

# Honda Motorcycle Spare Parts Supply with Economic Order Quantity

(Case Study : CV AHASS MOTOR JAYA 2)

Lisa Anjas

Teknik Industri Universitas Bina Darma  
Palembang, Indonesia

Renilaili

Teknik Industri Universitas Bina Darma  
Palembang, Indonesia

Ch. Desi Kusmindari

Teknik Industri Universitas Bina Darma  
Palembang, Indonesia

**Abstract:-** Spare parts inventory planning needs to be done because the company has not been able to do it optimally. Economic Order Quantity (EOQ) is a method used in inventory control to determine the optimal number of orders with a minimum Total Inventory Cost. The purpose of this research is to get the optimal number of orders with a minimum total cost. The calculation results for Shoe Set Brake (06430-K44-V80) are 464 units, Ball Bearings (HB6201RS) are 451 units, Element Comp Air Cleaner (17210-K16-900) are 427 units, Pad Set FR (06455-KVB- T01) of 389 units, Element Comp Air Cleaner (17210-KZR-600) of 341 units, Oring-Fuel Pump (17572-GGL-J00) of 288 units, Belt Drive Kit (23100-k44-BA0) of 284 units, Tire RR (90/90-14FT235 42711-K59-A12 ) 294 units, Brake Shoe (43130-KZL-930) 292 units, Race Steering Kit (06535-GN5-505) 306 units.

**Keywords:-** Economic Order Quantity, Inventory Control, Spare Part, Inventory Planning.

## I. INTRODUCTION

The advanced era of science and technology has created a lot of competition between humans. This will encourage a company to make improvements in its system thus it can meet market demand optimally. A system that can help the company to meet market demand optimally is the optimal inventory planning by using Economic Order Quantity.

The EOQ method will be able to minimize the occurrence of Out Of Stock so that it does not interfere with processes within the company and is able to save supply costs incurred by the company because of the raw material supply efficiency. One of companies that often experiences Out Of Stock is CV AHASS Motor Jaya 2.

Through EOQ or Economy Order Quantity it can find out how many quantities must be ordered so that the total cost, in this case the sum of ordering costs and storage costs, is minimized. [1]

The problem formulation of this research was how to plan Honda motorcycles spare parts to determine optimal supply thus minimize supply shortages.

The aims of this research were to control the planning of Honda motorcycle spare parts supply and to determine the optimal supply at CV AHASS Motor Jaya 2 Palembang.

Supply is materials owned by the company in the form of raw goods, semi-finished goods and finished goods that are ready to be distributed to consumers. It is very important for the company because with sufficient raw material supply, it will facilitate the production operations of a company. [2]

According to Gaspersz (2005), forecasting activity is a business function that seeks to estimate the sales and use of products so that the products can be made in the right quantity [3]. One method for forecasting is by using linear regression.

Linear regression is a statistical method used to form a model or relationship between one or more independent variables X and a response variable Y. Regression analysis with one independent variable X is called simple linear regression, whereas if there is more than one independent variable X, it is referred to multiple linear regressions. The linear regression formula:[4]

$$Y = a + bX \dots\dots\dots (1)$$

$$b = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2} \dots\dots\dots (2)$$

$$a = \frac{(\sum y)}{n} - \frac{b(\sum x)}{n} \dots\dots\dots (3)$$

EOQ method is highly recommended to control the total cost of supply. With the forecasting that has been done, the results show that the company's ordering costs are directly proportional to the frequency of orders [5]. The EOQ formula is as follow:

$$Q = \sqrt{\frac{2 \times D \times S}{H}} \dots\dots\dots(4)$$

The safety stock is additional supply held to protect or maintain the possibility of materials shortage materials (stockout) . [1] The formula for Safety Stock is as follow:

$$SS = Sd \times Z \dots\dots\dots(5)$$

Sofjan Assauri [1] argues that Reorder point (ROP) is the limit or point of the repurchase number. The formula for calculating the reorder point (ROP) is as follows:

$$ROP = (LT \times AU) + \text{Safety stock (SS)} \dots\dots\dots(6)$$

Some previous studies using EOQ are (1) Putri Garneta [6] according to a study titled Inventory control Mechanical parts with the Q method, back order conclusion is obtained to determine how much is needed optimal ordering, determining safety stock, determining return order point values. Calculate the total inventory issued by the company and provide suggestions for improvements to control category A mechanical spare parts inventory, (2) Degra Salida Lifie [7] by title Inventory planning for Toyota Kijang Super car parts with economic order quantity, get results Grouping using the ABC method, forecasting sales for the next 1 year at CV Sapari Motor, knowing the value of safety stock and knowing the total coast (TC), (3) Indrastin Angraini[8] by title Analysis of planning and controlling raw material inventory with economic order quantity at CV Maju Mapan Lestari Palembang get result supplies of raw materials increase and decrease every year such as polytam, calvet, dyes, moisture proof and PE AL. Frequency of purchase of raw materials CV. Maju Mapan Lestari Palembang when using the EOQ is 9 times Polytam, 6 to 7 times Calvet, 3 times Coloring, 5 times Moisture Anti, 6 times PE Al in one code. Limits or points of ordering raw materials needed by CV. Maju Mapan Lestari Palembang using the 2013 EOQ of 4,001 kg of Polytam, 2,352 kg of Calvet, 455 kg of dye, L667 kg of Anti Moisture, 2,859 kg of PE Al. In 2014 Polytam 3,657 kg, Calvet L974

kg, Coloring 593 kg, Anti-Damp 1,813 kg, PE Al 2,759 kg. In 2015 Polytam was 4,740 kg, Calvet was 2,648 kg, Coloring was 1,054 kg, Anti-Damp was 1,063 kg, PE Al was 2,616 kg, (4) Jose L Gonzales & Daniel Gonzales [5] by title Analysis of an Economic Order Quantity and reorder point inventory control model for company XYZ.

## II. RESEARCH METHOLODOLY

### A. Research Date and Location

This research was taken at CV AHASS Motor Jaya 2 which is a spare part distributor company as well as a service provider for Honda motorbikes located at JL Captain Abdullah No.03, Plaju sub-district from August 2021 to January 2022.

### B. Data Collection Methods [9]

#### • Literature Study

Literature study is a way of solving a problem by finding solutions from previous theories.

#### • Observation

Focus in this observation was the maintenance of spare parts raw materials in the warehouse up to distribution to consumers.

#### • Interview

The informant of this interview was the company employee and owner of CV AHASS Motor Jaya 2.

### C. Data Processing Methods

The data processing methods are as follows:

- Forecasting spare parts sales for the next 12 months
- Calculating Economic Order Quantity (EOQ) standard
- Calculating spare parts Safety Stock (SS)
- Calculating spare parts Reorder Point (ROP)
- Calculating Total Coast (TC)

## III. RESULT AND DISCUSSION

### A. Forecasting

The data used in the study are 10 spare parts items that have the highest levels of inventory shortages. The data used for forecasting are spare parts sales data in the last 1 year. Spare part sales for the last 1 years describe in tabel 1 below

Table 1 Spare Parts Sales Data for the Last 1 Year

No	Part Code	Description	Item
1	06430-K44-V80	Shoe Set, Brake	1016
2	Hb6201rs	Bearing, Ball	1018
3	17210-K16-900	Element Comp., Air Cleaner	902
4	06455-Kvb-T01	Pad Set Fr	803
5	17210-Kzr-600	Element Comp, Air Cleaner	623
6	17572-Ggl-J00	O-Ring, Fuel Pump	686
7	23100-K44-Ba0	Belt Drive, Kit	518
8	42711-K59-A12	Tire Rr (90/90-14 Ft235)	466
9	43130-Kzl-930	Brake Shoe	420
10	06535-Gn5-505	Race Steering Kit	398

Forecasting results using linear regression are obtained as in table 2 below

Table 2 Forecasting Result with Linear Regresion

No	Part Code	Description	Item
1	06430-K44-V80	Shoe Set, Brake	1154,94
2	Hb6201rs	Bearing, Ball	1093,52
3	17210-K16-900	Element Comp., Air Cleaner	978,53
4	06455-Kvb-T01	Pad Set Fr	813,56
5	17210-Kzr-600	Element Comp, Air Cleaner	624,53
6	17572-Ggl-J00	O-Ring, Fuel Pump	445,33
7	23100-K44-Ba0	Belt Drive, Kit	433,41
8	42711-K59-A12	Tire Rr (90/90-14 Ft235)	462,99
9	43130-Kzl-930	Brake Shoe	456,26
10	06535-Gn5-505	Race Steering Kit	503,73

#### B. Mean Absolute Percentage Error (MAPE ) Score

MAPE is used to see the percentage of forecasting error against the original data. MAPE for all spare parts data is shown in table 3 below

Table 3 Mean Absolute Percentage Error (MAPE) Score

No	Part Code	Description	Mape
1	06430-K44-V80	Shoe Set, Brake	6.05 %
2	Hb6201rs	Bearing, Ball	4.54%
3	17210-K16-900	Element Comp., Air Cleaner	5.77%
4	06455-Kvb-T01	Pad Set Fr	5.63%
5	17210-Kzr-600	Element Comp, Air Cleaner	19.0%
6	17572-Ggl-J00	O-Ring, Fuel Pump	14.49%
7	23100-K44-Ba0	Belt Drive, Kit	13.52%
8	42711-K59-A12	Tire Rr (90/90-14 Ft235)	7.71%
9	43130-Kzl-930	Brake Shoe	15%
10	06535-Gn5-505	Race Steering Kit	9.42%
		Average	10%

#### C. Economic Order Quantity

The data required for EOQ calculations is shown in the table 4 until 6 below

Table 4 Ordering Cost Data

No	Cost Type	Amount
1	Administration and Employee	Rp. 50.000
2	Electricity, computer, and internet	Rp. 25.000
3	Shipping cost	Rp. 25.000
		Rp 100.000

Source: CV AHASS Motor Jaya 2

The ordering cost above was the amount required to make a one-time order. These costs consisted of administrative and employee costs, electricity, computer, internet and shipping costs.

Table 5 Storage Cost Data

No	Cost Type	Amount
1	Administration and Employee	Rp. 300.000
2	Electricity and computer	Rp. 200.000
3	Warehouse maintenance	Rp. 125.000
		Rp. 625.000

Source: CV AHASS Motor Jaya 2

The storage cost data in table 4 was the data for one month. Meanwhile, to conduct research by using the economic order quantity method required annual storage data.

Table 6 Storage Cost Data in 1 Year

No	Description	Per year
1	Administration and Employee	Rp. 3.600.000
2	Electricity, computer, and internet	Rp. 2.400.000
3	Warehouse maintenance	Rp. 1.500.000
	Total	Rp. 7.500.000

Based on table 5 the total cost per year for the storing cost, the results obtained for ordering costs in one year was 7,500,000 rupias, the total annual cost was divided by the total orders in one year to get the result of storage cost per unit. Lead time for all item are 15 day/month

➤ Equation :  $EOQ = \sqrt{\frac{2 \times D \times S}{H}}$

➤ Where

- EOQ = The optimal number of orders for the company
- D = Number of needs or forecasting (1155)
- S = Ordering fee for 1 time order (Rp. 100.000)
- H = Storage cost per product  
(Rp. 625.000 x 12 / 6967 = 1.076,5 / unit)

So the economic Order Quantity for all spare part items is described in the table 7 below

Table 7 Calculation of Economic Order Quantity

No	Part Code	Description	Eoq
1	06430-K44-V80	Shoe Set, Brake	464
2	Hb6201rs	Bearing, Ball	451
3	17210-K16-900	Element Comp., Air Cleaner	427
4	06455-Kvb-T01	Pad Set Fr	389
5	17210-Kzr-600	Element Comp, Air Cleaner	341
6	17572-Ggl-J00	O-Ring, Fuel Pump	288
7	23100-K44-Ba0	Belt Drive, Kit	284
8	42711-K59-A12	Tire Rr (90/90-14 Ft235)	294
9	43130-Kzl-930	Brake Shoe	292
10	06535-Gn5-505	Race Steering Kit	306

From the calculation of the economic order quantity, the results showed in table 7 above. The EOQ score for each spare part had been obtained so that the company can undertake the optimal order to minimize the company's total cost.

#### D. Safety Stock

The safety factor for the service level used was 95% = 1.64, then: *Safety Stock* (SS) = Deviation standard X Safety factor

From safety stock calculation, the safety stock value for the all item is describe on table8 below:

Table 8 Calculation for Safety Stock

No	Part Code	Description	Safety Stock
1	06430-K44-V80	Shoe Set, Brake	6
2	Hb6201rs	Bearing, Ball	3
3	17210-K16-900	Element Comp., Air Cleaner	3
4	06455-Kvb-T01	Pad Set Fr	1
5	17210-Kzr-600	Element Comp, Air Cleaner	1
6	17572-Ggl-J00	O-Ring, Fuel Pump	10
7	23100-K44-Ba0	Belt Drive, Kit	4
8	42711-K59-A12	Tire Rr (90/90-14 Ft235)	1
9	43130-Kzl-930	Brake Shoe	2
10	06535-Gn5-505	Race Steering Kit	5

From the table 8 above, the results obtained that total of safety stock values for each spare part varied. The safety stock score was the total of spare parts that must be available and can be used if the order arrived beyond the lead time to avoid stock shortages.

#### E. Reorder Point

$$\text{ROP} = (\text{Daily Average} \times \text{Lead Time}) + \text{Safety Stock}$$

From the calculation above, the Reorder Point score for all item is shown on table 9

Table 9 Calculation of Reorder Point

No	Part Code	Description	Rop
1	06430-K44-V80	Shoe Set, Brake	54
2	Hb6201rs	Bearing, Ball	49
3	17210-K16-900	Element Comp., Air Cleaner	44
4	06455-Kvb-T01	Pad Set Fr	35
5	17210-Kzr-600	Element Comp, Air Cleaner	27
6	17572-Ggl-J00	O-Ring, Fuel Pump	29
7	23100-K44-Ba0	Belt Drive, Kit	22
8	42711-K59-A12	Tire Rr (90/90-14 Ft235)	21
9	43130-Kzl-930	Brake Shoe	21
10	06535-Gn5-505	Race Steering Kit	26

From the table 9 above, the results obtained that the number of Reorder Point score for each spare part varied. The Reorder Point score was the point that determined the supply must be reordered. It aimed to make the received orders according to the waiting time.

#### F. Total Cost

$$(\text{TC}) = \left(\frac{D}{Q}\right) S + \left(\frac{Q}{2}\right) H$$

➤ Where:

- D = Forecasting demand
- Q = EOQ
- S = Ordering Cost
- H = Storage cost

From the above calculation, the Total Cost for all item spare parts are follows:

Table 10 Calculation of Total Cost

No	Part Code	Description	Total Cost
1	06430-K44-V80	Shoe Set, Brake	498.670
2	Hb6201rs	Bearing, Ball	485.322
3	17210-K16-900	Element Comp., Air Cleaner	459.106
4	06455-Kvb-T01	Pad Set Fr	418.633
5	17210-Kzr-600	Element Comp, Air Cleaner	366.827
6	17572-Ggl-J00	O-Ring, Fuel Pump	309.877
7	23100-K44-Ba0	Belt Drive, Kit	305.679
8	42711-K59-A12	Tire Rr (90/90-14 Ft235)	315.727
9	43130-Kzl-930	Brake Shoe	313.674
10	06535-Gn5-505	Race Steering Kit	329.409

From the table 10 above, the results obtained that the Total Cost for each spare part varied. The total cost required to perform optimal inventory with the minimum total costs incurred.

## IV. CONCLUSION

From the calculation result of the economic order quantity, it was obtained the results of optimal order number with minimum costs. the calculation results for shoe

set brake (06430-k44-v80) was 464 units, bearing ball (hb6201rs) was 451 units, element comp air cleaner (17210-k16-900) was 427 units, pad set fr (06455-kvb- t01) was 389 units, element comp air cleaner (17210-kzr-600) was 341 units, oring-fuel pump (17572-ggl-j00) was 288 units,

belt drive kit (23100-k44-ba0) was 284 units, tiler (90/90-14ft235 42711-k59-a12 ) was 294 units, brake shoe (43130-kzl-930) was 292 units, and race steering kit (06535-gn5-505) was 306 units. Forecasting was good with mape results of 10% and the accuracy rate of 90%.

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