Implementation of Economic Batch Quantity (EBQ) at Mutual Industries in Order to Increase Productivity and Reduce Effective Cost in A Given Batch or Product Run - A Case Study

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Abstract: In today’s competitive world, satisfying the varied needs of customers along with the minimum cost is an important factor. However this case study emphasizes on the implementation of economical batch quantity in order to increase the productivity by allotting the minimum batch size. So during the case study focus of attraction was to find the minimum batch size so that the cost occurring for production would be bearable, because sometimes in automation industries it happens that because of improper production planning small quantity of finished goods is manufactured which leads to increase the cost of finished goods. So by adopting the EBQ model minimum batch quantity can be achieved.

KEYWORDS: Economical batch quantity[EBQ], Annual demand, setup cost, inventory cost

I. INTRODUCTION

Economic batch quantity is a measure used to determine the quantity of units that can be produced at the minimum average costs in a given batch or product run. Some assumptions made in economic batch quantity they are:

1. Demand is known and constant within a certain period of time
2. Unit cost of the inventory item is constant
3. Production time is known and constant
4. Setup cost is constant and does not change

II. METHODOLOGY:

Table 1: Methodology

| 2.1 | Determining the need for EBQ implementation |
| 2.2 | Data Collection and Analysis |
| 2.3 | Design for implementation |

2.1. Determining The Needs For EBQ implementation

EBQ is a value adding activity that every organization should follow. It gives the basic idea that what batch quantity should be made for better utilization of available resources. Before implementing EBQ in mutual industries it was found that there is uneven quantity of finished goods being manufactured so there was need to implement EBQ at mutual industries. According to survey results before implementation of EBQ varying batch quantity can be seen from following tables results into varying cost per batch.

Table 2: Varying batch Quantity

<table>
<thead>
<tr>
<th>Batch Number</th>
<th>Batch Quantity (Finished goods)</th>
<th>Total cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch 1</td>
<td>750</td>
<td>54075</td>
</tr>
<tr>
<td>Batch 2</td>
<td>1100</td>
<td>79310</td>
</tr>
<tr>
<td>Batch 3</td>
<td>1800</td>
<td>129780</td>
</tr>
<tr>
<td>Batch 4</td>
<td>1250</td>
<td>90125</td>
</tr>
<tr>
<td>Batch 5</td>
<td>900</td>
<td>64890</td>
</tr>
</tbody>
</table>

NOTE: Cost for each finished good is taken to be Rs.721 Which includes Set up Cost And Inventory cost

From above table it can be seen that there is huge difference between batch Quantity, so to have a perfect batch quantity EBQ model should be implemented.

2.2. Data Collection & Analysis

With the help of the staff present in industries and past records of the company, data needed for the implementation of EBQ model is gathered before that some common terms are used in data collection they are as follows:

1. \( K \) = Set up cost or order cost
2. \( D \) = Annual Demand or annual usage
3. \( F \) = Holding cost or carrying cost
4. \( T \) = Cycle length
5. \( P \) = Production rate
6. \( Q \) = Economical batch quantity
Now after data collection it was found that:

- Per day demand in Mutual industries for finished goods is = 1000
- Hence monthly demand for finished goods is = 24000
- Cost of each finished good = 707 (Includes cost of raw material and labours)
- Set up cost for monthly demand for finished goods is = 16800000
- Inventory cost for finished goods is = 336000 (Includes storage, Interest, Taxes)

2.3 Design For Implementation

Now most important part is implementation of EBQ model. EBQ model is illustrated by following equation:

$$\text{EBQ} = \sqrt{\frac{2 \times \text{ANNUAL DEMAND} \times \text{SET UP COST}}{\text{INVENTORY CARRYING COST}}}$$

Hence from above data

$$\text{EBQ} = \sqrt{(2 \times 24000 \times 16800000 \div 336000)}$$

$$\text{EBQ} = 1550 \text{ Units}$$

This value are taken for monthly execution of EBQ model if we want to make it annually then it should be multiplied by 12, hence the annual demand.

From above equation it is found that if batch of 1550 units is made it has minimum average cost hence minimum batch size is obtained. Cost occurred after obtaining the minimum batch quantity can be elaborated as follows:

### Table 3: Cost after implementing EBQ

Below table will indicate the total cost arising after the implementation of EBQ model

<table>
<thead>
<tr>
<th>Batch Quantity</th>
<th>Total cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1550</td>
<td>1117550</td>
</tr>
</tbody>
</table>

Hence from table it is seen that total cost related with 1550 units will be 1117550 hence this cost will be Economical for production purpose and 1550 units will be Economical ordering quantity that means to have an effective cost from company point of view minimum 1550 units should be produced in one batch quantity less than this wont be economical.

### III. SUMMARY & CONCLUSION

The table below will show the effect of EBQ model due to which effective cost per batch has decreased. The table show the comparison of product produced and their cost before and after the implementation of EBQ model. Gains through EBQ model are tremendous it should be properly exercise in industries, so that volume of the product can be increased also the cost associated with this product can be decreased

<table>
<thead>
<tr>
<th>Batch Number:</th>
<th>Batch1</th>
<th>Batch2</th>
<th>Batch3</th>
<th>Batch4</th>
<th>Batch5</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch Quantity (Before EBQ model)</td>
<td>750</td>
<td>1100</td>
<td>1800</td>
<td>1250</td>
<td>900</td>
<td>1160</td>
</tr>
<tr>
<td>Total cost (Before EBQ model)</td>
<td>540750</td>
<td>793100</td>
<td>1297800</td>
<td>901250</td>
<td>648900</td>
<td>836360</td>
</tr>
<tr>
<td>Batch Quantity (After EBQ model)</td>
<td>1550</td>
<td>1550</td>
<td>1550</td>
<td>1550</td>
<td>1550</td>
<td>1550</td>
</tr>
<tr>
<td>Total cost (After EBQ model)</td>
<td>1117550</td>
<td>1117550</td>
<td>1117550</td>
<td>1117550</td>
<td>1117500</td>
<td>1117500</td>
</tr>
</tbody>
</table>

Hence Final conclusion is that after implementing EBQ model productivity increases as seen from table difference comes out to be of 390 units

But a strict instruction should be given that minimum cost associated should not be less than Rs.117550 otherwise that wont be consider as economic order quantity.

### REFERENCES
