

IMPROVEMENT OF PRODUCT EFFICIENCY FOR KAMPUNG FRIED RICE PRODUCT

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ABSTRACT: Efficiency is important to production process which must be managed to take the lowest production time and the most rewarding. The aim of this research is to analyze the production capacity, bottlenecks and wastes in the production process. Finding solutions of problems which effect to decrease cycle time and increased production capacity. From the survey case study company found that production capacity problems, lower than the demand of customers in the market. The cycle time is higher than the demand rate of customers and also has unnecessary activities in the production process. The way for improvement start with calculate capacity of every step in the process to find the bottleneck, Finding cycle time compared with demand rate at the bottleneck, Using Flow Process Chart to analyze 7 wastes and improve working methods that unnecessary. Then reduce and eliminate non-value activities by using 5W1H and ECRS techniques. The result of improvement, cycle time decreased 54.2%, effect to cycle time in preparation process lower than the customer demand rate. The production capacity of the frozen Kampong fried rice increased 40%. As the result, total improvements make profit for company 147,456 ringgit per year.

KEYWORDS: *Bottleneck, Flow Process Chart, 5W1H and ECRS*

1.0 INTRODUCTION

Productive efficiency is the most importantly, a more efficient business will produce lower cost goods than competitors. That means the business can either make a higher profit per unit sold or the business can offer customers a lower price than competitors (Chaovanapoonphol, 2018). Production Capacity is the volume of products that can be produced by an enterprise using current resources. The lowest production capacity point called bottleneck, which limits the overall output of the system due to its slowest output rate (Kasemset, 2014). Cycle time is important index in production efficiency system. Cycle time was defined as "the length of time between start and finish the production of and order. The cycle time relate with the takt time, which relationship between the work time available and the customer requirement (Shao, 2010). Flow Process chart is a tool for record standard steps of the process by writing with symbols, for analyze waste from the process. ECRS technique is a concept for improve work processes to be effective, removal unnecessary work or change the way of work. The results may be more than the old methods. The principle consists of elimination (Eliminate), Combine, Rearrange and painting. Simplify, which is a simple principle. Every business can apply the concept immediately without having to invest more in order to start reducing waste (Poonikom, 2017).

The company of case study is conducting business on the processing of frozen chicken products. Frozen Kampong Fried Rice is the best seller product of this company. The capacity of Kampong Fried Rice production process that determined by the longest cycle time of preparation process steps was lower than customer demand rate. As the result, the company cannot fulfill customer demands on the committee delivery date. From the analysis of current production capacity, cooking rice process in preparation step was a bottleneck of Kampong Fried Rice process because of its lowest capacity. Therefore, this research goal to reduce cycle time in cooking rice process in preparation step in order to increase the capacity of Frozen Kampong Fried Rice production process. Eventually the customer requirement can be achieved while sustaining quality products in the most efficient.

2.0 METHODOLOGY

2.1 Explore current condition of the production line

The data relate to Frozen Kampung Fried Rice production process such as information flow, customer requirement and total production time. Calculate the production capacity, cycle time and takt time. After that analyze the bottlenecks, compare cycle time in each process with customer demand rate. Then analyze possibility of the process to respond customer demand in the market. From this step, show that which point in the production line is bottleneck.

2.2 Analyze waste bottleneck point.

Using Flow Process Chart to analyze 7wastes. Eliminate unnecessary activities by 5W1H techniques and ECRS technique.

2.3 Improvements according to selected guidelines

After analyzing waste in flow process chart then continue to improve according to the selected guidelines which

2.4 Summary and evaluation of the improvement frozen Kampong fried rice production process

After improvement of production process can summarized and evaluated. Analyze the feasibility and profit for the company.

3.0 RESULT

3.1 Current condition of the production line

The process of the frozen Kampong fried rice of the company case study have 6 main production steps. Starting with receiving raw materials from the supplier who sent the products according to the orders of the production department. Then enter the raw material to preparation process that contain with cooking rice, blanching carrot diced and yard long bean, grinding and stir-frying curry, preparing scrambled eggs, bologna slicing, fried popia and fried anchovies. After done for preparing material, it will go into the stir-frying process by putting all prepared ingredients into the stir-fry pot. Mix them together and enter the packing process. And pass throw the IQF machine for start freezing process, until product core temperature below -18 degrees and packing carton.

From the data of Frozen Kampung Fried Rice production process, capacity of cooking rice in preparation step is lowest and lower than customer demand 40% follow figure 1. When calculating the demand of customers compared with cycle time, for study the efficiency of the production process. Found that the cycle time higher than the demand rate of products 50.29%.

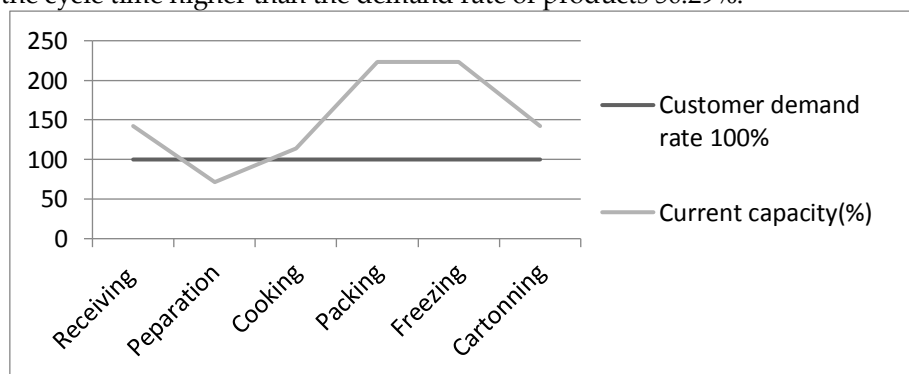


Figure1 Comparison between current capacity and customer demand(Percentage)

3.2 Analysis of waste in preparation process

Due to the calculation of production capacity, cycle time and takt time can't analyze the transportation and motion waste. But, flow process chart can analyze and use 5W1H technique to analyze movement. Table 2. Wastes transportation have 5 steps, moving soaking rice tank to boiling water tank, moving soaking rice tank to soaking rice point, moving rice tray trolley to rice cooker, moving rice tray out from the cooker and moving cooked rice tray to chill room. Wastes motion have 2 steps, Taking rice after soaking put in draining basket and arrange rice tray in to rice cooker.

Table 2 Analysis of waste in preparation process

Event Description	Symbol		Distance (m)		Time (min)	
	Before	After	Before	After	Before	After
1. Opening rice package and pour in to soaking rice tank	●	●	-	-	0.5	0.5
2. Moving soaking rice tank to hot water tank	➡	➡	2	2	0.5	0.5
3. Checking temperature of hot water	■	■	-	-	0.5	0.5
4. Weighing hot water and pour in to soaking rice tank	●	-	-	-	2	0.5
5. moving soaking rice tank to soaking rice point	➡	➡	8	8	1	1
6. Soaking rice in hot water	●	●	-	-	60	60
7. Taking rice after soaking put in draining basket	➡	-	-	-	1	-
8. Draining rice	●	●	-	-	15	15
9. Weighing soaked rice and put in small trays	●	●	-	-	15	4.5
10. Moving small rice tray trolley to rice cooker	➡	-	20	-	2	-
11. Arrange small rice tray in to rice cooker	➡	-	1	-	5	-
12. Cooking rice	●	●	-	-	35	35
13. Checking core temperature of rice after cooking	■	■	-	-	0.5	0.5
14. Moving rice tray out from the cooker	➡	➡	2	1	15	5
15. moving cooked rice tray to chill room	➡	➡	10	15	3	3
16. Reduce core temperature of rice after cooked	▼	▼	-	-	35	25
17. moving cooked rice tray to chill room	➡	➡	15	15	5	5
Total	17 steps	13 steps	58	41	196	156

3.3 Improvement

After improvement the steps of cooking rice reduce from 17 to 13 steps. Distance to cooking rice reduces from 58 to 41 or 29.31%. Time to cooking rice reduce from 196 to 156 mins, 20.45 %. Reducing of distance, time and steps because 1. The step weighing hot water and pour in to soaking rice tank use the new soaking tank that have mark to identify the volume of hot water. The worker no need to weight. 2. Taking out the rice after soaking and put in draining basket, using new soaking tank that have grille support inside. So, save energy and time for workers. 3. Moving small rice tray trolley to rice cooker and 4. Arrange small rice tray in to rice cooker. For 3 and 4, both 2 steps must

change the small stainless still tray to big stainless still tray for cooking rice. Because change rice cooker machine that company already has. Then analyze the flow process chart by 5W1H and ECRS follow Table2.

After improvement, the standard work method has been established by creating a One Point Lesson or OPL and training workers in the process of cooking rice with new machine. The detail contains with how each activity works. The manual was prepared for supervisor training old employees the correct working methods. And training new employees before starting work, to be able to understand how to work easily, quickly, accurately and safely. This OPL has a frequency every 3 months.

Table 2 The result of analysis the flow process chart by 5W1H and ECRS

Event Description	5W1H	ECRS
Weighing hot water and pour in to soaking rice tank	Another method: mark the scale to identify the volume of hot water at the soaking tank	Simplify: Mark the scale to identify the volume of hot water. The workers no need to weight the hot water, more comfortable and faster than the old method.
Taking rice after soaking put in draining basket	Another method: Soaking rice with soaking tank which has a grille basket support inside.	Eliminate: Design new soaking tank. The size of the tank is 55 x 55 x 30 cm with 45 cm of 4 legs and also has grille basket support inside the tank. Also install the tap for flow out the water after soaking at the bottom of the tank. The draining rice process after soaking will easier, the worker no need to take the rice from the tank and put inside basket. They just open the tap and water will go out. This method more comfortable and save time as well.
Weighing soaked rice and put in small trays	Another method: Weighting more rice and water	Simplify: Weight more rice and water in to the bigger stainless still tray replace small stainless still tray, more fast and easy to working.
Moving small rice tray trolley to rice cooker and arrange small rice tray in to rice cooker	Another method: Using big stainless still tray replace small stainless still tray	Eliminate: Using big tray replace small tray and move weighting rice point from preparation room to in front of new rice cooker. After weighing rice and water in the big tray, direct put the tray on rice cooker conveyer. So the step moving small rice tray trolley to rice cooker and arrange small rice tray in to rice cooker were eliminated.
Moving rice tray out from the rice cooker	Another method: Using big tray for cooking rice is easy to move the tray out from the rice cooker	Simplify: Actually if using the small tray for cooking rice, after cooked must knock out the rice from the small tray and put in the big tray. So, if using big stainless steel tray to cook rice, no need to knocked out from the small tray. New method is easier to move out from rice cooker, save water and energy.
Reduce core temperature of rice after cooked	Another method: Using new rice cooker can reduce	Simplify: Using a new rice cooker cooking rice. In the process of moving the rice tray out from the rice cooker, Because the

Event Description	5W1H	ECRS
	the time to cooling down the temperature of cooked rice.	room temperature at the end of rice cooker about 10-13°C. The low room temperature helps to pre-cooling the product. So, the cooling time in the chill room reduce from 35 mins to 25 mins.

4.0 CONCLUSION

Preparation step was the process that produce the highest cycle time and it is the bottleneck of the Frozen Kampung Fried Rice Process. This step was the only one step that cycle time was higher than takt time. It implies that customer demand could be satisfied. Two countermeasures were proposed including production capacity and reduction/elimination of unnecessary activities. As the result, the cycle time of preparation step was reduce from 0.875 min/kg to 0.40 min/kg or 54.28% improvement. In consequence, capacity of Frozen Kampung Fried Rice production process was enhanced 40% improvement. This method also use with another 6 rice products. Eventually, the customer requirement can be achieved while sustaining quality products in the most efficient.

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6.0 REFERENCES

- Chaovanapoonphol, Y. and Somyana, W. 2018. Production efficiency of maize farmers under contract farming in Los PDR. Agricultural Economy. . Chiang Mai University, Thailand.
- Kasemset, C., Pinmanee, P. and Umarin, P. 2014. Application of ECRS and Simulation Techniques in Bottleneck Identification and Improvement: A Paper Package Factory. Industrial Engineering. Chiang Mai University, Thailand.
- Shao, C.C. 2010. Manpower and cycle Time Reduction of a Labor-Intensive Assembly Line. B.Eng. Mechanical Engineering. Nanyang Technological University, Singapore.
- Poonikom, K. 2017. Efficiency Improvement in Manufacturing Process by Improvement Technique Case study: Drinking Water Bai-Pai-Keaw. Industrial Engineering. UbonRatchathani University, Thailand.