

## THE MATHEMATICAL MODEL OF DETERMINING THE WAGE PAYMENT INCENTIVE FOR TAPE EDGING SKILLED LABOR: CASE STUDY OF DARLING MATTRESS KHON KAEN CO., LTD.

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### Abstract

A study of Mathematical Model of Determining Wage Payment for Tape Edging Skilled Labor Case Study of Darling Mattress Khon Kaen Co.,Ltd. has a main purpose to develop a suitable motivated strategic paying method for tape edging skilled labor employee in order to enhance the number of mattresses. Thus the study is consisted of study of tape edging activity, study of wage paying methods by interviewing and collecting data from stakeholders. This is for evaluation the degree of influential factors to the sewing time and for explanations of statistical linear equation with variables between the factors and sewing time. The result shows up that “Year of Working”, “Mattress Type” and “Mattress Size” effect differently to the sewing time. After the equation was finalized, every average sewing time was calculated by using the equation then conversed into a wage per piece. The Standard Hour Plan System paying method combined with the 10 percent rate from Merrick Multiple Piece Rate System had been chosen suitably for this plant to solve the problem in this study. Number of mattresses which are sewed over the standard will be calculated as an added to his wage. The company can reduced the average cost in every mattress and be ready to distribute mattresses in the market. Importantly this strategy will greatly motivate the worker in every working day.

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**Keywords:** Skilled labor, Tape edging mattress, Wage payment, Incentive, Mathematical model



## Introduction

Nowadays mattress and bedding accessory markets are highly competitive in Thailand and abroad country because there is a growth beside the real estate business. This circumstance effects many mattress brand entrepreneur engaged in the market in order to seize the market share. With the competitive market, Darling Mattress Khon Kaen's executives consider labor force as one of the most important factors for the production. From the past, the company does not realize the capability of the labor force so this effect to the opportunity loss of using their mankind power and cannot persuade them to develop their skills. Some of the skilled works are paid daily which is unpleasant to the workers[1]. The tape edge workers are the one so their managers intend to determine a new wage payment policy[2] for the tape edge workers by paying them based on their performance for the fairness. This problem is led to the study of their work factors and the study of their performance in order to analyze and determine a mathematical model to use for paying the incentive wage for fairness to both sides and conforming to the present situation.

## Objectives

To determine wage payment an incentive mathematical model for tape edging skilled labor at Darling Mattress Khon Kaen Co., Ltd.

## Methodology

Researcher started with the study of tape edging activity and their wage payment. This is for understanding the present circumstance and searching for a new direction of policy. Then researcher set factors ("Year of Working", "Mattress Type" and "Mattress Size") which influence to the working time, determined the number of data by using Rule of Thumb which is 30 samplings in each subgroup. There are 27 subgroups in this case from the factors: 1 Year, 5 Years, 7 Years, Type A, Type B, Type C, 3.5 feet size, 5 feet size and 6 feet size All data are in nominal scale. After those steps, Researcher started to collect the data and analyze them with ANOVA, Post Hoc Test and Parameter Estimates tools. At this point, researcher had an equation to predict a working time into a working standard time with any set of factors which were studied. Researcher calculated all the possible outcomes for comparing, analyzing, calculating to determine a new wage payment policy. Finally when researcher had a new model of calculation from the new policy, the tool was created in Excel program for the ease of use.

## Results

According to the study, three factors which are "Year of Working", "Mattress Type" and "Mattress Size" have the influence on the time of work differently at the statistic significant 0.05. The "Year of Working" was differently classified and arranged from high to low working time (1 year, 5 years and 7 years). The "Mattress Type" was differently classified and arranged from low to high working time (Type A, Type B and Type C). The "Mattress Size" was differently classified

and arranged from low to high working time (3.5 feet size, 5 feet size and 6 feet size). They are all presented in Table 1.

**Table 1** Relation between working time vs Year of Working, Mattress Type, Mattress Size.

Mattress Type	Mattress Size / Year of Working	1 Year	5 Years	7 Years
A	3.5'	8.28	6.06	5.79
	5'	10.44	7.81	7.36
	6'	11.42	8.12	7.83
B	3.5'	15.16	12.51	12.18
	5'	18.52	14.51	14.26
	6'	21.05	16.38	15.86
C	3.5'	29.99	24.54	20.55
	5'	45.31	29.22	25.57
	6'	48.76	30.13	28.02

According to working time from three skilled labors, researcher sets 5 years of working time as a standard for calculate a new wage payment policy which is shown in Table 2.

**Table 2** Present the working standard time of 5 years of working and the adjusting wage 10% when skilled labor does the tape edging over standard.

Mattress Type (T)	Mattress size (S)	Time used (minute)	Increased wage 10% (Baht) g(T,S)
A	3.5'	6.06	4.81
	5'	7.81	6.19
	6'	8.12	6.44
B	3.5'	12.51	9.92
	5'	14.51	11.51
	6'	16.38	12.99
C	3.5'	24.54	19.46
	5'	29.22	23.17
	6'	30.13	23.89



## Conclusion

According to the study, all of three factors which are “Year of Working”, “Mattress Type” and “Mattress Size” have significantly an influence in the tape edging time. The high year of worker can do the work faster than the lower year of worker so that company should have the incentive for the high year worker compared in Table 1. The type A B and C mattress have an influence in the time from low to high relatively and also the size 3.5’, 5’ and 6’ have an influence in the time from low to high relatively.

From the considered standard hour plan and the interview from human resource manager led to the result by adding extra wage follow the performance-based pay concept combining with the 10% rate from Merrick Multiple Piece Rate System when worker can do the number of tape edging mattress over the standard 430 minutes each day. This mathematical model will be used and recorded all data which are produce over standard.

According to the tape edging skilled labors’ interview, they were in the first level of Maslow needs (Physiology needs “Money” for spending in daily life) which is conformed to the research by Theresa Chaudhry and Christopher Woodruff[3] said that increasing in wage for production worker affect them to follow the company condition. Researcher would expect the same result in the study, Darling Mattress Khon Kaen CO., LTD agreed to pay extra wage in each piece of mattress when the number of mattresses were done over standard. Researcher developed from Performance-Based Pay[4] and Standard Hour Plan. The result of the new policy was selected by using Standard Hour Plan combine with Merrick Multiple Piece Rate System which is present as the Equation (1).

$$\begin{aligned} \text{Daily wage} &= \text{Normal wage} + \text{Increased extra wage each piece } 10\% \\ \text{Daily wage} &= \text{Normal wage} + g(T,S) \end{aligned} \quad (1)$$

Increased extra wage each piece 10% from standard cost is shown in Table 2. It will be added up when worker can do the tape edging mattress over standard 430 minutes cumulatively in each days.

## Suggestions

The suggestion for developing a rate incentive in the model, if the rate is increased from 10% to 30% from standard cost per piece will affect strongly to the daily wage but it can affect to the overall cost to be lower a little bit in each mattress. Comparing to the overtime, workers will receive 1.5 time of normal daily wage but for the incentive model only tape edging worker will receive 1.3 times of normal piece rate. They will get lower wage compare to overtime wage 19-95 Satang only but they don’t need to be work for overtime presented in Table 3. The executive can adjust a higher rate in order to impel workers to do more work.

**Table 3** Comparing wage between overtime and 30% increased wage

Mattress Type	Mattress Size	Time used [1]	Mattress amount [2]*	Average wage per mattress (Baht/mattress)		Diff [3] - [4]
				OT [3]**	30% [4]	
A	3.5'	6.06	9.90	5.87	5.68	0.19
	5'	7.81	7.68	7.57	7.32	0.25
	6'	8.12	7.39	7.87	7.61	0.26
B	3.5'	12.51	4.80	12.12	11.72	0.40
	5'	14.51	4.14	14.06	13.6	0.46
	6'	16.38	3.66	15.87	15.35	0.52
C	3.5'	24.54	2.44	23.77	23	0.77
	5'	29.22	2.05	28.31	27.39	0.92
	6'	30.13	1.99	29.19	28.24	0.95

$$* [2] \text{ mattress per hour} = \frac{8 \text{ hour/day}}{[1] \text{ minute/mattress}}$$

$$** [3] \text{ Baht per mattress} = \frac{\frac{310 \text{ Baht/day}}{60 \text{ minute/hour}} \times 1.5 \text{ times}}{[2] \text{ mattress/hour}}$$

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