Improving Work Productivity Using Time Study and Line Balancing Methods in the Stationary Area at PT. XYZ

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Abstract

The objectives of the study in PT. XYZ on the stationary area is to identify the product that doesn't meet the target, and those products are Memo Square No Glue, Memo Square Glue, A4 Paper 100 Sheets and A4 Paper 250 sheets. The first method used is the Stopwatch Time Study to calculate the cycle time of every work element, then followed by the Time Study method to calculate normal time and standard time by considering performance rating and allowance. The second method used is Line Balancing which serves to calculate the performance on every line. Line efficiency obtained for those 4 products are 49.30% ; 51.46% ; 45.47% ; 45.66%. Furthermore, the line suggestion is the calculation of line performance using Rank Positional Weight (RPW) and Kilbridge Wester (KW) methods which produce better performance than before, namely the RPW line efficiency of 85.87%; 74.59%; 68.03%; 73.84%. While line efficiency with KW is 66.11%; 74.60%; 71.75%; 58.33%.

Keywords
Kilbridge Wester, Line Balancing, Rank Positional Weigh, Time Study.

1. Introduction

Nowadays, the development of industries and companies in Indonesia is increasing. Along with the development of the industry and the company, thus also develops the need for paper to support the running of the industry and the company. Not only industries and companies need paper, but almost all elements of society need paper to support daily activities, such as schools, universities and various other agencies. This makes the paper manufacturing industry an industry that provides for the needs of various elements of society, namely the need for paper. PT. XYZ has been present to meet the needs of the community for paper from 1977 until now. Based on the statement of PT. XYZ on its website, currently PT. XYZ has three factories located in three different locations, including an integrated pulp and paper mill in Perawang - Riau, a paper mill industry in Serang - Banten, and Tangerang IKPP, which has the smallest capacity among the two other factories but is the most profitable mill.

There are two business processes at PT. XYZ Tangerang. The first business process starts from processing raw materials, namely pulp paper, which will be processed using a machine until it becomes a paper roll. After that, the paper roll will be input for the second business process, which is a process in the stationary area consisting of the process of cutting, sorting, and converting until the paper material is ready to be distributed to the public. In the area of business processes, stationary often occurs a bottleneck and delay, resulting in the non-fulfilment target of the management. Therefore, planning and controlling each activity in the stationary area must be carried out. Planning and control can be done by measuring every activity in the process in the stationary area. Products contained in the stationary area used as observation material are Memo Square No Glue, Memo Square Glue, A4 100 Sheets, and A4 250 Sheets. The targets for the achievement of the four products is 500 packs of Memo Square No Glue, 450 pack of Memo Square Glue, 450 packs of Paper A4 100 Sheets, and 480 packs of Paper A4 250 Sheets. All production results are targets per day in one work line. However, on average, the results of achieving production only produce 376 packs for all products. The output results that are still far from the target make the research team take measurements of each process and conduct evaluations for productivity and work efficiency. Measurements made are ultimately expected to increase production productivity and improve the work efficiency of the product work process in the stationary area. Measurements of these activities are carried out to see how much time is needed by labor and also to find out how much the level of activity is carried out by the companies and workers to produce a product.

To measure every activity carried out by the company, an accurate measurement method is needed so that it can

provide precise information on the time needed and efficiency of the movement of each activity to produce a product. The method that can be used to measure the time of measured activities is the Time Study method. With the Time Study method, calculations can be made for each production process in PT. XYZ so that it can produce cycle times and standard time for each process. By getting standard time in each of these processes, it can also be known the capacity that can be produced by the workforce on a daily basis.

To reduce bottlenecks and delays in the process in the stationary area, it is necessary to allocate work stations and the equal distribution of work from each work operation. Therefore, the production line in the stationary area must be balanced in order to reduce or eliminate the delay so that the line becomes more effective and efficient. Therefore, it is required a method to evaluate the line of the production process in the stationary area is by using a Line Balancing. By using the line balancing method, the company can evaluate its production trajectory and can also improve the production trajectory with the aim of maximizing work efficiency in order to increase production output, reduce bottlenecks, and minimize imbalances from the production trajectory. The final result of line balancing calculation using Rank Positional Weight (RPW) and Kilbridge Wester (KW) methods will be a proposal or suggestion to the company to increase productivity in production and work efficiency in a production process in the stationary area at PT. XYZ.

2. Research Methodology

2.1 Field Observation

In the first stage, field observations are carried out first to find out all the processes that exist in the factory and look for issues that will be raised for research.

2.2 Problem Formulation

This stage aims to find out the problem points found in the company.

2.3 Literature Review

Literature study is a stage of activities that must be first carried out in the research process. This activity is useful to get information and materials about research that will be conducted and sourced from books or journals.

2.4 Data Collection

Data collection is the process of finding data that matches the required object. The data obtained will be used as a guide for data processing and data analysis. The data taken is work station data, manpower and cycle time data on each work element.

2.5 Data Processing

Data processing is the process of processing existing data in data collection, which will then be used for case studies. Data processing is usually in the form of calculations in accordance with the object of the case study that has been studied. After the results are obtained, problems arise. Data processing is done by data uniformity test, data adequacy test, adjustment factor and leeway factor, normal time and standard time, line balancing calculation on the current line, then the last is line balancing calculation using Rank Positional Weight (RPW) and Kilbridge method Wester (KW).

2.6 Discussion and Analysis the Results

After processing the data, it can be analyzed the results of the data processing, usually in the form of implementation of what has been done in data processing, will be adjusted to the appropriate theories. This discussion will aim to obtain a solution that is used to correct errors found in the identification of the problem.

2.7 Conclusions and Recommendations

Making conclusions obtained from the analysis of data processing that has been done, then from the analysis taken an outline to be concluded. Making suggestions based on case studies that have been done. The suggestions made are constructive and serve as input to improve.

3. Results and Discussion

3.1 Normal Time and Work Element Standard Time

Next is to do a normal time calculation (Wn). The calculation of Wn is seen based on adjustment factors, namely the

skill, effort, condition and consistency factors of each manpower in each work element. After getting Wn on each work element, then the next step is to make an assessment that is seen from the allowance factor that can affect work performance, namely the constant allowance factor and the variable allowance contained in appendix 6, then standard time (Wb) calculations are performed on each work element (Figure 1-8 and Table 1-12).

Table 1. Conclusions on the Calculation Results for Normal Time and Standard Time for Memo Square No Glue

Station	No	Work Element	WS (seconds)	P.	Wn (seconds)	K (%)	Wb (seconds)
CUT	1	CUT1	2.37	1.18	2.80	11	3.15
SORT	2	SORT1	25.88	1.13	29.24	11	32.85
	3	SORT2	26.89	1.13	30.39	11	34.15
CR	4	CR1	1.64	1.14	1.87	11	2.10
	5	CR2	1.84	1.14	2.10	11	2.36
	6	CR3	11.30	1.14	12.88	11	14.47
MCP	7	MCP1	2.72	1.18	3.21	11	3.61
	8	MCP2	30.19	1.18	35.62	11	40.02
	9	MCP3	3.64	1.18	4.30	11	4.83
MCS	10	MCS1	4.03	1.13	4.55	11	5,11
	11	MCS2	6.08	1.13	6.87	11	7.72
	12	MCS3	6.25	1.13	7.06	11	7.93
	13	MCS4	5.42	1.13	6.12	11	6.88
TOTAL			128.25	-	-	-	165.18

Table 2. Conclusions on the Calculation Results for Normal Time and Standard Time for Memo Square Glue

Station	No.	Work Element	WS (seconds)	P.	Wn (seconds)	K (%)	Wb (seconds)
CUT	1	CUT1	2.37	1.18	2.80	11	3.15
SORT	2	SORT1	25.88	1.13	29.24	11	32.85
	3	SORT2	26.89	1.13	30.39	11	34.15
CR	4	CR1	1.64	1.14	1.87	11	2.10
	5	CR2	1.84	1.14	2.10	11	2.36
	6	CR3	11.30	1.14	12.88	11	14.47
MCP	7	MCP1	2.72	1.18	3.21	11	3.61
	8	MCP2	30.19	1.18	35.62	11	40.02
	9	MCP3	3.64	1.18	4.30	11	4.83
PM	10	PM1	4.84	1.08	5.23	11	5.88
	11	PM2	13.83	1.08	14.94	11	16.79
	12	PM3	22.07	1.08	23.84	11	26.79
	13	PM4	6.04	1.08	6.52	11	7.33
MCS	14	MCS1	3.59	1.13	4.06	11	4.56
	15	MCS2	3.23	1.13	3.65	11	4.10
	16	MCS3	3.07	1.13	41.56	11	3.90
TOTAL			163.14	-	-	-	206.88

Table 3. Conclusions on the Calculation Results for Normal Time and Paper Time for A4 100 Sheets

Station	No.	Work Element	WS (seconds)	P.	Wn (seconds)	K (%)	Wb (seconds)

CUT	1	CUT1	2.37	1.18	2.80	11	3.15
SORT	2	SORT1	25.88	1.13	29.24	11	32.85
	3	SORT2	26.89	1.13	30.39	11	34.15
CR	4	CR1	1.64	1.14	1.87	11	2.10
	5	CR2	1.84	1.14	2.10	11	2.36
	6	CR3	11.30	1.14	12.88	11	14.47
MCP	7	MCP1	2.72	1.18	3.21	11	3.61
	8	MCP2	30.19	1.18	35.62	11	40.02
	9	MCP3	3.64	1.18	4.30	11	4.83
PB	10	PB1	1.43	1.16	1.66	9	1.82
	11	PB2	8.73	1.16	10.13	9	11.13
	12	PB3	1.44	1.16	1.67	9	1.84
TOTAL			118.08	-	-	-	152.34

Table 4. Conclusions on the Calculation Results for Normal Time and Paper Time for A4 250 Sheets

Station	No.	Work Element	WS (seconds)	P.	Wn (seconds)	K (%)	Wb (seconds)
CUT	1	CUT1	2.37	1.18	2.80	11	3.15
SORT	2	SORT1	25.88	1.13	29.24	11	32.85
	3	SORT2	26.89	1.13	30.39	11	34.15
CR	4	CR1	1.64	1.14	1.87	11	2.10
	5	CR2	1.84	1.14	2.10	11	2.36
	6	CR3	11.30	1.14	12.88	11	14.47
MCP	7	MCP1	2.72	1.18	3.21	11	3.61
	8	MCP2	30.19	1.18	35.62	11	40.02
	9	MCP3	3.64	1.18	4.30	11	4.83
MCS	10	MCS1	2.76	1.13	3.12	11	3.51
	11	MCS2	3.22	1.13	3.64	11	4.09
	12	MCS3	3.01	1.13	3.40	11	3.82
	13	MCS4	3.17	1.13	3.58	11	4.02
TOTAL			118.64	-	-	-	152.98

3.2 Line Balancing with Rank Positional Weight

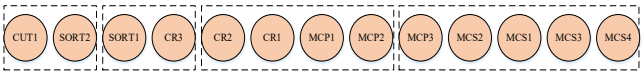

Figure 1. Division of Work Elements into Work Station Memo Square No Glue Using the RPW Method

Table 5. The State of Memo Square No Glue Line With RPW Method

Station	No	Weight Value	Work Element	Wb (seconds)	Wb Work Station (seconds)	Idle Time (seconds)
I	1	165.18	CUT1	3.15	37.30	10.79
	2	129.18	SORT2	34.15		
II	3	127.89	SORT1	32.85	47.32	0.77
	4	90.58	CR3	14.47		

III	5	78.46	CR2	2.36	48.09	0.00
	6	78.21	CR1	2.10		
	7	76.10	MCP1	3.61		
	8	72.50	MCP2	40.02		
IV	9	32.48	MCP3	4.83	32.47	15.62
	10	22.53	MCS2	7.72		
	11	19.92	MCS1	5.11		
	12	14.81	MCS3	7.93		
	13	6.88	MCS4	6.88		
TOTAL				165.18	-	27.18

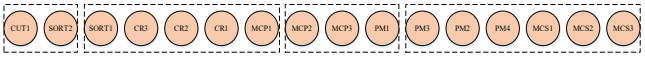

Figure 2. Division of Work Elements into Work Station Memo Square Glue Using the RPW Method

Table 6. The State of Square Glue Memo Line with RPW Method

Station	No.	Work Element	Wb (seconds)	Wb Work Station (seconds)	Idle Time (seconds)
I	1	CUT1	3.15	37.3	18.17
	2	SORT2	34.15		
II	3	SORT1	32.85	55.39	0.08
	4	CR3	14.47		
	5	CR2	2.6		
	6	CR1	2.10		
	7	MCP1	3.61		
III	8	MCP2	40.02	50.73	4.74
	9	MCP3	4.83		
	10	PM1	5.88		
IV	11	PM3	26.79	55.47	0
	12	PM2	16.79		
	13	PM4	7.33		
	14	MCS1	4.56		
V	15	MCS2	4.10	8.00	47.47
	16	MCS3	3.90		
TOTAL			206.88	-	70.46

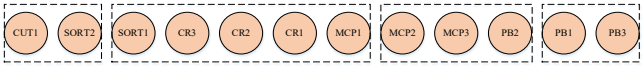

Figure 3. Division of Work Elements into Work Station A4 100 Sheets Paper Using the RPW Method

Table 7. The State of A4 100 Sheets Paper Line With RPW Method

Station	No.	Work Element	Wb (seconds)	Wb Work Station (seconds)	Idle Time (seconds)
I	1	CUT1	3.15	37.3	18.68
	2	SORT2	34.15		
II	3	SORT1	32.85	55.39	0.59
	4	CR3	14.47		

	5	CR2	2.36		
	6	CR1	2.10		
	7	MCP1	3.61		
III	8	MCP2	40.02	55.98	0
	9	MCP3	4.83		
	10	PB2	11.13		
IV	11	PB1	1.82	3.66	52.32
	12	PB3	1.84		
TOTAL			152.34	-	71.59

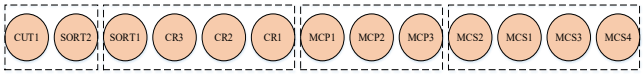

Figure 4. Division of Work Elements into A4 250 Sheets Paper Work Station Using the RPW Method

Table 8. The State of A4 250 Sheets Paper Line Using the RPW Method

Station	No.	Work Element	Wb (seconds)	Wb Work Station (seconds)	Idle Time (seconds)
I	1	CUT1	3.15	37.29	14.49
	2	SORT2	34.15		
II	3	SORT1	32.85	51.79	0.00
	4	CR3	14.47		
	5	CR2	2.36		
	6	CR1	2.10		
III	7	MCP1	3.61	48.46	3.33
	8	MCP2	40.02		
	9	MCP3	4.83		
IV	10	MCS2	4.09	15.44	36.35
	11	MCS1	3.51		
	12	MCS3	3.82		
	13	MCS4	4.02		
TOTAL			**152.98**	**-**	**54.17**

3.3 Line Balancing with Kilbridge Wester

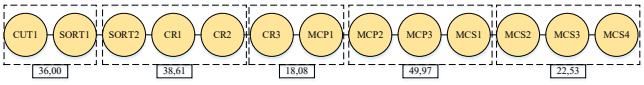

Figure 5. Division of Work Elements into Work Station Memo Square No Glue With KW Method

Table-9. The State of Memo Square No Glue Line with KW Method

Station	No	Work Element	Column	Wb	Wb work station	Idle time
I	1	CUT1	A	3.15	36.00	13.97
	2	SORT1	B	32.85		
II	3	SORT2	B	34.15	38.61	11.36
	4	CR1	C	2.10		

	5	CR2	C	2.36		
III	6	CR3	C	14.47	18.08	31.89
	7	MCP1	D	3.61		
IV	8	MCP2	E	40.02	49.97	0.00
	9	MCP3	F	4.83		
	10	MCS1	G.	5.11		
V	11	MCS2	G.	7.72	22.53	27.43
	12	MCS3	H	7.93		
	13	MCS4	I	6.88		
TOTAL				**165.18**	**-**	**84.65**

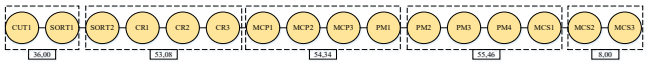

Figure 6. Division of Work Elements into Work Station Memo Square Glue Using the KW Method

Table 10. The State of Square Glue Memo Line with KW Method

Station	No	Work Element	Column	Wb	Wb work station	Idle time
I	1	CUT1	A	3.15	36.00	19.46
	2	SORT1	B	32.85		
II	3	SORT2	B	34.15	53.08	2.38
	4	CR1	C	2.10		
	5	CR2	C	2.36		
	6	CR3	C	14.47		
III	7	MCP1	D	3.61	54.34	1.12
	8	MCP2	D	40.02		
	9	MCP3	F	4.83		
	10	PM1	G.	5.88		
IV	11	PM2	H	16.79	55.46	0.00
	12	PM3	H	26.79		
	13	PM4	I	7.33		
	14	MCS1	J	4.56		
V	15	MCS2	J	4.10	8.00	47.46
	16	MCS3	K	3.90		
TOTAL				206.88	-	70.43

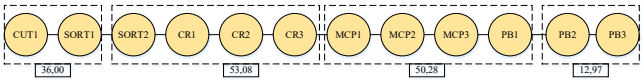

Figure 7. Division of Work Elements into A4 100 Sheets paper Work Station with the KW Method

Table 11. The State of A4 Sheets Paper Line with the KW Method

Station	No	Work Element	Column	Wb	Wb work station	Idle time
I	1	CUT1	A	3.15	36.00	17.08
	2	SORT1	B	32.85		
II	3	SORT2	B	34.15	53.08	0.00
	4	CR1	C	2.10		

	5	CR2	C	2.36		
	6	CR3	C	14.47		
III	7	MCP1	D	3.61	50.28	2.79
	8	MCP2	D	40.02		
	9	MCP3	F	4.83		
	10	PB1	G.	1.82		
IV	11	PB2	G.	11.13	12.97	40.11
	12	PB3	H	1.84		
TOTAL				152.34	-	59.98

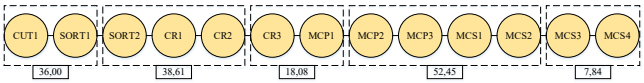

Figure 8. Division of Work Elements into A4 250 Sheets Paper Work Station Using the KW Method

Table 12. The State of A4 Sheets Paper Line with the KW Method

Station	No	Work Element	Column	Wb	Wb work station	Idle time
I	1	CUT1	A	3.15	36.00	16.45
	2	SORT1	B	32.85		
II	3	SORT2	B	34.15	38.61	13.84
	4	CR1	C	2.10		
	5	CR2	C	2.36		
III	6	CR3	C	14.47	18.08	34.37
	7	MCP1	D	3.61		
IV	8	MCP2	D	40.02	52.45	0.00
	9	MCP3	F	4.83		
	10	MCS1	G.	3.51		
	11	MCS2	G.	4.09		
V	12	MCS3	H	3.82	7.84	44.61
	13	MCS4	I	4.02		
TOTAL				**152.98**	**-**	**109.27**

3.4 Comparison of Current Line Performance, RPW Line Performance and KW Line Performance

Table 13. Comparison Between Performance of All Memo Square No Glue Line Values

	Currently	RPW	KW
Longest Work Station Time (seconds)	67.00	48.09	49.97
Line Efficiency (%)	49.30%	85.87%	66.11%
Balance Delay (%)	50.69%	14.12%	33.88%
Smoothness Index	90.99	19	45.75
Number of Work Stations	5	4	5
Per Day Output (unit)	376	524	504

It can be seen in Table 13 the comparison performance between current lines, lines using the RPW method and lines with the KW method. On the current line, the longest workstation time is 67.00 seconds, namely at the SORT work station, which has SORT1 and SORT2 working elements which are paper sorting. In the line with the RPW method, it is obtained that the longest work station time is 48.09 seconds, at work station III, with work elements CR2, CR1, MCP1 and MCP2. In the line with the KW method, the longest work station time is 49.97 seconds at work station IV with work elements MCP2, MCP3 and MCS1. From the RPW and KW methods, obtained the longest workstation time. The shortest is from the RPW method, which is equal to 48.09 seconds. In terms of line efficiency, a greater percentage is generated by the RPW method, which is 85.87% when compared to the KW method with a yield of 66.11%, then followed by a smaller balance delay value also obtained by the RPW method, which is 14.12% when compared with the KW method with 33.88% results. From the smoothness index, it is also obtained the smallest value, namely the RPW method with a value of 19 when compared with the KW method of 45.75.

Table 14. Comparison Between Performance of All Memo Square Glue Line Values

	Currently	RPW	KW
Longest Work Station Time (seconds)	67.00	55.47	55.46
Line Efficiency (%)	51.46%	74.59%	74.60 %
Balance Delay (%)	48.53%	25.40%	25.39 %
Smoothness Index	98.99	53.46	51.36
Number of Work Stations	6	5	5
Per Day Output (unit)	376	454	454

It can be seen in table 14 the comparison between current line performance, line performance with the RPW method and line performance with the KW method. On the current line, the longest workstation time is SORT, which is 67.00 seconds with SORT1 and SORT2 work elements, which are paper sorting. In the calculation of line performance using the RPW method, the longest work station time is 55.47 seconds at work station IV with work elements PM3, PM2, PM4 and MCS1. Then the KW method generated the longest work station time of 55.46 seconds at work station IV with work elements PM2, PM3, PM4 and MCS1. From the RPW and KW methods, the longest smaller workstation time is the KW method which is 55.46 seconds. In line efficiency, a greater percentage is obtained by the KW method, which is 74.60%, compared to the RPW method, which is 74.59%. Then proceed with the search for the smallest value of the balance delay in the KW method, which is equal to 25.39%, when compared with the RPW method, which is equal to 25.40%. In terms of smoothness index also obtained the smallest value with the KW method of 51.36 when compared with the RPW method, which is equal to 53.46.

Table 15. Comparison Between Performance of All 100 Sheets A4 Paper Line Values.

	Currently	RPW	KW
Longest Work Station Time (seconds)	67.00	55.98	53.08
Line Efficiency (%)	45.47%	68.03%	71.75 %

Balance Delay (%)	54.52%	32.01%	28.24 %
Smoothness Index	97.24	55.55	43.68
Number of Work Stations	5	4	4
Per Day Output (unit)	376	450	475

It can be seen in table 15 the comparison between current line performance, line performance with the RPW method and line performance with the KW method. On the current line, the longest workstation time is SORT, which is 67.00 seconds with SORT1 and SORT2 work elements, which are paper sorting. In the calculation of line performance using the RPW method, the longest work station time is 55.98 seconds at work station III with work elements MCP2, MCP3 and PB2. Then the KW method generated the longest work station time, which is 53.08 seconds at work station II with work elements SORT2, CR1, CR2 and CR3. From the RPW and KW methods, the longest smaller workstation time is the KW method, which is 53.08 seconds. In line efficiency, a greater percentage is generated by the KW method, which is 71.75%, compared to the RPW method, which is 68.03%. Then proceed with the search for the smallest value of the balance delay in the KW method, which is equal to 28.24%, when compared with the RPW method, which is equal to 32.01%. In terms of smoothness index also obtained the smallest value with the KW method of 43.68 when compared with the RPW method.

Table 16. Comparison Between the Performance of All A4 Sheets 250 Paper Line Values

	Currently	RPW	KW
Longest Work Station Time (seconds)	67.00	51.79	52.45
Line Efficiency (%)	45.66%	73.84 %	58.33 %
Balance Delay (%)	54.33%	26.15 %	41.66 %
Smoothness Index	96.9	39.27	60.27
Number of Work Stations	5	4	5
Per Day Output (unit)	376	486	480

It can be seen in table 16 comparing performance between current lines, lines using the RPW method and lines with the KW method. On the current line, the longest work station time is 67.00 seconds, which at the SORT work station with SORT1 and SORT2 working elements which are paper sorting. In the line with the RPW method, it is obtained that the longest work station time is 51.79 seconds at work station II with work elements SORT1, CR3, CR2 and CR1. In the line with the KW method, the longest work station time is 52.45 seconds at work station IV with work elements MCP2, MCP3, MCS1 and MCS2. From the RPW and KW methods obtained the longest workstation time, the shortest is from the RPW method, which is equal to 51.79 seconds. In terms of line efficiency, a greater percentage is generated by the RPW method, which is 73.84%, when compared to the KW method with a yield of 58.33%, followed by a smaller balance delay value also obtained by the RPW method, which is 26.15% when compared with the KW method with 41.66% results. From the smoothness index, it is also obtained the smallest value, namely the RPW method with a value of 39.27 when compared to the KW method, which is 60.27.

4. Conclusion

The following is the conclusion of the analysis that has been delivered:

1. Calculation of normal time is done by considering the adjustment factor on each manpower in each work station. The adjustment factors are the skill, effort, condition and consistency possessed by each manpower. The calculation of standard time is done by considering the leeway factor or loose time of the manufacturing process of the product. The easing factors are constant allowance and variable allowance.

2. Current line performance calculation is done by calculating the Line Efficiency value, which is a comparison of the total time per work station to the relation of cycle time to the number of work stations. Then the Balance Delay value is the ratio between idle time to cycle time and the number of workstations. In other words, the amount between Balance Delay and Line Efficiency is equal to one. Furthermore, the Smoothness Index value is an index that shows the relative smoothness of an equilibrium assembly line.
3. Based on the calculation of line performance using the Rank Positional Weight (RPW) and Kilbridge Wester (KW) methods, the following conclusions are generated (Table 17).

Table 17. Proposal Conclusion with RPW and KW

	Memo Square No Glue	Memo Square Glue	A4 100 Sheets Paper	A4 250 Sheets Paper
	RPW	KW	KW	RPW
Line Efficiency (%)	85.87%	74.60%	71.75%	73.84%
Balance Delay (%)	14.12%	25.39%	28.24%	26.15%
Smoothness Index	19	51.36	43.68	39.27

For the Memo Square No Glue product, the best method that is used as a proposal is the RPW method, which produces a line efficiency value of 85.87%, a balance delay value of 14.12%, and a smoothness index value of 19. For Memo Square Glue products, the best method used as a proposal is the KW method, which produces an efficiency value of 74.50%, a balance delay value of 25.39%, and a smoothness index value of 51.36%. For A4 100 Sheets Paper products, the best method used as a proposal is the KW method, which produces an efficiency value of 71.75%, a balance delay value of 28.24%, and a smoothness index value of 43.68. For A4 250 Sheets Paper products, the best method that is used as a proposal is the RPW method which produces an efficiency value of 73.84%, a balance delay value of 26.15%, and a smoothness index value of 39.27.

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