PLANNING AND CONTROLLING OF RAW MATERIAL IN ACCUMULATOR PRODUCTION AT THE PT XX

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ABSTRACT

In the industrial planning and controlling area, the production of raw material is one of the factors that is important to the company. PT XX, the accumulator company is a type of business that produces batteries in a variety of sizes. Up to present, the company has produced batteries by conventional method but sometimes there are problems of process production because of the lack of material or raw material in the warehouse. There are excess of other raw material and there are lack of another. Production and raw material did not match well because the company still had the trouble in making planning and controlling of raw materials, especially in determining the amount and time of ordering.
To produce 1096 unit 12V 75 Ah batteries based on production planning in 2014, the cost for raw material will be Rp. 1,521,357,600.00

Keywords : Planning and Controlling of Raw Material

INTRODUCTION

The most important thing for companies to win competition in the free market area is how to be able to produce smoothly without undesirable delay so that companies will be more efficient and will improve the competitiveness of products in the market.
Smooth production process is dependent on accurate production planning, if not it will give very adverse impact to the company. Or it may be the cessation of the production process.
Companies need to consider the factors supporting production activity such as raw materials, production facilities, labors and others. Therefore it does scheduling, production planning and raw material planning in order to support the smooth running of the production process in determining the amount and time of ordering.

LITERATURE

Planning and Controlling of Materials

Inventories can be defined as material that is stored in the warehouse to be used in production or sale. Inventories of raw materials are related to the role of management in the company to succeed the goal of companies. In order to achieve the objectives of companies in expediting the process of planning and control of production, raw

materials are required. Planning of raw material consists of Master Production Schedule (JIP) into any required materials. This schedule includes when and how the amount of raw material is required and ordered. The planning is a process to predict what will happen in the future. Therefore the planning and controlling of raw materials is an attempt to estimate the raw material requirements for the foreseeable future, and determine the volume / amount of stock to ensure smooth production process.

Forecasting

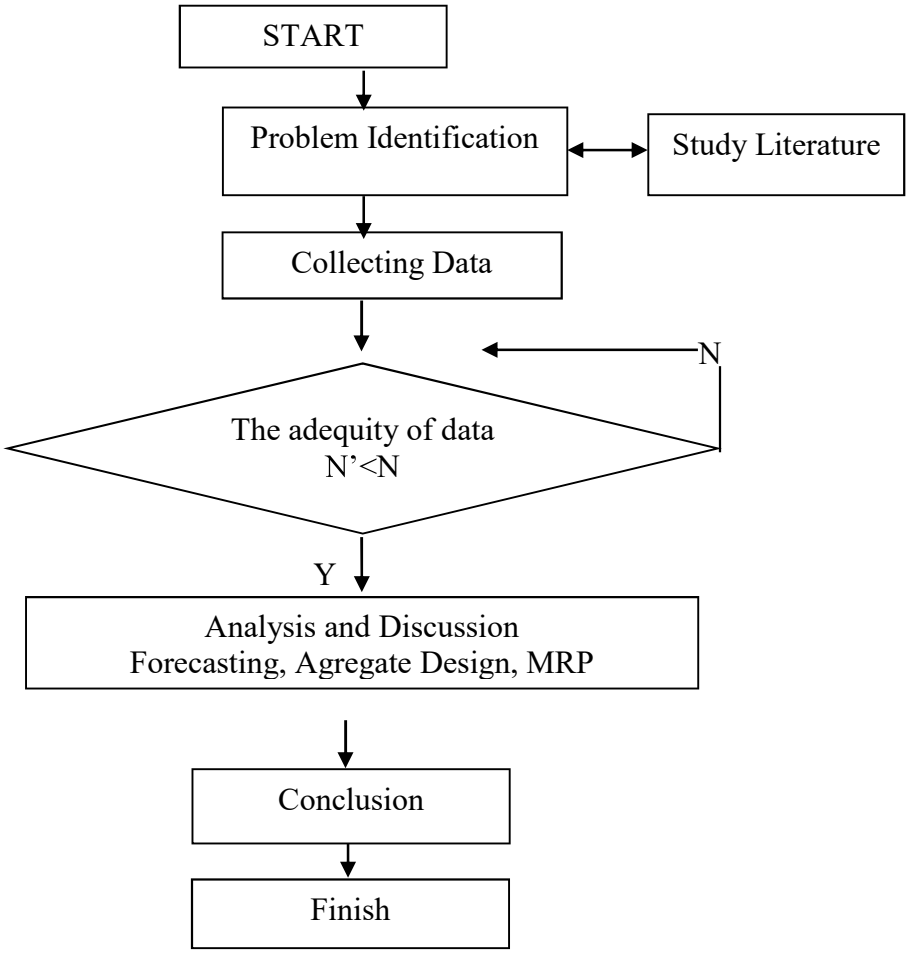
Forecasting is an estimation of the expected level of demand for a product or multiple products in a given period of time in the future. Forecasting is basically estimation. However by using certain way of forecasting can be more than estimation. The results of forecasting will affect the plan so production activities can be aligned with the requests of consumer. Because of that they are important factors that will affect the production plan on the future relating to the supply of raw materials required in the production process. Several methods are used in forecasting trends such as Straight Line and Trend Line Curves Method.

Material Requirement Planning

Material Requirement Planning is a method used to finish up the issue of raw materials used to make products where the finished product depends on how much and when the finished product is needed. Master Planning Schedule is a plan regarding how many products are needed and when these products will be needed. Master Planning Schedule is the first step of the MRP system by inputting Bill of Materials of the product concerned, the above data can be processed by the MRP method given the circumstance of existing inventory in the company.

There are two ways in determining the amount of required material in accordance with the master planning schedule i.e. i) purchasing quantity based on Master Planning Schedule and ii) purchasing quantity based on Economic Order Quantity.

METHOD



ANALYSIS AND DISCUSSION

PT. XX is a small company producing batteries. The data obtained at 12V 75 Ah batteries production in 2013 is as follows:

No.	Month	Amount (Unit)	Raw Material	Requirements (per accu)
1	January	90	Plate Sel –	42
2	February	92	Plate Sel +	36
3	March	93	Splitter	138
4	April	91	Deksel	6
5	May	92	Covering	6
6	June	90	Box	1
7	July	93	Asphalt	125
8	August	92	Lead	465
9	September	92		
10	October	91		
11	November	91		
12	December	90		

For Test Data Adequacy assumed a 99% confidence level and the degree of accuracy of 5%, the number of observations that must be done is

$$N' = \left[\frac{60\sqrt{N.\sum dt^2 - (dt)^2}}{\sum dt}\right]^2$$

$$N' = \left[\frac{60\sqrt{12100297 - (1097)^2}}{1097}\right]^2$$

N' = 0,6809
N' ≤ N, 0,6809 ≤ 12 (The data assumed insufficient)

For the uniformity test data is as follows:

$$\bar{X} = \frac{\sum X}{N}$$

SD = 1,0836
BKA = $\bar{X}$ + 3. SD = 91,42 + 3,2508 = 94,76
BKB = $\bar{X}$ - 3. SD = 91,42 - 3,2508 = 88,1692

Forecasting using Straight-Line Method

$$d't = a + b\,t$$

for b as follows as :

$$b = \frac{\sum t \sum dt - N.\sum t.dt}{N\sum t^2 - (\sum t).^2}$$

$$b = \frac{78.1097 - 12.7123}{12.650 - (78).^2}$$

$$b = 0{,}052445$$

$$a = \frac{\sum dt - b.\sum t}{N}$$

$$a = \frac{1097 - 0{,}052445.78}{12}$$

$$a = 91{,}076$$

$$d't = 91{,}076 + 0.052445\ t$$

the forecasting gets following:

t	Dt	d't	(dt – d't)	(dt - d't)^2
1	90	91.128445	-1.128445	1.273388
2	92	91.18089	0.81911	0.90504696
3	93	91.233335	1.766665	1.329159509
4	91	91.28578	-0.28578	0.0816702
5	92	91.338225	0.661775	0.913495544
6	90	91.39067	-1.39067	1.93396
7	93	91.443115	1.556885	1.247751979
8	92	91.49556	0.50444	0.710239396
9	92	91.548005	0.451995	0.672305734
10	91	91.60045	-0.60045	0.36054
11	91	91.652895	-0.652895	0.42627
12	90	91.70534	-1.70534	2.90818
Amount				3.558371442

$$Sdt = \sqrt{\frac{\sum_{t=1}^{n}(dt-d't).^2}{n-2}}$$

$$Sdt = \sqrt{\frac{3.55837}{10}} = 0.355837$$

Forecasting using Curve Line Method

$$d't = a + b\,t + c\,t^2$$

Where :

$b = \frac{\gamma.\delta - \vartheta.\alpha}{\gamma.\beta - \alpha^2} = 0.01543$, $c = \frac{\vartheta - b.\alpha}{\gamma} = -0.00746$, $a = \frac{\sum dt}{N} - \frac{b.\sum t}{N} - \frac{c.\sum t^2}{N} = 90.91$

Curve Line Equation as follows

$$d't = 90.91 + 0.01543\,t - 0.00746\,t^2$$

t	A	b	c	dt	d't	t^2	(dt –d't)	(dt – d't)^2
1	90.91	0.01543	0.00746	90	90.91797	1	-0.91797	0.84266892
2	90.91	0.01543	0.00746	92	90.91102	4	1.08898	1.18587744
3	90.91	0.01543	0.00746	93	90.88915	9	2.11085	4.45568772
4	90.91	0.01543	0.00746	91	90.85236	16	0.14764	0.02179757
5	90.91	0.01543	0.00746	92	90.80065	25	1.19935	1.43844042
6	90.91	0.01543	0.00746	90	90.73402	36	-0.73402	0.53878536
7	90.91	0.01543	0.00746	93	90.65247	49	2.34753	5.5108971
8	90.91	0.01543	0.00746	92	90.556	64	1.444	2.085136
9	90.91	0.01543	0.00746	92	90.44461	81	1.55539	2.41923805
10	90.91	0.01543	0.00746	91	90.3183	100	0.6817	0.46471489
11	90.91	0.01543	0.00746	91	90.17707	121	0.82293	0.67721378
12	90.91	0.01543	0.00746	90	90.02092	144	-0.02092	0.00043765
								19.6408949

$$Sdt = \sqrt{\frac{19.64089}{10}} = 1.964089$$

Agregate Planning

Regular production capacity is 100 units per month, therefore no extra hour in the production process.

Tabel 1. Agregate Planning

T	Month	Regular Time	dt
1	January	100	91
2	February	100	91
3	March	100	91
4	April	100	91
5	May	100	91
6	Juny	100	91
7	July	100	91
8	August	100	91
9	September	100	92
10	October	100	92
11	November	100	92
12	December	100	92
Jumlah			1096

Raw Material Requirement Planning

Based on forecasting and production structure, raw material requirements planning is as follows:

Month	Plate Sel -	Plate Sel +	Splitter	Deksel	Coverage	Box	Asphalt	Lead
January	3822	3276	12558	546	546	91	11375	42315
February	3822	3276	12558	546	546	91	11375	42315
March	3822	3276	12558	546	546	91	11375	42315
April	3822	3276	12558	546	546	91	11375	42315
May	3822	3276	12558	546	546	91	11375	42315
June	3822	3276	12558	546	546	91	11375	42315
July	3822	3276	12558	546	546	91	11375	42315
August	3822	3276	12558	546	546	91	11375	42315
September	3864	3312	12696	552	552	92	11500	42780
October	3864	3312	12696	552	552	92	11500	42780
November	3864	3312	12696	552	552	92	11500	42780
December	3864	3312	12696	552	552	92	11500	42780
Amount	46032	39456	151248	6576	6576	1096	137000	509640

1. Plate Sel –Planning
   Requirement of Plate Sel – per year : 46032 sheets
   Cost per ordering : Rp. 50.000,00
   Price per sheet : Rp. 1.000,00

Holding percentage : 10 %
EOQ = 6785

2. Plate Sel + Planning
   Kebutuhan Plate Sel + per year : 39456 sheets
   Cost per ordering : Rp. 50.000,00
   Price per sheet : Rp. 1.250,00
   Holding percentage : 10 %
   EOQ = 5618

3. Splitter Planning
   Requirement of Splitter per year : 151248 unit
   Cost per ordering : Rp. 50.000,00
   Price per unit : Rp. 500,00
   Holding percentage : 10 %
   EOQ = 17393

4. Deksel Planning
   Requirement of Deksel per year : 6576 sheets
   Cost per ordering : Rp. 50.000,00
   Price per unit : Rp. 2.000,00
   Holding percentage : 10 %
   EOQ = 1813

5. Cover Planning
   Requirement of cover per year : 6576 sheet
   Cost per ordering : Rp. 50.000,00
   Price per unit : Rp. 500,00
   Holding percentage : 10 %
   EOQ = 3627

6. Box Planning
   Requirement of Box per year : 1096 sheets
   Cost per ordering : Rp. 50.000,00
   Price per unit : Rp. 7.500,00
   Holding percentage : 10 %
   EOQ = 382

7. Asphalt Planning
   Requirement of Asphalt per year : 13700 Kg
   Cost per ordering : Rp. 50.000,00
   Price per Kg : Rp. 3.000,00
   Holding percentage : 10 %
   EOQ = 2136

8. Lead Planning
   Requirement of lead per year : 509640 Kg
   Cost per ordering : Rp. 50.000,00
   Price per Kg : Rp. 2.500,00
   Holding percentage : 10 %
   EOQ = 14278

CONCLUSION

Based on the results of these calculations, the conclusions drawn are as follows:

1 For Production Planning of 12V 75 Ah batteries are 1096 in 2014
2 For Raw Material Planning in the following table:

Raw Material	Ordering	Price per unit	Raw Material Cost
Plate Sel -	46032	1000	46.032.000
Plate sel +	39456	1350	53.265.600
Splitter	151248	500	75.624.000
Deksel	6576	3000	19.728.000
Coverage	6576	500	3.288.000
Box	1096	7500	8.220.000
Asphalt	13700	3000	41.100.000
Lead	509640	2500	1.274.100.000
Amount			1.521.357.600

Therefore the purchase of raw materials for the production of batteries 12V 75Ah is Rp. 1,521,357,600.00 per year

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