

# Low Cost Ergonomics Improvement: Application in Food Related Small and Medium Enterprise (SME)

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**Abstract-** The main purpose of this study was to investigate and understand the current application of ergonomics in Small and Medium Enterprise (SME). At the same time, this study was implemented to investigate the ergonomics problem in SME by using Ergonomics Problem Solving Techniques. Ergonomics problems were analyzed and recommended solutions were implemented. The solutions improved workers comfort as well as the effectiveness of the tasks.

**Keywords:** *Ergonomics, RULA, REBA, Working posture, Ergonomics Improvement.*

## I. INTRODUCTION

Small and Medium Enterprise (SME) is one of the important industry in Malaysia. In Malaysia, SME is characterized as a company with annual turnover of below RM25 million and with less than 150 workers. Although it could be just a small scale (micro), with less than 10 workers, the fact that it contribute to national economic growth cannot be denied [1].

In SME, ergonomics related problems are one of the one of the main issues being neglected. This could be due to some reason such as lack of ergonomic knowledge, to save cost (as the have limited fund or capital to run business), lack of skilled workers and etc especially in the small scale SME.

Low cost improvement could be very useful for SME because the approaches were affordable. Simple solution could made a huge different.

Elsewhere, low cost improvement programs had been applied such as Work Improvement in Small Enterprises (WISE) [2], Work Improvement in Neighbourhood Development (WIND) [2] and Participation Oriented Safety Improvement Under Trade Union Initiative (POSITIVE) [3].

## II. METHODOLOGY

### *The company and production processes*

The company, Harilah Enterprise, is producing fish crackers. The processes involved are boiling the fillet, mixing with flour, shaping the mixture (into cylinder shape), cooking (using microwave), cutting and drying. The flow of the processes were shown in Figure 1.

For this particular study, the processes being analyze were boiling and mixing since it got the most complains from the workers due to the unsuitable workstation and the task involved.



Figure 1: Process of Making Fish Crackers.

### *RULA, REBA and RWL methods*

RULA (Rapid Upper Limb Assessment), REBA (Rapid Entire Body Assessment) and Niosh RWL (Recommended Weight Limit) methods were used to analyse the problem.

Results for before and after improvement were calculated and compared.

*The Improvement*

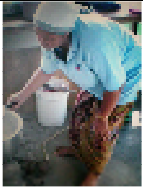
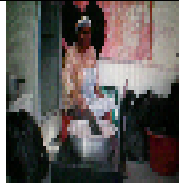
After analysing current situation, the improvement were suggested and implemented. Cooking trolley were design and fabricated.

II. RESULTS

Table 1, 2 and 3 show the results for RULA, REBA and RWL scores for the selected activities


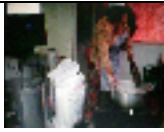




RULA method was applied to evaluate posture at cooking (boiling process) workstation. Both score, before and after improvement, were calculated and compared. Based on Table 1, the RULA scored improved from 6 (before improvement) to 3 (after improvement). This showed the improvement made were very significant and reduced the risk for cooking task.

TABLE 1  
RULA SCORES

	Before Improvement	After Improvement
Working posture while boiling fillet		
RULA Score	6	3

REBA method was used to assess the task between cooking and mixing. Similarly to RULA assessment for the cooking workstation, the REBA scores improved significantly as shown in Table 2. It had improved the working condition between two workstation and give benefits to the worker.

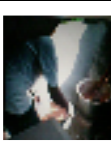



TABLE 2  
REBA SCORES

	Before Improvement	Score	After Improvement	Score
Transfer fillet to basin		9		3
Pick up filled basin		9		3
Pick up empty basin		7		3

NIOSH has produced a work practises guide for the design of manual handling tasks and an equation for determining safe loads. NIOSH's goal in developing the equation is to specify controls on industrial lifting which will protect healthy workers. The ratio between the load actually lifted and the RWL is known as lifting index. An index of less than 1 is believed not to increase the risk of injury.

For both origin and destination, lifting index were calculated for before and after improvement. The improvements were very significant. For origin, the improvement was from 1.18 to 0.04 and for destination the improvement was from 0.71 to 0.03.

TABLE 3  
RWL SCORES

	Before Improvement		After Improvement	
	Origin	Destination	Origin	Destination
				
RWL	6.77	1.18	6.77	11.31
Lifting Index	1.18	0.71	0.04	0.03

IV. DISCUSSION

Beside improvement on work postures, other improvement related to productivity was also significant. Tale 4 summarised some improvement made.

Before improvement, Harilah Enterprise only used 15 kg of fillet to produce their product. The cooking time actually same for different quantity of fillet because the time is fix and the maximum cooking time about half an hour. Before improvement, the location of cooking workstation is about 4 meters from mixing workstation. So there is transporting time to transfer the fillet from pot into the mixer by using basin. The worker needs travel three times between two workstations and the transporting time about 30 second for each travelling. For 15 kg fillet, the time taken to clear the pot about 8 minute. Two workers were needed each time when the production run. One worker worked at cooking workstation and need to pour fillet into basin. The other worker will works at mixing workstation where this worker need to carry the basin to the mixing workstation and pour flour into mixer.

After improvement, there improvements were quite significant in the production line. The quantity of fillet had been increased to 20 kg per cycle. The cooking time remain same at 30 minute. The new location for cooking workstation was near to the mixing workstation and there was no transporting time to transfer the fillet from pot into the mixer. Because the quantity was extra 5 kg compare to the before improvement, the time taken to clear the pot was about 10 minute. Other reason why the time

taken was longer to empty the pot because the worker used small container to transfer the fillet into the mixer. The amounts of worker become one where this worker could do two jobs because the location of the two workstation was nearer to each other. The same worker could pour flour into the mixer and pour fillet into the mixer because the distance was closed.

Overall, the improvement that was implemented at Harilah Enterprise, not only improved the workstation and task but also improved on productivity.

TABLE 4  
OVERALL COMPARISON BEFORE AND AFTER IMPROVEMENT

	<b>Before Improvement</b>	<b>After Improvement</b>
Quantity Fillet	15 kg	20 kg
Cooking Time	30 minute	30 minute
Transporting Time	1.5 minute	None
Time Taken To Empty Pot	8 minute	10 minute
Workers	2 persons	1 person

#### IV. CONCLUSION

In general, the changes made were very successful where significant improvement was achieved on the assessed task. Moreover, the new design trolley had improved a few task involved during fish crackers production.

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