

Forecasting Of Optimal Raw Material Supplies For Paving Block Making In UD. Karya Jaya

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Abstract—UD. Karya Jaya is one of the manufacturing companies engaged in the production of paving blocks, located in Keude Bungkah Village, Muara Batu, North Aceh. In the implementation of the production system, the company has been using machines and equipment that has been adapted to technological developments. In the sense, the machine used is a machine designed by the company, which has the level and effectiveness of production 99% has a perfect success for its products. In producing paving blocks, the raw materials used are cement, sand, gravel and paint additives. Such raw materials shall always be available for the smoothness of production. Available means according to production needs. Based on the above, it is necessary to calculate the inventory forecasting to avoid the accumulation of raw materials. The results showed that the forecasting method used to predict the demand of raw materials in the month of August 2017-July 2018 is Cement raw material is linear method, Sand raw materials is a quadratic method, raw materials of gravel and paints are linear methods. With the result of the forecast that is the amount of raw material demand for the period of August 2017-July 2018 average per month is the cement is 1098 sacks, Sand is 20 trucks, the gravel is 8 trucks and the paint is 105 sacks.

Keywords— *Production; Forecasting; Raw Materials.*

I. INTRODUCTION

UD. Karya Jaya is one of the manufacturing industry engaged in the production of materials for building needs such as brick and paving block located in Keude Bungkah, Muara Batu, North Aceh. In the implementation of the production system the raw materials used are cement, sand, gravel and paint. such raw materials shall always be available for the smoothness of production. In fulfillment of its requirement, the company does not have the planned amount of order, in the sense that the company makes inventory only based on past experience only, and its nature is fixed every month. Inventories that are too large or too small can cause problems in the company. Lack of inventory will result in the production process is hampered. So that consumer demand can not be fulfilled at the right time. This research is conducted to plan

the planning and control of raw materials more efficient. Planning method that will be used is forecast raw material inventory, so that the raw material needs can be controlled as needed.

II. LITERATURE REVIEW

2.1 Forecasting

A good production capacity plan should be in line with demand. Future conditions are not predictable so that business people are unwilling to work with an uncertain future condition orientation. Attempts to minimize uncertainty are commonly accomplished by certain methods or forecasting techniques. Forecasting is the art and science of predicting future events by retrieving historical data and projecting it into the future using several forms of mathematical models. Forecasting is the application of a model that has been developed in the future [1].

The main purpose of forecasting is to predict future demand. Forecasting will never be perfect, but even so the results of forecasting will provide direction for a plan [2].

When viewed from the time horizon, the purpose of forecasting can be classified into 3 (three) groups, are [3]:

- a. Long term forecasting, generally 5 to 20 years, this planning is used for production planning and resource planning, in this case the role of top management is needed in planning the purpose of forecasting.
- b. Medium term forecasting, generally monthly or quarterly, is used to determine cash flow calculations and budget determination on production planning and control, in this case the middle management role required in planning forecasting purposes.
- c. Short term forecasting, generally daily or weekly, is used to make decisions in relation to the scheduling of labor, machine, raw materials and other. Short term production resources, the role of Low Management is needed in setting forecasting objectives.

2.2 Forecasting Method

In forecasting systems, the use of forecasting methods greatly affects the results of forecasting obtained. of the nature of its users, then forecast can be divided into two types, namely [4]:

- a. Forecasting is subjective, forecasting based on intuition or user feeling. the nature and characteristics of the user forecasting, greatly affect whether or not the forecasting results obtained.
- b. Forecasting is objective, forecasting based on past data. The use of this method is done by using certain calculation techniques followed by analysis of forecasting results.

Based on the nature of the prediction then generally forecasting method is classified into 2 (two) parts, that is the method of qualitative forecasting and the method of quantitative forecasting. The classification of forecasting methods based on the predicted nature of the prediction can be seen in Figure 1 [5].

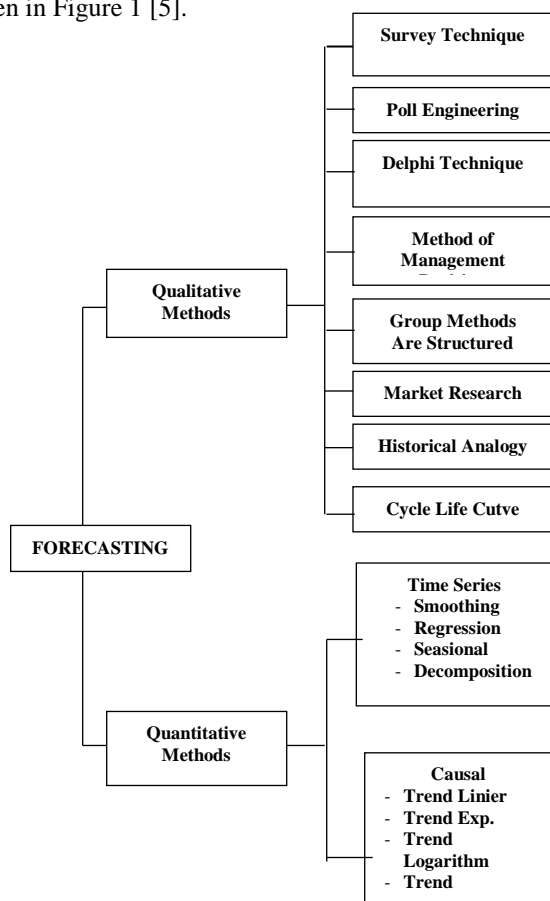


Figure 1 Classification of Forecasting

In doing the calculation of the method of quantitative forecasting, required forecasting steps, namely:

1. Define the purpose of forecasting.
2. Preparation of scatter diagrams (scatter diagram).
3. Selection of at least two forecasting methods deemed appropriate.

4. Calculation of the parameters of the forecasting function.
5. Calculation of errors of each forecasting method.
6. Selection of the best method by looking at the results of the calculation method with the smallest error.
7. Verify forecasting.

III. RESEARCH METHODS

The research method used is the method of forecasting calculation that begins with the determination of forecasting purposes, depiction scatter diagram, determination and selection of forecasting method used, calculation of forecasting error, verification of forecasting results and ending by calculation of forecasting results for the next year.

IV. RESULTS

4.1 Data of Raw Material

The following is data of demand for raw material of paving block on UD. Karya Jaya Period August 2016-July 2017, which can be seen in Table 1.

Table 1 Data of Raw Material Demand on Paving Block Making

No	Month	Total of Cement (Sacks)	Amount of Sand (Truck)	Number of Gravel (Truck)	Number of Paint (Sacks)
1	August	1030	21	8	106
2	September	1030	21	7	103
3	October	1000	20	9	107
4	November	1050	22	8	105
5	December	1000	20	7	103
6	January	1050	22	9	105
7	February	1080	23	8	108
8	March	1100	24	9	110
9	April	1050	22	7	100
10	Mey	1070	23	8	105
11	June	1050	22	8	103
12	July	1050	22	8	105
Total		12555	258	94	1251

4.2 Forecasting Calculation of Raw Material Requirement for Paving Block Making

Forecasting is the beginning of the calculation that will be done by using the Time series method. Here are the steps of forecasting done, including are as follows:

1. Determining the purpose of forecasting.
The purpose of this forecast is to determine the amount of demand for raw materials paving block UD. Karya Jaya period August 2017-July 2018. The raw materials are: Cement, Sand, Gravel, Paint.
2. Create a scatter diagram.

Here is a scatter diagram of each raw material can be seen in Figure 2-Figure 5.

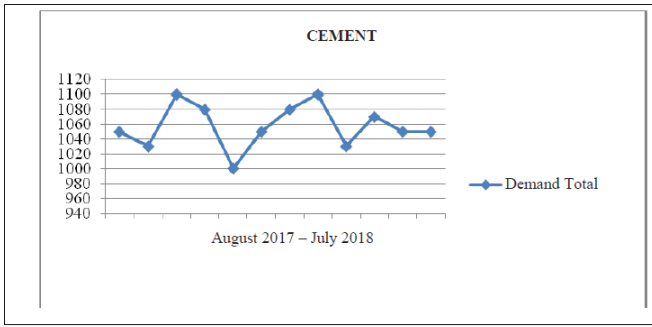


Figure 2 Scatter Diagram of Total Demand Cement Raw Materials at UD. Karya Jaya

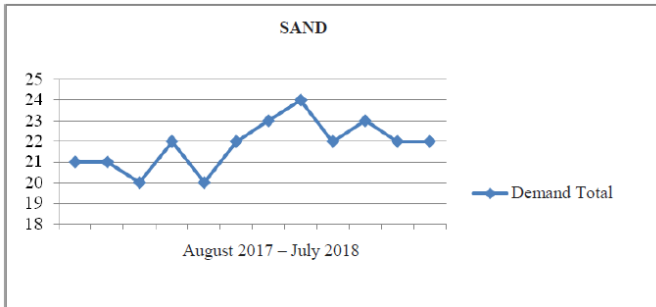


Figure 3 Scatter Diagram of Total Demand Sand Raw Materials at UD. Karya Jaya

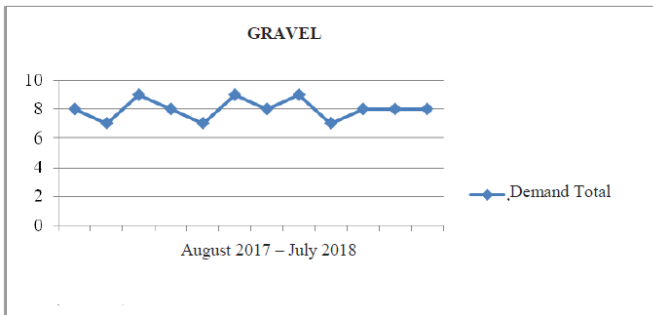


Figure 4 Scatter Diagram of Total Demand Gravel Raw Materials at UD. Karya Jaya

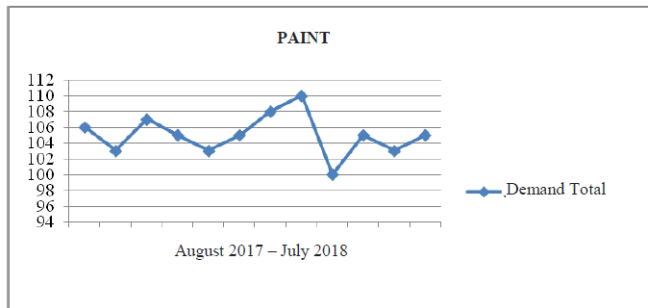


Figure 5 Scatter Diagram of Total Demand paint Raw Materials at UD. Karya Jaya

3. Choosing a forecasting methods.

The forecasting methods chosen to forecast data include constant, linear, quadratic, exponential, and cyclical methods.

4. Forecasting parameters.

a. Constant Method

Forecasting Function is

$$Y' = \frac{\sum_{t=1}^n Y}{n}$$

(1)

The following is the result of the calculation of forecasting parameters for the constant method as shown in Table 2-Table 5.

Table 2 Calculation of Forecasting Parameters Constant Method of Cement Raw Materials

Month (2017-2018)	t	Y
August	1	1030
September	2	1030
October	3	1000
November	4	1050
December	5	1000
January	6	1050
February	7	1080
March	8	1100
April	9	1050
Mey	10	1070
June	11	1050
July	12	1050
Total	78	12560

$$Y' = \frac{\sum Y}{n} = \frac{12.560}{12} = 1.046,67$$

The forecasting function is: $Y' = 1,046.67$
 The same calculation is done for the raw material of sand with a total of 262 the forecasting function is: $Y' = 21,833$, Total Gravel Raw Materials with 96 the forecasting function is: $Y' = 8$ and Paint Raw Material with Total 1260 the forecasting function is: $Y' = 105$.

b. Linear Method

Forecasting Function is $Y' = a + bx$ (2)

$$b = \frac{n \sum tY - \sum Y \sum t}{n \sum t^2 - (\sum t)^2}$$
 (3)

$$a = \frac{\sum Y - b \sum t}{n} \tag{4}$$

The result of calculation forecasting parameters for linear methods as shown in Table 3.

Table 3 Calculation of Forecasting Parameters for Linear Method of Cement Raw Materials

Month (2017-2018)	T	Y	tY	t ²
August	1	1030	1030	1
September	2	1030	2060	4
October	3	1000	3000	9
November	4	1050	4200	16
December	5	1000	5000	25
January	6	1050	6300	36
February	7	1080	7560	49
March	8	1100	8800	64
April	9	1050	9450	81
Mey	10	1070	10700	100
June	11	1050	11550	121
July	12	1050	12600	144
Total	78	12.560	82250	650

$$b = \frac{n \sum tY - \sum Y \sum t}{n \sum t^2 - (\sum t)^2}$$

$$b = \frac{12(82.250) - (12.560)(78)}{12(650) - (78)^2}$$

$$b = \frac{7.320}{1.716}$$

$$b = 4,266$$

$$a = \frac{\sum Y - b \sum t}{n}$$

$$= \frac{712.690 - (4,266)(78)}{12}$$

$$= 1018,94$$

The equation is: $Y' = a + bt$
 $Y' = 1018,94 + 4,266t$

The same calculation is done for sand raw material with forecasting function $Y' = 20,605 + 0,189t$, Gravel Raw Material with forecasting function $Y' = 7,955 + 0,007t$ and Paint Raw Material with forecasting function $Y' = 105,591 - 0,091t$.

c. Quadratic Method

Forecasting function: $Y' = a + bt + ct^2$

The result of calculation forecasting parameters for quadratic method as shown in Table 4.

Table 4 Calculation of Forecasting Parameters for Quadratic Methods of Cement Raw Materials

Month (2017-2018)	t	t ²	t ³	t ⁴	Y	tY	t ² Y
August	1	1	1	1	1030	1030	1030
September	2	4	8	16	1030	2060	4120
October	3	9	27	81	1000	3000	9000
November	4	16	64	256	1050	4200	16800
December	5	25	125	625	1000	5000	25000
January	6	36	216	1.296	1050	6300	37800
February	7	49	343	2.401	1080	7560	52920
March	8	64	512	4.096	1100	8800	70400
April	9	81	729	6.561	1050	9450	85050
Mey	10	100	1.000	10.000	1070	10700	107000
June	11	121	1.331	14.641	1050	11550	127050
July	12	144	1.728	20.736	1050	12600	151200
Total	78	650	6.084	60.710	12560	82250	687370

$$\alpha = \frac{\sum t \sum t^2 - n \sum t^3}{n \sum t^2 - (\sum t)^2}$$

$$= \frac{(78 \times 650) - (12 \times 6.084)}{12(650) - (78)^2}$$

$$= -22.308$$

$$\beta = \frac{(\sum t)^2 - n \sum t^2}{n \sum t^2 - (\sum t)^2}$$

$$= \frac{(78)^2 - (12 \times 650)}{12(650) - (78)^2} = -1.716$$

$$\gamma = \frac{(\sum t^2)^2 - n \sum t^4}{n \sum t^2 - (\sum t)^2}$$

$$= \frac{(650)^2 - (12 \times 60.710)}{12(650) - (78)^2}$$

$$= -306.020$$

$$\delta = \frac{\sum t \sum Y - n \sum tY}{n \sum t^2 - (\sum t)^2}$$

$$= \frac{(78 \times 12.560) - (12 \times 82.250)}{12(650) - (78)^2} = -7.320$$

$$\theta = \frac{\sum t^2 \sum Y - n \sum t^2 Y}{n \sum t^2 - (\sum t)^2}$$

$$= \frac{(650)(12.560) - (12)(687.370)}{12(650) - (78)^2} = -84.440$$

$$b = \frac{\gamma \delta - \theta \alpha}{\gamma \beta - \alpha^2}$$

$$= \frac{(-306.020)(-7.320) - (-84.440)(-22.308)}{(-306.020)(-1.716) - (-22.308)^2}$$

$$= 12,967$$

$$c = \frac{\theta - b \alpha}{\gamma}$$

$$= \frac{-84.440 - (12,967)(-22.308)}{-306.020} = 0,235$$

$$a = \frac{\sum dt - b \sum t - c \sum t^2}{n}$$

$$= \frac{12.560 - (12,967)(78) - (0,235)(650)}{12} = 949,666$$

The equation is: $Y' = 949,666 + 12,967t + 0,235t^2$

The same calculation is done for sand material with forecasting function $Y' = 19,728 + 0,565t - 0,029t^2$, Gravel Raw Material with forecasting function $Y' = 9,301 + 0,143t - 0,041t^2$ and Paint Raw Material with forecasting function $Y' = 105,123 + 0,396t - 0,05t^2$

d. Exponential Method

Forecasting function: $dt' = ae^{bt}$.

The result of the calculation of exponential parameter forecasting method as shown in Table 5.

Table 5 Calculation of Forecasting Parameters for Exponential Method of Cement Raw Materials

Month (2017-2018)	T	Y	t ²	ln Y	t ln Y
August	1	1030	1	6,937	6,937
September	2	1030	4	6,937	13,875
October	3	1000	9	6,908	20,723
November	4	1050	16	6,957	27,826
December	5	1000	25	6,908	34,539
January	6	1050	36	6,957	41,739
February	7	1080	49	6,985	48,893
March	8	1100	64	7,003	56,025
April	9	1050	81	6,957	62,609
Mey	10	1070	100	6,975	69,754
June	11	1050	121	6,957	76,522
July	12	1050	144	6,957	83,479
Total	78	12560	650	83,436	542,921

$$b = \frac{n \sum t \ln Y - \sum t \sum \ln Y}{n \sum t^2 - (\sum t)^2} \quad (13)$$

$$= \frac{12(542,921) - 78(83,436)}{12(650) - (78)^2} = 0,0041$$

$$\ln a = \frac{\sum \ln Y - b \sum t}{n} \quad (14)$$

$$= \frac{83,436 - (0,0041)(78)}{12} = 6,926$$

$$a = 1018,412,$$

The equation is: $Y' = 1018,412 e^{0,0041t}$

The same calculation is done for sand material with forecasting function $Y' = 20,594 e^{0,009t}$, Gravel Raw Material with forecasting function $Y' = 7,909 e^{0,0012t}$ and Raw Material with forecasting function $Y' = 105,531 e^{0,0009t}$.

e. Cyclical Method

Forecasting function:

$$Y' = a + b \sin \left(\frac{2\pi}{n} \right) + c \cos \left(\frac{2\pi}{n} \right)$$

The result of calculation of cyclic method forecasting parameters as shown in Table 6.

Table 6 Calculation of Forecasting Parameters for Cyclic Method of Cement Raw Materials

t	Y	Sin	Cos	YSin	YCos	Sin ²	Cos ²	Sin Cos
1	1030	-0,988	0,154	-1017,64	158,62	0,976	0,024	-0,152
2	1030	-0,305	0,952	-314,15	-980,56	0,093	0,907	0,290
3	1000	0,894	0,448	894	-448	0,799	0,201	-0,401
4	1050	0,581	0,814	610,05	854,7	0,337	0,663	0,473
5	1000	-0,715	0,699	-715	699	0,511	0,489	-0,500
6	1050	-0,801	0,598	-841,05	-627,9	0,642	0,358	0,479
7	1080	0,468	0,884	505,44	-954,72	0,219	0,781	-0,413
8	1100	0,945	0,326	1039,5	358,6	0,894	0,106	0,308
9	1050	-0,176	0,984	-184,8	1033,2	0,031	0,969	-0,173
10	1070	-1	0,022	-1070	-23,54	1,000	0,000	0,022
11	1050	-0,132	0,991	-138,6	1040,55	0,018	0,982	0,131
12	1050	0,959	0,284	1006,95	-298,2	0,920	0,080	-0,272
78	12560	-0,27	1,202	-225,3	1269,35	6,439	5,561	-0,208

$$\sum Y = n a + b \sum \sin + c \sum \cos \quad (15)$$

$$\sum Y \sin = a \sum \sin + b \sum \sin^2 + c \sum \sin \cos \quad (16)$$

$$\sum Y \cos = a \sum \cos + c \sum \cos^2 + b \sum \sin \cos \quad (17)$$

$$12.560 = 12a - 0,270b - 1,202c \dots\dots\dots (1)$$

$$-225,3 = -0,270a + 6,439b - 0,208c \dots\dots\dots (2)$$

$$-1.269,35 = -1,202a + 5,561c - 0,208b \dots\dots\dots (3)$$

Followed by the elimination of the data so that the acquired Function of Forecasting is:

$$Y' = 548,143 - 332,771 \sin - 4.902,201 \cos$$

The same calculations performed for sand raw materials with the Forecasting Function are $Y' = 20,191 + 0,957 \sin - 16,609 \cos$, Gravel Raw Material with forecasting function $Y' = 5,549 + 1,266$ forecast function $Y' = 92,309 + 5,337 \sin - 127,897 \cos$.

5. SEE Calculation

Calculation error using the method of SEE (Standard Error of Estimation) by using the formula.

$$SEE = \sqrt{\frac{\sum (Y - Y')^2}{n - f}} \quad (18)$$

Cement Raw Materials

1). Constant Method

Degree of freedom (f) = 1

Equation: $= 1,046.67$ and SEE calculations can be seen in Table 7.

Table 7 Calculation of SEE for Constant Method of Cement Raw Materials

Month (2017-2018)	T	Y	Y'	e = Y - Y'	e ²
August	1	1030	1.046,67	-16,67	277,89
September	2	1030	1.046,67	-16,67	277,89
October	3	1000	1.046,67	-46,67	2.178,09
November	4	1050	1.046,67	3,33	11,09
December	5	1000	1.046,67	-46,67	2.178,09
January	6	1050	1.046,67	3,33	11,09
February	7	1080	1.046,67	33,33	1.110,89
March	8	1100	1.046,67	53,33	2.844,09
April	9	1050	1.046,67	3,33	11,09
Mey	10	1070	1.046,67	23,33	544,29
June	11	1050	1.046,67	3,33	11,09
Juli	12	1050	1.046,67	3,33	11,09
Total	78	12560	12.560,04	-0,04	9.466,67

SEE = 29.336

2). Linear Method

Degree of freedom (f) = 1

Equation: $= 1018,94+4,266t$ and SEE calculations can be seen in Table 8.

Table 8 Calculation of SEE for Linear Method of Cement Raw Materials

Month (2017-2018)	T	Y	Y'	e = Y - Y'	e ²
August	1	1030	1023,206	6,794	46,15844
September	2	1030	1027,472	2,528	6,390784
October	3	1000	1031,738	-31,738	1007,301
November	4	1050	1036,004	13,996	195,888
December	5	1000	1040,27	-40,27	1621,673
January	6	1050	1044,536	5,464	29,8553
February	7	1080	1048,802	31,198	973,3152
March	8	1100	1053,068	46,932	2202,613
April	9	1050	1057,334	-7,334	53,78756
Mey	10	1070	1061,6	8,4	70,56
June	11	1050	1065,866	-15,866	251,73
July	12	1050	1070,132	-20,132	405,2974
Total	78	12560	12560,03	-0,028	6864,569

SEE = 26,200

3). Quadratic Method

Degree of freedom (f) = 3.

Equation: $949,666 + 12,967t + 0,235t^2$ and SEE calculations, SEE = 54,89

4). Exponential Method

Degree of freedom (f) = 2.

Equation: $1018,412 e^{0,0041t}$ and SEE calculations, SEE = 26,24

5). Cyclical Method

Degree of freedom (f) = 3.

Equation:

$548,143-332,771\sin-4.902,201\cos$,
SEE calculations, SEE = 3808,947

The recapitulation results of SEE value can be seen in Table 9.

Table 9 The recapitulation results of SEE value for Paving Block Making

Forecast Methods	Result of SEE Calculation			
	Cement	Sand	Gravel	Paint
Constant	29.336	1,192	0,742	2,629
Linear	26,200	1,028	0,774	2,811
Quadratic	54,89	1,026	1,768	2,924
Exponential	26,24	1,031	0,775	3,093
Cyclical	3808,947	12,994	19,882	99,084

6. Hypothesis Analysis

Hypothesis Analysis is done by finding the smallest SEE value, that is method of constant forecasting. The Constant method cannot be used, because the result value by using the Constant method will be constant or the same every month. So the comparison taken is the second and third of the SEE value.

a. Cement Raw Materials

Hypothesis testing is done by comparing SEE Linear with exponential SEE.

$$H_0 = SEE \text{ Linier} \leq SEE \text{ Eksponensial}$$

$$H_1 = SEE \text{ Linier} \geq SEE \text{ Eksponensial}$$

Testing statistics =

$$= 0,997$$

$$= 2,978$$

$$F_{hitung} \leq F_{tabel} \text{ maka } H_0 \text{ diterima.}$$

Conclusion:

The method used to forecasting demand, the cement raw material in the month of August 2017 - July 2018 is a linear method with forecasting function: $Y' = a + bt$, $Y' = 1018,94 + 4,266t$.

b. Sand Raw Materials

The method used to forecasting demand, the cement raw material in the month of August 2017 - July 2018 is a Quadratic method with forecasting function:

$$Y' = 19,728 + 0,565t - 0,029t^2$$

c. Gravel Raw Materials

The method used to forecasting demand, the cement raw material in the month of August 2017 - July 2018 is a Linear method with forecasting function: $Y' = a + bt$,

$$Y' = 7,955 + 0,007t$$

d. Paint Raw Materials

The method used to forecasting demand, the cement raw material in the month of August 2017 - July 2018 is a Linear method with forecasting function: $Y' = a + bt$,
 $Y' = 105,591 - 0,091t$

7. Forecast verification

The forecasting verification process is performed to determine whether the specified forecasting function is representative enough for the data to be foreseen. The results of the forecasting verification for cement raw materials can be seen in Table 10.

Table 10 Verification Results of Cement Raw Material Forecasting

Month (2017-2018)	T	Y	Y'	e = Y - Y'	MR
August	1	1030	1023,206	6,794	0
September	2	1030	1027,472	2,528	4,266
October	3	1000	1031,738	-31,738	34,266
November	4	1050	1036,004	13,996	45,734
December	5	1000	1040,27	-40,27	54,266
January	6	1050	1044,536	5,464	45,734
February	7	1080	1048,802	31,198	25,734
March	8	1100	1053,068	46,932	15,734
April	9	1050	1057,334	-7,334	54,266
Mey	10	1070	1061,6	8,4	15,734
June	11	1050	1065,866	-15,866	24,266
July	12	1050	1070,132	-20,132	4,266
Total	78	12560	12560,03	-0,028	324,266

= 29,479

Moving Range Chart Demand of Cement Raw Material can be seen in Figure 6.

The image shows that all data is within the control limit. This method is assumed to be quite representative because all data is within the control limit so that linear method forecasting can be used.

The forecasting result of demand for raw materials for paving blocks making in August 2017- July 2018 can be seen in Table 11-Table 14.

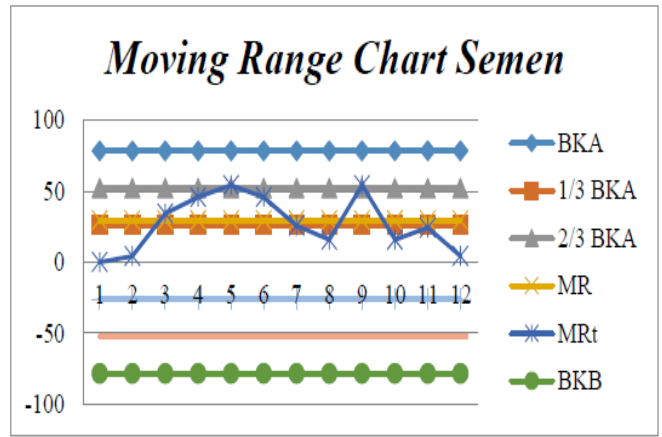


Figure 6 Moving Range Chart Demand of Cement Raw Material

Table 11 The forecasting result of demand for cement raw materials for paving blocks making in August 2017- July 2018

Month (2017-2018)	X (t)	Persamaan	Unit (Sacks)
August	13	$Y' = 1018,94 + 4,266t$	1074
September	14	$Y' = 1018,94 + 4,266t$	1079
October	15	$Y' = 1018,94 + 4,266t$	1083
November	16	$Y' = 1018,94 + 4,266t$	1087
December	17	$Y' = 1018,94 + 4,266t$	1091
January	18	$Y' = 1018,94 + 4,266t$	1096
February	19	$Y' = 1018,94 + 4,266t$	1100
March	20	$Y' = 1018,94 + 4,266t$	1104
April	21	$Y' = 1018,94 + 4,266t$	1109
Mey	22	$Y' = 1018,94 + 4,266t$	1113
June	23	$Y' = 1018,94 + 4,266t$	1117
July	24	$Y' = 1018,94 + 4,266t$	1121
Total			13,174

Raw material demand average per month = $13174/12 = 1098$ Sacks

Table 12 The forecasting result of demand for Sand raw materials for paving blocks making in August 2017- July 2018

Month (2017-2018)	X (t)	Persamaan	Unit (Trucks)
August	13	$Y' = 19,728 + 0,565t - 0,029t^2$	22
September	14	$Y' = 19,728 + 0,565t - 0,029t^2$	22
October	15	$Y' = 19,728 + 0,565t - 0,029t^2$	22
November	16	$Y' = 19,728 + 0,565t - 0,029t^2$	21
December	17	$Y' = 19,728 + 0,565t - 0,029t^2$	21
January	18	$Y' = 19,728 + 0,565t - 0,029t^2$	21
February	19	$Y' = 19,728 + 0,565t - 0,029t^2$	20
March	20	$Y' = 19,728 + 0,565t - 0,029t^2$	19
April	21	$Y' = 19,728 + 0,565t - 0,029t^2$	19
Mey	22	$Y' = 19,728 + 0,565t - 0,029t^2$	18
June	23	$Y' = 19,728 + 0,565t - 0,029t^2$	17
July	24	$Y' = 19,728 + 0,565t - 0,029t^2$	17
Total			239

Raw material demand average per month = $239/12 = 20$ Trucks

Table 13. The forecasting result of demand for Gravel raw materials for paving blocks making in August 2017- July 2018

REFERENCES

Month (2017-2018)	X (t)	Persamaan	Unit (trucks)
August	13	$Y' = 7,955+ 0,007t$	8
September	14	$Y' = 7,955+ 0,007t$	8
October	15	$Y' = 7,955+ 0,007t$	8
November	16	$Y' = 7,955+ 0,007t$	8
December	17	$Y' = 7,955+ 0,007t$	8
January	18	$Y' = 7,955+ 0,007t$	8
February	19	$Y' = 7,955+ 0,007t$	8
March	20	$Y' = 7,955+ 0,007t$	8
April	21	$Y' = 7,955+ 0,007t$	8
Mey	22	$Y' = 7,955+ 0,007t$	8
June	23	$Y' = 7,955+ 0,007t$	8
July	24	$Y' = 7,955+ 0,007t$	8
Total			96

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Raw material demand average per month = $96/12 = 8$ Trucks

Table 14. The forecasting result of demand for Paint raw materials for paving blocks making in August 2017- July 2018

Month (2017-2018)	X (t)	Persamaan	Unit (Sacks)
August	13	$105,439 - 0,0035t$	105
September	14	$105,439 - 0,0035t$	105
October	15	$105,439 - 0,0035t$	105
November	16	$105,439 - 0,0035t$	105
December	17	$105,439 - 0,0035t$	105
January	18	$105,439 - 0,0035t$	105
February	19	$105,439 - 0,0035t$	105
March	20	$105,439 - 0,0035t$	105
April	21	$105,439 - 0,0035t$	105
Mey	22	$105,439 - 0,0035t$	105
June	23	$105,439 - 0,0035t$	105
July	24	$105,439 - 0,0035t$	105
Total			1,260

Raw material demand average per month = $1,260/12 = 105$ Sacks

V. CONCLUSION

The conclusion showed that the forecasting method used to predict the demand of raw materials in the month of August 2017-July 2018 is Cement raw material is linear method, Sand raw materials is a quadratic method, raw materials of gravel and paints are linear methods. With the result of the forecast that is the amount of raw material demand for the period of August 2017-July 2018 average per month is the cement is 1098 sacks, Sand is 20 trucks, the gravel is 8 trucks and the paint is 105 sacks.

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