



iJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 Issue: VIII Month of publication: August 2019

DOI: <http://doi.org/10.22214/ijraset.2019.8121>

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Forecasting of Reorder Point using Economic Order Quantity for a Leading Food Industry

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Abstract: *The global market is growing with economical uncertainties. Companies are deeming for growth and chance to reduce their total cost, and administration of companies would like to enhance quality, efficiency and competence without increasing their investment. The achievement of many organizations is associated to their ability to supply product and services at a lower price in the right place and time. In this paper development of an Inventory Control Model for Y- Cook! India Private Ltd, Hosakote, Karnataka is designed and proposed. For this analysis Economic Order Quantity method of inventory management is considered. In this paper reorder point and costs are calculated to compare two models, one is used by this company and other is suggested technique.*

Keywords: *EOQ, Reorder Point, Inventory Control, Just in time*

I. INTRODUCTION

Food processing attained propulsion in the last five years particularly in urban India., in view of the fast urbanization that is increasing the difference between utilization and production. Y-Cook, Food processing technology company, making another classification in the nourishment space – the class of essentially processed and prepared vegetables, lentils and organic fruit based products. The company significantly allow the field fresh green fruits and vegetables to hold their regular freshness, shading, surface, flavor and supplements for a year with no preservatives or added ingredient or even preservation.

A. Inventory Control and Management

It is one of the most essential aspects of organization and the percentage of inventories to total asset in general varies between 15 to 25%. Stock administration framework has principally two concerns, one is level of customer service for example to have right products, in ideal spot and at ideal time and other is to control the cost of ordering and carrying inventories. With the present uncertain economy, organizations are probing for unconventional strategies to keep at the forefront of their competitors by successfully driving deals and by cost lessening.

Retail food processing companies do not stand for an opportunity in today's atmosphere if they do not have a suitable inventory control management system unblemished. EOQ / ROP model have been utilized for a long time, however yet a few organizations have not taken benefit of it. An EOQ could help with choosing what might be the best reorder quantity at the company's most reduced cost. Like EOQ, the reorder point will encourage when to put in a request for explicit items dependent on their chronicled request. The reorder point likewise enables adequate stock within reach to fulfil request while the following request appear because of the lead time.

Since retail can be unpredictable and competitive, the interest of seeing how forecasting can affect the economic order quantity (EOQ) and reorder point led to assist Company in finding alternative methods to solved their forecasting issues.

B. Economic Order Quantity (EOQ)

Ford W. Harris (1915) developed a formula for Economic Order Quantity where as R. H. Wilson significantly contributed to the in-depth analysis and application of this model. EOQ establish the most economic size of the order to be placed by the companies to reduce the ordering and holding cost. The EOQ procedure written by James A. Cargal [3] gives the precise explanation of usage of variables.

Economic order quantity can be calculated mathematically with a great degree of accuracy as given below:

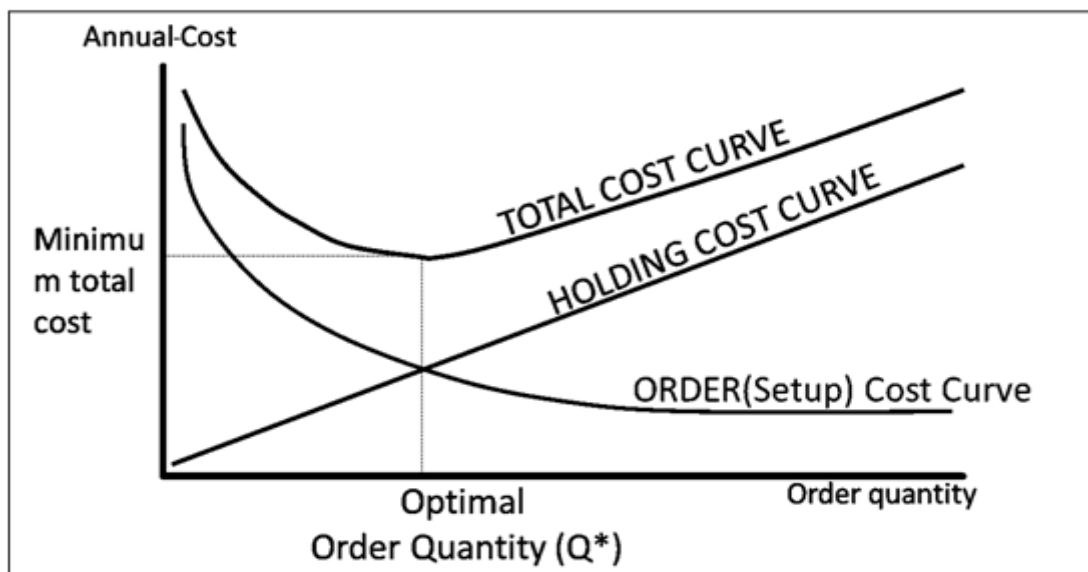
$$EOQ = \sqrt{(2 \times A \times O) / C}$$

Where,

A = Annual demand in units

O = Cost incurred to place a single order

C = Carrying cost per unit per year



C. Assumptions of EOQ

- 1) It assumes that demand is known and consistent over time
- 2) No deficiencies are permitted
- 3) Lead time for the acceptance of order is consistent
- 4) The requested quantity is received at the same time
- 5) The procurement price of item is consistent

II. REVIEW OF LITERATURE

Erlenkotter, Donald [1], elaborated how Ford Whitman Harris developed the formula for Economic Order Quantity in his research paper, "Ford Whitman Harris and the Economic Order Quantity Model" proclaimed in 1990.

Nobil, A.H., Sedigh, A.H.A. and Cárdenas-Barrón, L.E. Middle Eastern J Sci Eng (2019) [2], considered an EOQ control model for developing items, wherein the value and size of items significantly increase during time, a few occurrences of these things are livestock, fish, and poultry. The principle contrast between this stock framework and more established ones is weight addition of items during stocking without purchasing more. This paper analyses a stock arrangement of poultries that new-born items are nourished to reach the ideal weight for customers. In this investigation, to obtain optimum system solution for minimizing total costs, including setup, purchasing, holding, feeding, and shortage cost, employed mathematical measures to approximate growing rates and model the system as a non-linear programming. Hessian matrix is used to solve the obtained optimization model.

Vivek Madhav Rao; Dharamvir Mangal(2018) [3], in this paper, study the existing procedure of forecasting model and suggests an inventory control method. Requested quantity of item and reorder point was prescribed to decrease the inventory. This research goes through a contextual analysis accomplished for ideal stock control, connected to B.Brown Medical India Pvt. Ltd. The investigation shows a single item stock in which cyclic assessment of stock control, where distinct unsystematic demand might be fulfilled. A numerical result is given to include understanding into the outcomes.

Leonid Eksler, Roei Aviram, Amir Elalouf, and Aakash Kamble(2018) [4], In this paper, the researchers present an Economic Order Quantity model with substitutions among items and a powerful stock replacement approach. The key conjecture is that numerous items in the market are substitutable at various levels, and that, by and large, a consumer who finds that an ideal item is inaccessible will select an item with comparable characteristics or usefulness. The fundamental reason for developing this model is to empower inventory managers to overcome the unexpected circumstances where in a particular product availability is impacting customer choice. The resulting increment sought after for related items won't bring on additional stock out episodes.

A. Statement of the Problem

The present method use for forecasting demand by this company is erroneous in estimating the raw material requirements of the company. It has brought delay in delivery of finished products to clients. Y-Cook employs JIT (Just in Time) model to trace out the demand and receiving raw material only as are needed in the production process, thereby reducing inventory costs, but this led to the sudden placement of an order for material.

The rationale of this analysis is to suggest an alternative method to overcome the stock out or overstocking situation and reducing cost by using more efficient estimation based on EOQ. For this reason, a detailed study of the ordering of items/ material by using JIT is undertaken, using data of two months to compare the existing with the proposed method of estimation.

B. Objective of the Study

- 1) To Study the various Inventory Techniques used by the Y-Cook! Private Ltd
- 2) To determine an efficient inventory control procedure for Y-Cook Private Ltd
- 3) To measure the applicability of the EOQ model of the inventory control system with the existing system.

C. Limitation

Due to a company, regulation data collection is allowed only for two months and 10 different products/items are considered in the analysis. Demand is considered as stable over the analysis. But in reality, demand is not uniformly distributed. Additionally, it was difficult to gather information from all accessible sections.

III. RESULTS AND DISCUSSION

A. Inventory Practices at Y-Cook! Private Ltd

The manufacturing plant of Y-Cook is part of the most completely integrated food technology facility in India with all critical components, including saplings sourced in-house from existing facilities on-site. This gives Y-Cook! Complete control over inventory and product quality.

B. Quality Check Points

- 1) *Washing*: Sanitizer concentration
- 2) *Solid Filling*: Specifications of the cob
- 3) *Liquid Filling*: Volume of brine solution
- 4) *Sealing*: Elimination of sealing defects
- 5) *Cooking*: Temperature and time
- 6) *Cleaning*: Chemical, physical and biological hazards
- 7) *Packing*: Metal detector and coding

C. Data Analysis: Applicability of Economic Order Quantity Technique

Table: 1 – Comparison of Opening Stock and Production level

Product Type	Year opening stock	Production
S. Cob	1,85,151	6,27,586
D. Cob	1,40,593	10,78,765
Kernels-500g	4,000	2,13,969
Kernels-1kg	22,883	72,373
Baby Potato	0	5,223
Sweet Potato	1,850	26,832
Tapioca	144	14,703
Rajma Dal	4,300	24,050
Tuvur Dal	3,295	6,709
Baby Corn	94	9,467

Table: 2 Comparison of Demand and Economic Order Quantity

Product type	Demand per year	Re-Order cost/order	Carrying cost/unit/year	EOQ
S. Cob	6,25,110	27,179	85p	1,99,940
D. Cob	13,26,396	28,835	1.24p	2,48,371
Kernels-500g	2,28,443	7,369	62p	73,691
Kernels-1kg	92,324	1,248	₹3	8,764
Baby Potato	7,562	315	24p	4,455
Sweet Potato	17,538	731	24p	10,336
Tapioca	16,674	695	24p	9,827
Rajma Dal	17,873	715	30p	9,230
Tuvur Dal	9,869	395	10p	8,830
Baby Corn	16,028	267	75p	3,378

Table: 3 Assessment of Opening Stock and EOQ

Product Type	Demand per year	Year opening stock	EOQ	Production
S. Cob	6,25,110	1,85,151	1,99,940	6,27,586
D. Cob	13,26,396	1,40,593	2,48,371	10,78,765
Kernels-500g	2,28,443	4,000	73,691	2,13,969
Kernels-1kg	92,324	22,883	8,764	72,373
Baby Potato	7,562	0	4,455	5,223
Sweet Potato	17,538	1,850	10,336	26,832
Tapioca	16,674	144	9,827	14,703
Rajma Dal	17,873	4,300	9,230	24,050
Tuvur Dal	9,869	3,295	8,830	6,709
Baby Corn	16,028	94	3,378	9,467

D. Interpretation

- 1) Demand per year for the product double cob is 13,26,396 and the order cost and carrying cost are 28,835 and 1.24p respectively and the calculated EOQ is 2,48,371 whereas the year opening stock is only 1,40,593
- 2) Demand per year for the product single cob is 6,25,110 and the order cost and carrying cost are 27,179 and 85p respectively and the calculated EOQ is 1,99,940 whereas the year opening stock is 1,85,151
- 3) Demand per year for the product kernels 500gm is 2,28,443 and the order cost and carrying cost are 7,369 and 62p respectively and the calculated EOQ is 73,691 whereas the year opening stock is only 4000
- 4) Demand per year for the product kernels 1kg is 92,324 and the order cost and carrying cost are 1,248 and rs.3 respectively and the calculated EOQ is 8,764 whereas the year opening stock is 22,883
- 5) Demand per year for the product Baby potato is 7,562 and the order cost and carrying cost are 315 and 24p respectively and the calculated EOQ is whereas 4,455 the year opening stock is 0
- 6) Demand per year for the product Sweet potato is 17,538 and the order cost and carrying cost are 731 and 24p respectively and the calculated EOQ is 10,336 whereas the year opening stock is 1,850
- 7) Demand per year for the product Baby Corn is 16,028 and the order cost and carrying cost are 267 and 75p respectively and the calculated EOQ is 3,378 whereas the year opening stock is 9,467

IV. CONCLUSION

The model projected thus gives a productive and dynamic way out for the company to manage inventory efficiently and control different items inside a stock framework. Enhanced inventory management process definitely is useful in taking care of the difficulties faced by the organization with respect to inventory control and to prepare the organization to decreasing the high investment made in inventory. Analysis of collected data shows that the company can pursue the Economic Order Quantity (EOQ) for ideal purchase and it can retain safety stock for its items in order to evade stock-out circumstances & help in uninterrupted production flow. This would lessen the expense and improve the profitability. An intriguing road for future research is stretched out based on proposed model to different sorts of items which are used in production process. As a result, inventory control should be far reaching enough to cover the progression of materials beginning from generation till the items are sold.

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