

# Inventory Management with Zero Inventory Concept in an Automobile Shop

Deepak Kumar Rathaur<sup>1</sup> Dr. P. M. Mishra<sup>2</sup>

<sup>1,2</sup>Department of Mechanical Engineering

<sup>1,2</sup>Maulana Azad National Institute of Technology, Bhopal, Madhya Pradesh, India

**Abstract**— The aim of this paper is to reduce the inventory in an automobile shop. Zero Inventory concept is a cost-effective philosophy. Zero inventory concept originally came from Toyota. It has certainly brought a huge success to Toyota. An automobile shop in which no or very little inventory in storage, simply ordering exactly what it needs to sell and receiving it in a timely manner is known as the zero inventory based system. Zero Inventory is the goal of JIT (Just-In-Time) inventory management in an automobile shop. When we use Zero Inventory concept in an automobile shop then various costs are reduced like, inventory carrying cost, inventory handling cost, infrastructure & maintenance cost, safety and security cost etc. Zero Inventory concept in any organization improves the Economic Order Quantity (EOQ) and reduce the total optimum cost and total optimum time. Zero Inventory focuses on the process not on product. The conclusion of this research indicates that Zero Inventory system is successful in an automobile shop and operating Zero Inventory system leads to many advantages to an automobile shop.

**Key words:** Zero Inventory, Automobile Shop

## I. INTRODUCTION

In today's global world, the real challenges for an automobile shop or any business are providing good or excellent quality, cost and delivery performance to attain the customer satisfaction. These types of challenges can be achieved by inventory management. The scope of inventory management concept concerns the fine lines between inventory holding costs, replenishment lead time, inventory carrying costs, inventory handling costs, inventory safety & security costs, asset management, inventory forecasting, inventory valuation, inventory visibility, future inventory price forecasting, physical inventory, available physical space for inventory, quality management, replenishment, returns & defective goods and demand forecasting. Balancing these competing requirements leads to optimal inventory levels or proper management of inventory which is an ongoing process as the business needs shift and react to the wider environment. The main objectives of inventory management are to maintain inventory at appropriate level or balanced these competing requirements to avoid excessive or shortage of inventory because both the cases are undesirable for business or failure of business.

Thus, inventory management is faced with the following important objectives:

- 1) To minimize the wastage of inventory at optimal level to reduce the inventory cost.
- 2) To reduce the infrastructure & maintenance costs to maximize the profitability.
- 3) Inventory management with zero inventory concepts.
- 4) To reduce the carrying cost of inventory.
- 5) To minimize the holding cost of inventory.

- 6) To keep investment in inventory at optimum level.
- 7) To minimize the losses of theft, obsolescence & wastage etc.
- 8) To minimize safety and security cost of inventory.
- 9) To minimize inventory ordering costs.

Zero Inventory concept based system or shop has no or very little inventory in stock. Basic aim of zero inventory is to eliminate the waste of goods or items. Inventory management with zero inventory concept is to provide only what is needed by customer, when it is needed and in the quantities ordered. The production of goods or parts of vehicles i.e. four wheeler or two wheeler is done in a way that minimizes the time taken and cost to deliver the finished goods, the man-power required, the work-space required, and it is done with the highest quality, and usually at the lowest cost. To remain alive in the fast growing global market. Zero inventory discipline has to work in each aspect for waste reduction in order to optimise the cost and total optimum time. The basic aim of inventory management with zero inventory concept is inventory elimination and to assist manufacturers who have an aspiration to improve the company's operations to become more competitive through the implementation of zero inventory system tools. The goals of inventory management with zero inventory concept are to increase the efficiency of an automobile shop and reducing wasted materials, time & effort and reducing the costs.

## II. RESEARCH OF METHODOLOGY

The inventory management problem is the problem faced by a company or an automobile shop that must decide how much to order in each time period to meet demand rate for its products. These problems can be modelled using mathematical techniques of optimal control, network optimization and dynamic programming. The study of such types of problems is a part of inventory theory.

Various problems related to inventory management are given as follows

Generally inventory carrying cost is very high.

Infrastructure & Maintenance problems.

Safety and security problems of inventory in any industry or in any plant.

Space problems because to keep the inventory large space is required.

Ordering cost is also high.

To keep the inventory in excess to manage the supply-demand rate, so it is also a big. Problem.

### A. Mathematically Data of an Automobile Shop

#### 1) Before Zero Inventory Concept

Demand rate	R	=	500000 vehicles per year
Inventory carrying cost	C1	=	250 rs. Per vehicle
Inventory ordering cost	C3	=	500 rs. per order

Table 1:

a) Economic Order Quantity  
(EOQ)  $q_o = \sqrt{\frac{2RC_3}{C_1}}$   
 $q_o = \sqrt{\frac{2 \times 500000 \times 500}{250}}$   
 = 1414.22 Units per year

b) Total Optimum Time  
 $t_o = \sqrt{\frac{2C_3}{RC_1}} = \sqrt{\frac{2 \times 500}{500000 \times 250}}$   
 = 0.0028 years

c) Total Optimum Cost  
 $C_o = \sqrt{2RC_1C_3}$   
 $= \sqrt{2 \times 500000 \times 250 \times 500}$   
 =  $353.55 \times 10^3$  rs. per year

**B. Mathematically Data of an Automobile Shop-**

**1) After Zero Inventory Concept**

- Demand Rate R = 500000 vehicles per year
- Inventory carrying cost C1 = 25 rs. per vehicle
- Inventory ordering cost C3 = 100 rs. per order

a) Economic Order Quantity (EOQ)  
 $q_o = \sqrt{\frac{2RC_3}{C_1}} = \sqrt{\frac{2 \times 500000 \times 100}{25}}$   
 = 2000 units per year (increased upto 41.4 %)

b) Total Optimum Time  
 $t_o = \sqrt{\frac{2C_3}{RC_1}} = \sqrt{\frac{2 \times 100}{500000 \times 25}}$   
 = 0.000016 years (reduced upto 94.3 %)

c) Total Optimum Cost  
 $C_o = \sqrt{2RC_1C_3} = \sqrt{2 \times 500000 \times 25 \times 100}$   
 = 50000 rs. per year (reduced upto 85.8 %)

**III. RESULTS**

- 1) Inventory carrying cost will be reduced.
- 2) Inventory handling cost will be reduced.
- 3) Storage cost will be reduced.
- 4) Maintenance cost will be reduced.
- 5) Insurance, interest, safety and security cost will also reduce etc.

**IV. CONCLUSION**

The inventory management with “Zero Inventory” concept can be used in an automobile shop or an industry for the transportation of materials from the outside vendors directly to the work-in-progress areas where the required value added through the manufacturing operations occurred, which followed by the shipping of the finished items out of the door, all at a reasonable prize and at a reasonable rate of time. The inventory management with Zero Inventory concept would save companies or shops the costs of maintenance,

infrastructure, material handling, stocking, inventory carrying, inventory tracking, inventory ordering and the risks of obsolescence and damage. Finally, if we use this concept in an automobile shop or an organization then we can some improve the profitability and efficiency of an automobile shop or an organization.

**REFERENCES**

- [1] A study of the Toyota Production System, Shigeo Shingo, Productivity Press, 1989.
- [2] Bromwich, M., Bhimani, A., "Accounting for just-in-Time manufacturing systems", Management Accounting, pp. 31-4, 1991.
- [3] Bongiorno, Sara. "All in the timing", The Greater Baton Rouge Business Report, 19 July 2004.
- [4] Brox, J.A., Fader, C., "Assessing the impact of JIT using economic theory", Journal of Operations Management, Vol. 15, pp. 371-388, 1997.
- [5] Cannella S., Ciancimino E. (2010) Up-to-date Supply Chain Management: the Coordinated (S, R). In "Advanced Manufacturing and Sustainable Logistics". Dangelmaier W. et al. (Eds.) 175–185. Springer-Verlag Berlin Heidelberg, Germany.
- [6] Chang, D., Lee, S.M., "The impact of critical success factors of JIT implementation on organizational performance", Production Planning & Control", Vol. 7, No. 3, pp. 329-338, 1996.
- [7] Cheng, T.C.E., Podolsky, S., "Just-in-time manufacturing- an introduction (New York: Chapman and Hall), 1993.
- [8] Crawford, K.M., Cox, J.M., "Addressing manufacturing problems through the implementation of just-in-time", Production and Inventory Management Journal, Vol. 32, pp. 33-6, 1991.
- [9] Crawford, K.M., Blackstone, J.H., Cox, J.F., "A study of JIT implementation and operating problems", International Journal of Production Research, Vol. 26, No. 9, 1988, pp. 1561-1568, 1993. IJRMET Vol. 2, Issue 1, April 2012 ISSN : 2249-5762 (Online) | ISSN : 2249-5770 (Print) 62 International Journal of Research in Mechanical Engineering & Technology www.ijrmet.com
- [10] Cook, R.L, "Applying JIT principles to continuous process manufacturing supply chains", Production and Inventory Management Journal, Vol. 37, No. 1, pp. 12-17, 1996.
- [11] De Hann, J., Yamamoto, M., "Zero inventory management: facts or fiction?" Lessons from Japan, Vol. 59, pp. 65-75, 1999.
- [12] Deshpande, S.P., Golhar, D.Y., "HRM practices of JIT firms in Canada", Production Planning and Control, Vol. 7, No. 1, pp. 79-85, 1996.
- [13] Ebrahimpur, M., Schonberger, R.J., "The Japanese Just-intime/Total quality control production system: Potential for developing countries", International Journal of Production Research, Vol. 22, No. 3, pp. 421-430, 1984.
- [14] Emiliani, B., with Stec, D., Grasso, L. and Stodder, J. (2007), Better Thinking, Better Results: Case Study and Analysis of an Enterprise-Wide Lean Transformation,

- second edition, The CLBM, LLC Kensington, Conn., ISBN 978-0-9722591-2-5.
- [15] Flinchbaugh, Jamie and Carlino, Andy (2006), *The Hitchhiker's Guide to Lean: Lessons from the Road*, SME, ISBN 0-87263-831-6
- [16] Francis, Q.J., "Building a practical JIT program", *Traffic Management*, Vol. 28, pp. 55, 1989.
- [17] Garg, Dixit. Deshmukh, S.G., Kaul, O.N., "Critical Analysis in JIT purchasing in Indian Context", *Productivity*, Vol. 37, No. 2, 1996, pp. 271-277, 1996.
- [18] [https://books.google.co.in/books?id=TxJNaPkuc4oC&pg=PA43&ots=BnyoLMA\\_eL&dq=kanban%20in%20jit%20or%20zero%20inventory&pg=PP1#v=onepage&q=kanban%20in%20jit%20or%20zero%20inventory&f=true](https://books.google.co.in/books?id=TxJNaPkuc4oC&pg=PA43&ots=BnyoLMA_eL&dq=kanban%20in%20jit%20or%20zero%20inventory&pg=PP1#v=onepage&q=kanban%20in%20jit%20or%20zero%20inventory&f=true).
- [19] Hirano, Hiroyuki and Makota, Furuya (2006), "JIT Is Flow: Practice and Principles of Lean Manufacturing", PCS Press, Inc., ISBN 0-9712436-1-1
- [20] Impact of just-in-time (JIT) inventory system on efficiency, quality and flexibility among manufacturing sector, small and medium enterprise (SMEs) in South Africa, Musara Mazanai, *African Journal of Business Management* Vol. 6(17), pp. 5786-5791, 2 May, 2012, pg. 5787-5788
- [21] Management Coaching and Training Services, (2006). *The Just-In-Time (JIT) Approach*. Retrieved June 19, 2006 from the World Wide Web.
- [22] Ohno, Taiichi (1988), *Toyota Production System: Beyond Large-Scale Production*, Productivity Press, ISBN 0-915299-14-3
- [23] Ohno, Taiichi (1988), *Just-In-Time for Today and Tomorrow*, Productivity Press, ISBN 0-915299-20-8
- [24] Ohno, Taiichi (March 1998), *Toyota Production System: Beyond Large-Scale Production*, Productivity Press, ISBN 978-0-915299-14-0.