as “assembly lines were developed for a cost-efficient mass production of standardized products, designed to exploit a high specialization of labor and the associated learning effects **(**Scholl et al., 1998**)**”. Under the term assembly line balancing (ALB) various optimization models have been introduced and discussed in the literature, which are aimed at supporting the decision maker in configuring efficient assembly systems. “Subsequent works however, more and more attempt to extend the problem by integrating practice relevant constraints, like u-shaped lines, parallel stations or processing alternatives” **(**Scholl et al., 1998).

3. Methodology

3.1. Research Strategy

The procedure for implementing the first state method intended for this project is to have a question and answer session with industry supervisors. First, the boss is concerned about what kind of issue that occurred in the business and instead need to do investigation inside the shop floor. Next is to define the problem and review all the previous recent changes, Use the testing method to find a suitable assembly blast line and collect all the data afterwards. The proposed assembly line is early if there is a failure in the initial assembly line. Methodology is detailed project preparation. The technique is to be planned as best as possible for smooth running of

the project. By this, each level of the project does not depart from the defined path or, to be more precise, the study results do satisfy the requirements of the problem to be solved. It is therefore necessary to learn and comprehend in depth the processes that exist in the research methodology framework. Stages of methods used in this analysis.

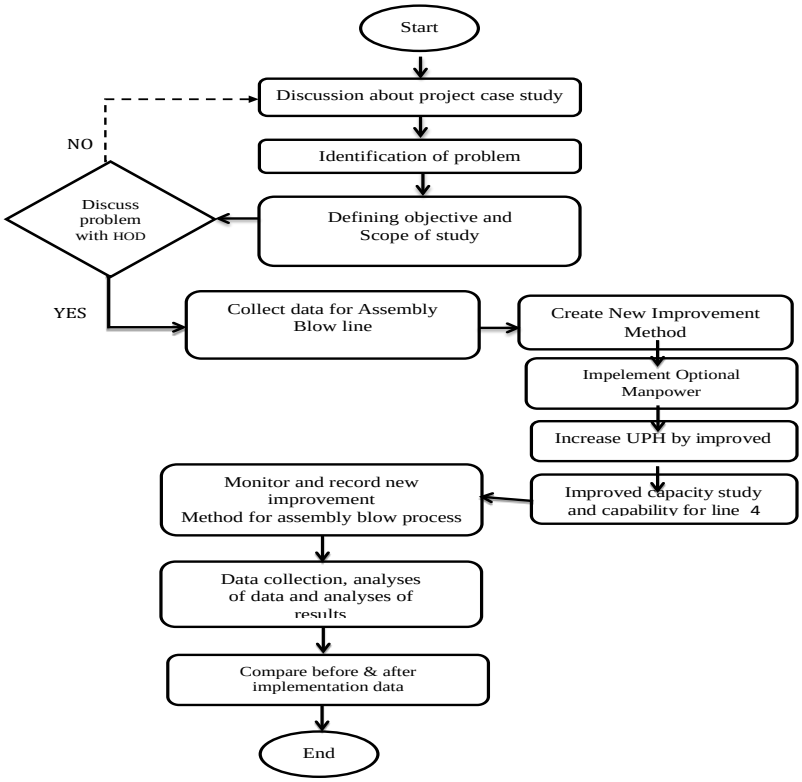

Figure 1. Project methodology

Figure 1. shows that the beginning of project methodology needs to discuss about project case study. Next, identification of problem, defining objective and scope of study. Before this, discuss the problem with head of departments if Yes can proceed it and if No find the new discussion about project case study. Then, collect data for assembly blow line must be tally with your objective and scope. Create new improvement method and select the objective need to provide your project case study. Monitor and record new improvement method for assembly blow process. Finally, data collection, analyses of data and analyses of results to do compare before and after implementation data.

3.2. Optional Manpower

The Optional manpower is for new manpower skilled (B1) of assembly blow line. If the cycle time of original line is break, that means we need to new manpower for backup that suitable with tool and it is call OPTIONAL MANPOWER. Without optional manpower, normally company the line (B1) the line can't run operation or run with no skill manpower. Which is any abnormality during run cannot be detected. If the original manpower is absent, company can use Optional manpower, for fine the suitable manpower company needed do a training process. Therefore, training is a systematic process of altering employees' behavior, knowledge and motivation in order to increase their effectiveness and achievement of organizational goals. The goal of personnel development is to make it possible for the employee to reach the top or achieve the best in his career. Figure 2 shows that schedule Optional Manpower using the legend common knowledge in Japan like we all understand in occident the meaning of a tick

(done, correct, passed) and a cross (not good) that used an observation an interview to twelve employees of the company.

Figure 2. Schedule Optional Manpower

3.3. Unit Per Hour

The emphasis in this research is on defining cycle time as the indicator of a business cycle from start to finish. The time of production refers to production activities, such as the total time necessary for manufacturing a product. Cycle time tells us how much time it takes for a single job to be carried out, from cycle time to Unit per hour. Unit per hour (UPH) is the complete output of the products or finishes in one hour as refers to Equation 1**.**

$$\text{Unit per hour (UPH)} = \frac{3600}{\text{Cycle time}} \tag{1}$$

3.4. The Rate of Operation

Operating rate is the percentage of the total production capacity of a used business, sector, or region. The utilization rate of the factory is identical with the rate of operation. Operating rate is the amount to be met by output to ensure no downtime. The rate of service is correlated with the assembly line as refers to Equation 2.

$$\frac{\text{Actual}}{\text{Plan}} \text{ X } 100 \tag{2}$$

3.5 The Rate of Rejection

The rate of rejection is the percentage of manufactured parts rejected, for a fixed period of time or a lot of bits. Each part production in industries does not achieve its expected quantity, so the company will only allow 3% dismissal at each part production. The rate of rejection as refers to Equation 3.

$$\frac{\text{Total Reject}}{\text{Total Output}} \text{ X } 100 \tag{3}$$

3.6. Net UPH

Net UPH consider rejected item during process of assembly. Unit per hour only count total production done by employee or assembly line, every production process has been recorded. Net UPH considered rejection part in the process, this is because rejection part is not an output or finish good. This method makes output data more accurate by minus it with reject part, actual output that can be used is recorded. The Net UPH as refers to Equation 4.

$$\frac{\text{Gross UPH} \times \text{Operation Rate}}{100 - \text{Rejection Rate}} \tag{4}$$

3.7. Required Working Time

Under the general Working Hour Act provision, regular working hours shall not exceed eight hours per day or 40 hours per week. The general law does not preclude arrangement of working hours where the working hour is shorter than the above. The general clause also requires work hours to be spread over longer periods of time, allowing for a six-day working week. For this particular working hour, means the total time needed to meet a single customer request. The required working time as refers to Equation 5.

$$\frac{\text{Monthly Request}}{\text{Net UPH}} \tag{5}$$

3.8. Available Working Hour Per Month

Working hour can be calculated over a longer period of time, based on an average. In this arrangement, weekly working hours can be calculated so that they balance out on average for an adjustment of 52 weeks to no more than 40 hours a week. The period of adjustment may be shorter, too. In this study, working hours were already shorter less than one month or 4 weeks, because customer demand usually occurs within a month. The available working hour per month as refers to Equation 6.

$$(\text{WORKING HOUR PER DAY} \times \text{WORKING DAY}) + \text{OT} \tag{6}$$

3.9. Legend of Chart

This geometric symbol is in fact a common knowledge in Japan:
Simple circle ○: Called "maru" the simple circle means satisfactory or good. If in the same document the circle and bullseye is used, circle means satisfactory else it means good.
Triangle △: Called "sankaku" the triangle means "weak", "average" or "in progress". If bullseye is used in the same document, it means "weak" else it means "good". In some cases, for tracking progress of an action plan it can means "in progress".
Cross X: Called "peke" the cross means "bad" (Japanese people say "No Good"). This is the easiest symbol to understand because it has the same meaning for us too.

4. Results

As can be seen in Figure 3, result in line b1 summary is divided into 12 person data such as total for individual, before 3 monthly company manpower summary and after 3 monthly data collection manpower summaries. The line B1 summary from Manpower Assembly Blow Line B1.

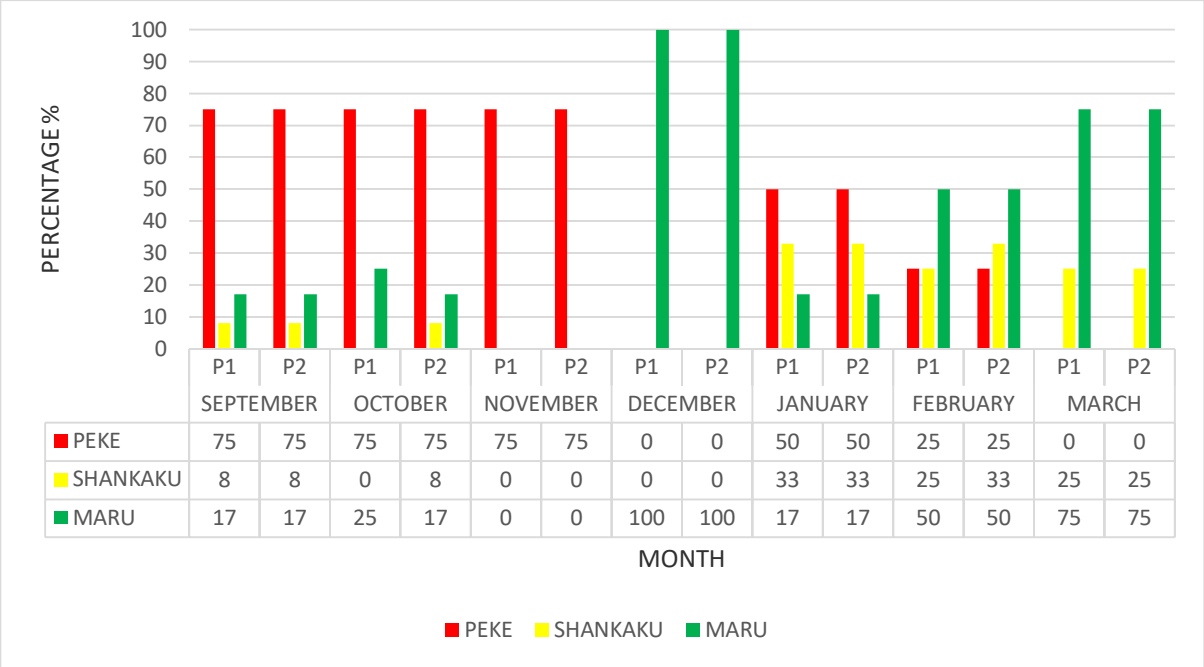

Figure 3. Result Optional Manpower

4.1. Improved UPH

As can be seen in Figure 4, result in line B4 summary is divided into 12 person data such as total for individual, before 3 monthly company manpower summary and after 3 monthly data collection manpower summaries. The line B1 summary from UPH Assembly Blow Line B4. Graph shows that targeting for company in line b1 plan 20 UPH. For the before three months actual for September is 12, October is 14 and November is 15. After the implementation, graphs shows that, UPH for B4 is increasing for each month. January is 17, February is 14 and March is 20. So, the implementation for UPH at B4 usually is successful.

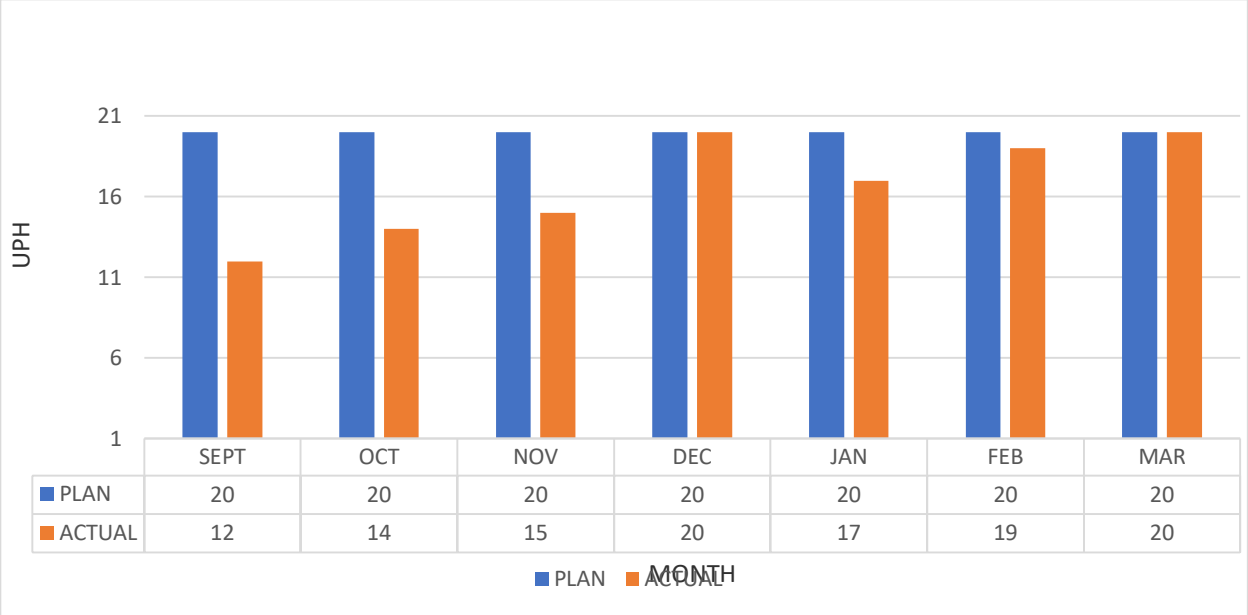

Figure 4. After Implementation UPH B4

4.2. Line Utilization

Line utilization is the percentage production for the selected assembly line in a month term. Following data will show line utilization before using the new UPH for line B4 for one production of Duct Assy Heater to Register. As can be seen in Figure 5, line utilization improved January, February and March. Besides that, as you can see result for before and after is very different. The graph shows the summary line utilization B4. Before three months sets of data were recorded in a day using capacity study. The first sets, which were recorded after the production started on morning shows plan 85 %, followed by second sets which, were recorded before lunch period. The final sets show lower productivity compared to other two sets. On March, the third set shows higher productivity due to the efficient manpower for line B4.

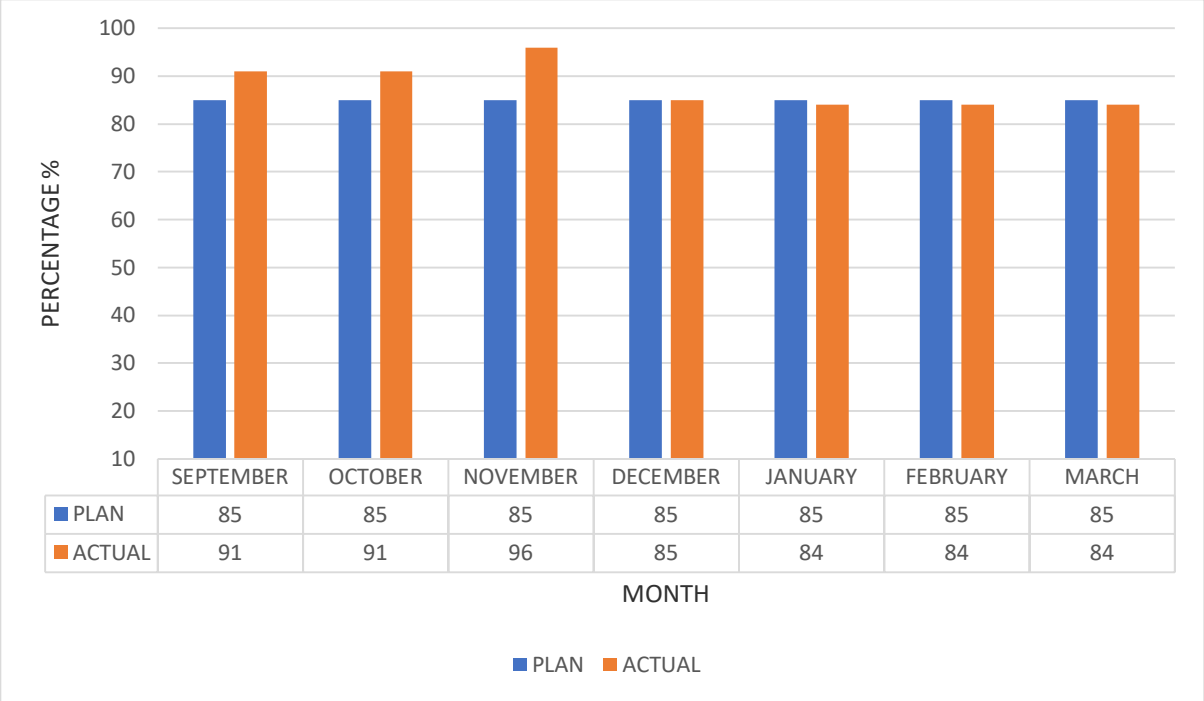

Figure 5. Summary for Line B4 for Utilization

5. Discussion

From the findings, improvement for assembly blow lines must be change the new results. As a you can see, base on Overall Equipment Effectiveness (OEE) method, maximum percentage that acceptable for the assembly line utilization is 85% and the remaining 15% is the idle time for the manpower. If the utilization of assembly line more than 85%, optional line needs to implement to reduce the utilization and balance the production to make sure downtime not happen.

6. Conclusion

The objective is achieving. Capacity study has a lot of advantage for manufacturing company that have high production. By using the balancing of capacity, all assembly line can be used to the optimum level without any waste. This is also can avoid and minimize overtime production that lead to cost saving. Other than that, optional manpower is the way to back up

References

Adams, E. E. and Ebert R. J. (1978). Production and Operations Management. Englewood Chiffs, Prentice Hill, Inc, USA

Imaga, E. U. L. (2003). Theory and Practice of Production and Operations Management: Rhyce Kerex, Ogui, Enugu, Nigeria

Scholl, A. and Klein, R. (1999). ULINO: Optimally balancing U-shaped JIT assemblylines. International Journal of Production Research 37, 721–736.

Scholl, A., Klein R. and Domschke W. (1998). Pattern based vocabulary building for effectively sequencing mixed model assembly lines. Journal of Heuristics. Vol. 4: 359 - 381.