Raw Material Inventory Control Using Always Better Control (ABC), Moving average (MA) and Economic Order Quantity (EOQ) Methods at UD. MBS Audio Pesanggaran Banyuwangi

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Abstract

Along with the phenomenon of the rampant trend of audio trucks and audio music to meet the needs of celebrations of holidays and celebrations in the community, UD. MBS Audio Pesanggaran as a service industry that produces audio infrastructure, faces obstacles in managing raw materials, such as inaccurate order quantities, procurement delays, and demand fluctuations that hamper production. This study aims to optimize the supply of raw materials in the form of plywood using the always better control (ABC) method, the Moving Average (MA) forecasting method, and Economic Order Quantity (EOQ) to improve efficiency and smooth production. The analysis results show that based on the ABC method, raw materials are grouped into three categories. Category A consists of 12mm and 15mm plywood, with a percentage of inventory value of 32.83% and 21.89% respectively, so it should be prioritized in management. Category B includes 8mm Plywood and Screws with values of 21.64% and 9.85% respectively, which are still important but not as big as category A. Meanwhile, category C consists of Gun Nails, Wood Paint, Wood Glue, and Putty, with inventory values ranging from 1.09% to 5.40%, which need to be managed so that they are not excessive.12 mm and 15 mm plywood fall into category A, with top priority. 3-month MA forecasting estimates an annual requirement of 436 units for 12 mm plywood and 144 units for 15 mm plywood. EOQ calculations determine the optimal ordering quantities of 116 reorder point units (ROP 4) and 36 units (ROP 1) respectively, with a Total Inventory Cost (TIC) of Rp. 400,017 for 12 mm plywood and Rp. 399,998 for 15 mm plywood. With this strategy, the company can optimize the availability of raw materials, reduce inventory costs, and improve efficiency and smooth production.

Keywords: Inventory control, Raw Material, Always Better Control (ABC), Moving Average (MA), Economic Order Quantity (EOQ)

INTRODUCTION

Each region has a characteristic production that is recognized by the public to consume it (Suprihatin, 2024). Inventory management is a key factor in ensuring smooth operations, especially in the manufacturing industry. Improper management

can lead to production delays, increased costs, and decreased customer satisfaction (Jaenuddin et al., 2021). Therefore, companies must plan and manage inventory properly to ensure timely availability of raw materials while minimizing the risk of excess storage (Pakpahan & Sirait, 2022).

UD. MBS Audio Pesanggaran as one of the micro, small and medium enterprises that is increasing performance efforts in order to realize an independent economy (Susanti et al., 2021), which is engaged in making sound boxes, faces various challenges in managing raw materials, such as inaccurate order quantities, procurement delays, and demand fluctuations (Triyanto & Sofiana, 2023). These problems often lead to stock shortages (stockouts) that hamper production and delay product delivery to customers. On the other hand, excess inventory can increase storage costs and the risk of raw material obsolescence (Fitriadi et al., 2023).

Business in the field of audio sound systems requires high accuracy in order to obtain optimal customer satisfaction so as to increase output and revenue (Suprihatin, 2024), the absence of a structured raw material classification system makes inventory management less efficient, thereby reducing company productivity (Suprihatin et al., 2023). UD. MBS Audio Pesanggaran also utilizes e- commerce as one of the sales platforms, which requires adequate stock availability, in order to meet customer demand quickly (Marafi et al., 2024). Therefore, an effective inventory management strategy is needed to optimize raw material stocks, reduce the risk of production delays, and improve operational efficiency (Yuliandi et al., 2024).

Based on the results of the survey that has been conducted, the accumulated raw material inventory data from December 2023 to November 2024 can be seen in Table 1.1 below:

Table 1. 1 Raw Material Inventory Data

Component	Demand	Inventory	Unit
Triplek 8mm	Lbr	424	445
Triplek 12mm	Lbr	346	450
Triplek 15mm	Lbr	240	225
Sekrup	Box	500	450
Paku Tembak	Box	328	300
Lem Kayu	Pcs	220	225
Dempul	Pcs	150	225
Cat Kayu	Pcs	288	300
Total		2.496	2.620

Based on Table 1.1, the total inventory of raw materials (2,496 units) is less than the total requirement (2,625 units), which indicates a shortage of raw materials that can disrupt production. This leads to an imbalance between inventory and needs, increasing the risk of over- or under-stocking. UD. MBS Audio Pesanggaran

still manages inventory manually without any inventory management system. This can result in procurement delays and reduced customer satisfaction. A more structured raw material control system is needed to optimize availability and cost efficiency (Suprihatin & Hamid, 2022).

To overcome this problem, the ABC method can be used to classify raw materials based on their level of importance, helping companies identify the materials that have the most influence on production. The Moving Average forecasting method is suitable for application because demand fluctuations are quite significant but tend to be stable overall (Guslan & Saputra, 2020). Meanwhile, the application of Economic Order Quantity (EOQ) in category A allows companies to determine the optimal order quantity, reduce ordering and storage costs, and ensure timely availability of raw materials without excess or shortage of stock (Triana et al., 2021).

METHOD

Always Better Control (ABC)

ABC analysis is a method used in inventory management to categorize goods based on their value or importance to the company's total costs and profits (Guslan & Saputra, 2020). This method focuses on managing goods efficiently and effectively, with the principle that not all goods require the same attention. According to (Saputra et al., 2024) there are three classes in the ABC classification, namely:

1. Class A: Inventory that has a high annual volume value of rupiah. This class represents about 60% - 80% of the cost of inventory. The management of goods in this class requires stricter attention to ensure their availability and quality.
2. Class B: Inventory with a medium annual volume value, which represents 25% - 35% of the cost of inventory. Items in this class need to be managed well, although not as stringently as class A.
3. Class C: Items with a low annual dollar volume value, representing only about 5% - 15% of inventory costs. These items can be managed in a more relaxed manner.

Requirement percentage calculation formula= $\frac{\text{inventory value}}{\text{absorpstion of funds}}$ X 100%

Economic Order Quantity (EOQ)

The application of the Economic Order Quantity (EOQ) method can significantly assist companies in managing raw material purchases in a more systematic and efficient manner. This method allows companies to determine the optimal order quantity, so as to minimize the total cost of inventory. The EOQ method supports better decision-making in inventory management, thereby improving efficiency in overall stock and storage management.

The formula used in determining EOQ: $Q = \sqrt{2DS}$

$$\overline{H}$$

Description:
Q = EOQ = Economical optimal purchase quantity
D = Quantity of goods needed (units/year)
S = Ordering cost (rupiah/order)
H = Storage costs (rupiah/unit/year)

RESULTS AND DISCUSSION

Always Better Control (ABC) Method

Table 1. 2. ABC Analysis Based on Total Raw Material Demand for December 2023 - November 2024

No	Raw Material	Curency Rp	Inventory value %	Cumulative value %
1	Triplek 12mm	Rp67.500.000	32,83	32,83
2	Triplek 15mm	Rp45.000.000	21,89	54,72
3	Triplek 8mm	Rp44.500.000	21,64	76,36
4	Sekrup	Rp20.250.000	9,85	86,21
5	Paku Tembak	Rp11.100.000	5,40	91,61
6	Cat Kayu	Rp10.500.000	5,11	96,72
7	Lem Kayu	Rp4.500.000	2,19	98,91
8	Dempul	Rp2.250.000	1,09	100,00

Table 1. 3. Inventory Item Categorization

Catagory	Item
A	Triplek 12mm, Triplek 15mm
B	Triplek 8mm, Sekrup
C	Paku Tembak, Cat Kayu, Lem Kayu, Dempul

Based on analysis 1.2. and 1.3 above, ABC categories, raw materials at UD. MBS Audio Pesanggaran are classified into three categories. Category A includes 12mm Plywood and 15mm Plywood, which have a significant impact on smooth production and the largest cost consumption, so they are the top priority in management. Category B, consisting of 8mm Plywood and Screws, has a medium level of importance with moderate cost consumption. Meanwhile, Category C includes Gun Nails, Wood Paint, Wood Glue, and Putty, whose usage is lower and cost consumption is small, so its management focuses on meeting needs without

overstocking.

From the results of the ABC analysis, raw materials in Category A, namely 12 mm plywood and 15 mm plywood, are considered very important as these raw materials have a significant impact on smooth production and the highest cost consumption. Plywood 12mm and Plywood 15mm, which have a significant impact on smooth production and the largest cost consumption, so they are the top priority in management. Category B, consisting of 8mm plywood and Screws, has a medium level of importance with moderate cost consumption. Meanwhile, Category C includes Gun Nails, Wood Paint, Wood Glue, and Putty, whose usage is lower and cost consumption is small, so its management focuses on meeting needs without overstocking.

From the results of the ABC analysis, raw materials in Category A, namely 12 mm plywood and 15 mm plywood, are considered very important as these raw materials have a significant impact on smooth production and the highest cost consumption. Therefore, the management of Category A raw materials requires special attention to ensure smooth production and cost efficiency. Based on the characteristics of the data, which fluctuates quite significantly but tends to be stable overall, the most suitable forecasting method is Moving Average. This method gives greater weight to the most recent data, so it can respond to changes quickly and produce relevant forecasts to ensure optimal availability of raw materials.

Moving Average Method

Moving average is a forecasting method used to estimate values in future periods by utilizing historical data within a certain period of time. This method works by taking a number of observed values from the previous period, calculating their average, and using the result as a prediction for the next period.

Forecasting 12 mm Plywood Raw Materials

Forecasting calculation of 12 mm plywood raw materials in December 2024 - November 2025

Table 1. 4. Comparison Results of MAD, MSE, MAPE Values of 12 mm Plywood

	3 Month	4 Month	5 Month	6 Month
MAD	6,3611	6,625	7,952	7,643
MSE	60,0625	64,165	75,151	72,616
MAPE	19,11%	21,08%	25,48%	24,52%

Source: Data Processing

Based on the accuracy evaluation in table 1.4 using the Moving Average (MA) method with 3-month, 4-month, 5-month, 6-month parameters, the lowest Mean Absolute Deviation (MAD) value in 3 months is 6.3611 and the Mean Squared Error (MSE) value is 60.0625, and the Mean Absolute Percentage Error (MAPE) value is 19.11%. This method with 3 monthly parameters will be used

for further forecasting.

From the results of the accuracy calculation above, the calculation of the 12 mm Plywood raw material inventory forecast using 3 monthly parameters for the period December 2024 - November 2025 can be seen in table 1.5. below:

Table 1.5. Forecasting Results of 12mm Plywood Raw Materials for 1 Year:

Triplek 12mm			
Period	**Data Actual (Yt)**	**Forcasting** $(Ft = \frac{\sum At{\sim}1 + At{\sim}2 + At{\sim}3}{n})$	**Ft**
Sep-24	27	-	-
Okt-24	36	-	-
Nov-24	44	-	-
Des-24	-	Ft = (44+36+27)/3	36
Jan-25	-	Ft = (36+44+36)/3	39
Feb-25	-	Ft = (39+36+44)/3	40
Mar-25	-	Ft = (40+39+36)/3	38
Apr-25	-	Ft = (38+40+39)/3	39
Mei-25	-	Ft = (39+38+40)/3	39
Jun-25	-	Ft = (39+39+38)/3	38
Jul-25	-	Ft = (38+39+39)/3	39
Ags-25	-	Ft = (39+38+39)/3	39
Sep-15	-	Ft = (39+39+38)/3	38
Okt-25	-	Ft = (38+39+39)/3	39
Nov-25	-	Ft = (39+38+39)/3	39
		Total	**463**

Source: Data Processing

The calculation results of table 1.5 above show that the Moving Average (MA) method with 3 monthly parameters provides the best accuracy, characterized by Mean Absolute Deviation (MAD) of 6.3611, Mean Squared Error (MSE) of 60.0625 and Mean Absolute Percentage Error (MAPE) value of 19.11%. Therefore, for the calculation of Economic Order Quantity (EOQ) for the 12mm plywood raw material requirement level using the 3 monthly MA value.

Forecasting 15 mm Plywood Raw Materials

Forecasting calculation of 15 mm plywood raw materials in December 2024 - November 2025 Table 1.6. Comparison Results of MAD, MSE, MAPE Values of 15 mm Plywood

	3 month	4 month n	5 month	6 month
MAD	4,75	5,95	6,76	7
MSE	28,2014	39,34	50,0079	55,068

Source: Data Processing

Based on the accuracy evaluation in table 1.6 using the Moving Average (MA) method with 3-month, 4-month, 5-month and 6-month parameters, the lowest Mean Absolute Deviation (MAD) value in 3 months is 4.75 and the Mean Squared Error (MSE) value is 28.2014, and the Mean Absolute Percentage Error (MAPE) value is 27.95%. This method with 3 monthly parameters will be used for further forecasting.

From the results of the accuracy calculation above, the calculation of the 15 mm Plywood raw material inventory forecast using 3 monthly parameters for the period December 2024 - November 2025 can be seen in table 1.17 below:

Table 1. 7 Forecasting Results of 15 mm Plywood Raw Materials for 1 Year

Triplek 15 mm			
Period	**Data Actual (Yt)**	**Forcasting** $(\boldsymbol{Ft} = \frac{\sum \boldsymbol{At{\sim}1 + At{\sim}2 + At{\sim}3}}{\boldsymbol{n}})$	**Ft**
Sep-24	15	-	-
Okt-24	12	-	-
Nov-24	11	-	-
Des-24	-	Ft = (11+12+15)/3	13
Jan-25	-	Ft = (13+11+12)/3	12
Feb-25	-	Ft = (12+13+11)/3	12
Mar-25	-	Ft = (12+12+13)/3	11
Apr-25	-	Ft = (11+12+12)/3	12
Mei-25	-	Ft = (12+11+12)/3	12
Jun-25	-	Ft = (12+12+11)/3	12
Jul-25	-	Ft = (12+12+12)/3	12
Ags-25	-	Ft = (12+12+12)/3	12
Sep-15	-	Ft = (12+12+12)/3	12
Okt-25	-	Ft = (12+12+12)/3	12
Nov-25	-	Ft = (12+12+12)/3	12
	Total		**144**

Source: Data Processing

The calculation results show that the Moving Average (MA) method with 3 monthly parameters provides the best accuracy, characterized by Mean Absolute Deviation (MAD) of 4.75, Mean Squared Error (MSE) value of 28.2014 and Mean Absolute Percentage Error (MAPE) value of 27.95%. Therefore for calculation of Economic Order Quantity (EOQ) for the level of 15mm plywood raw material requirements using the 3 monthly MA value.

Economic Order Quantity (EOQ)

12 mm plywood EOQ calculation

1. Ordering Cost

Ordering costs are the costs required for the entire process of ordering goods until the availability of goods in the warehouse. For 12 mm plywood ordering costs in the form of transportation costs of IDR 50,000 / one message (S).

2. Storage Costs

Storage costs are costs that must be incurred to handle the storage of raw materials in the warehouse. Details of storage costs are as follows:

Electricity = Rp. 100.000
Salary = Rp. 1.500.000
Total H = Rp. 1.600.000 / month
= (Total h)/D
= 1.600.000/463
= 3.456/unit

3. Economic Order Quantity (EOQ)

Q = √(2DS/H)
= √((2 x 463 x 50.000)/3.456)
= √(46.300.000/3.456)
= √13.397
= 116 unit

From the results of the above calculations, the optimal order for 12 mm plywood raw materials is 116 units / order.

4. Raw Material Ordering Frequency

F = D/Q
= 463/116
= 4 /years

5. Reorder Point (ROP)

L (Lead Time) = 2 days in years there are 258 days for work, so triplek 12 mm need / day :

d = D/(day works in a year)
= 463/258
= 1,8 (2 unit)

So the calculated or ROP :

ROP = d x L
= 2 x 2
= 4 unit

6. Total Inventory Cost (TIC) TIC = [D/Q S]+[Q/2 H]
= [463/116 50.000]+[116/2 3.456]
= 199.569 + 200.448
= 400.017

15 mm plywood EOQ calculation

1. Ordering Cost

Ordering costs are the costs required for the entire process of ordering goods until the availability of goods in the warehouse. For 15 mm plywood ordering costs in the form of transportation costs of IDR 50,000 / one message (S).

2. Storage Costs

Storage costs are costs that must be incurred to handle the storage of raw materials in the warehouse. Details of storage costs are as follows:

Electricity = Rp. 100.000
Salary = Rp. 1.500.000
Total H = Rp. 1.600.000 / bulan
= (Total h)/D
= 1.600.000/144
= 11.111/unit

3. Economic Order Quantity (EOQ)

Q = √(2DS/H)
= √((2 x 144 x 50.000)/11.111)
= √(14.400.000/11.111)
= √1.296
= 36 unit

From the results of the above calculations, the optimal order for 15 mm plywood raw materials is 36 units / order.

4. Raw Material Ordering Frequency

F = D/Q
= 144/36
= 4 / year

5. Reorder Point (ROP)

L (Lead Time) = 2 years and in 1 years there are 258 days for work, so need triplek 15 mm/day:

d = D/(day works in a year)
= 144/258
= 0,6 (1 unit)

So:

ROP = L x DL
= 2 x 1 = 2 units

6. Total Inventori Cost (TIC)

TIC = [D/Q S]+[Q/2 H]
= [144/36 50.000]+[36/2 11.111]
= 200.000 + 199.998
= Rp. 399.998

CONCLUSION

Based on research that has been done at UD. MBS Audio Pesanggaran obtained the results of calculations and analysis of the methods used, with the following conclusions:

1. Inventory Classification (ABC)

Based on the ABC method, raw materials are grouped into three categories. Category A consists of 12mm and 15mm plywood, with a percentage of inventory value of 32.83% and 21.89% respectively, so it must be prioritized in management. Category B includes 8mm Plywood and Screws with values of 21.64% and 9.85% respectively, which remain important but not as large as category A. Meanwhile, category C consists of Gun Nails, Wood Paint, Wood Glue, and Putty, with inventory values ranging from 1.09% to 5.40%, which need to be managed so as not to be excessive.

2. Forecasting Raw Material Requirements (Moving Average)

Forecasting raw material requirements using the Moving Average (MA) method shows that the 3-month MA parameter has the highest accuracy. For 12mm plywood, the Mean Absolute Deviation (MAD) value is 6.3611, the Mean Squared Error (MSE) is 60.0625, and the Mean Absolute Percentage Error (MAPE) is 19.11%. Meanwhile, 15mm plywood has an MAD value of 4.75, MSE of 28.2014, and MAPE of 27.95%. With these results, the 3-month MA method is used to estimate the need for raw materials in the next year, which is 436 units for 12 mm plywood and 144 units for 15 mm plywood.Optimasi Jumlah Pemesanan (Economic Order Quantity - EOQ)

3. Based on the EOQ method.

The optimal order quantity for 12 mm Plywood is 116 units per order with an order frequency of 4 times a year. The reorder point (ROP) is set when the remaining stock is 4 units. For 15mm plywood, the optimal order quantity is 36 units per order with an order frequency of 4 times a year and the ROP is set when the remaining stock is 1 unit. In addition, the Total Inventory Cost (TIC) calculation shows that the annual inventory cost for 12 mm plywood is IDR 400,017, while for 15 mm plywood it is IDR 399,998.

REFERENCES

Fitriadi, A. M. K., Syakhroni, A., & Mas'idah, E. (2023). Analisis Persediaan Bahan Baku Dengan Metode Analisis Always Better Control (ABC) Dan Metode Economic Order Quantity (EOQ). *Jurnal Teknik Industri (JURTI)*, *2*(1), 20–28.

Guslan, D., & Saputra, I. (2020). Analisis Pengendalian Inventori Dengan Klasifikasi ABC dan EOQ Pada PT Nissan Motor Distributor Indonesia. *Jurnal Logistik Bisnis*, *10*(1), 73–77. https://doi.org/10.46369/logistik.v10i1.700

Jaenuddin, Efendy, M. H., & Mulyanto. (2021). Analisa Pengendalian Persediaan Granite Menggunakan Metode Abc Studi Kasus Pt.Xyz. *Jurnal Industri Kreatif*,

8(2), 97–106. https://doi.org/10.36352/jr.v3i2

Marafi, G. I., Suprihatin, E., & Hidayah, A. (2024). *Analisis Kepuasan Pelanggan dengan Metode Service Quality (Servqual) dan Importance Performance Analysis (IPA) pada UMKM Gabin Osing di Banyuwangi*. *24*(3), 2875– 2882. https://doi.org/10.33087/jiubj.v24i3.5593

Pakpahan, S., & Sirait, G. (2022). Pengendalian Persediaan Suku Cadang Maintenance Di PT Abc Dengan Metode EOQ. *Jurnal Comasie*, *07*(07), 75– 83.

Suprihatin, E. (2024a). *ANALISIS KEPUASAN PELANGGAN JASA REPARASI SOUND SYSTEM DENGAN MENGGUNAKAN METODE IMPORTANCE PERFORMANCE ANALISYS (IPA) PADA UD. MBS AUDIO PESANGGARAN BANYUWANGI | Industrial Engineering | Mechanic Engineering | Civil Engineering J-ENSISTEC (Journal of En*. *10*(02), 1092–1100.

Suprihatin, E. (2024b). *Perceptions of Foreign Tourists Toward Local Wisdom and Natural Resources for Sustainability of Mount Ijen Banyuwangi Indonesia*. *45*(4), 1338–1351.

Suprihatin, E., & Hamid, A. (2022). Rebound Model To Toward Regional Economic Resurrection Post Covid-19 Pandemic in Banyuwangi Regency. *Die*, *13*(2), 206–219. https://doi.org/10.30996/die.v13i2.7302

Suprihatin, E., Rofiq, A., & Teknik, F. (2023). *SERVICE QUALITY AND IMPORTANCE PERFORMANCE ANALYSIS TO ACHIEVED SUSTAINABILITY TOURISM DEVELOPMENT ON MARINE PERFORMANCE TOURISM*. *7*(2), 734–745. https://doi.org/10.36526/js.v3i2.3209

Susanti, H. D., Pradana, D. A., & Suprihatin, E. (2021). Synergy of the Pentahelix Model to Establish Resilient Smes in Facing New Normal during Covid-19 Pandemic. *Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences*, *4*(1), 754–761. https://doi.org/10.33258/birci.v4i1.1666

Triana, N. N., Muztaba, R., Sayuti, M., & Hakim, A. (2021). Analisis Optimalisasi Manajemen Persediaan Pada Bahan Baku Bijih Plastik (Di Pt. Nissen Chemitec Indonesia). *Industry Xplore*, *6*(2), 99–108. https://doi.org/10.36805/teknikindustri.v6i2.1749

Triyanto, R., & Sofiana, A. (2023). Pengendalian Persediaan Spare-Part Menggunakan Metode Klasifikasi ABC Dan Sistem Q (Continuous Review)(Studi Kasus PT. XYZ). *Journal of Industrial and Mechanical …*, *1*(1), 25–34.

Yuliandi, F. F. M., Sari, R. P., & Fatwa, M. A. (2024). Analisis Manajemen Persediaan Menggunakan Metode ABC Analysis pada PT. BMJK. *STRING (Satuan Tulisan Riset Dan Inovasi Teknologi)*, *9*(1), 105–114. https://doi.org/10.30998/string.v9i1.23348