



RESEARCH ARTICLE

SUPPLY CHAIN LOGISTICS MANAGEMENT USING XYZ ANALYSIS – A CASE STUDY ON A
MANUFACTURING INDUSTRY

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ABSTRACT

Inherent uncertainties in demands and supply make it difficult for supply chains to achieve optimum inventory replenishment, resulting in loss of sales or keeping excessive inventories. An unkept inventory can take up to one-third of an organization's annual investment. Therefore, in order to compete with invariably erratic demands, it is not only challenging to develop an intelligent system to maintain and control an optimum level of inventory but has also become mandatory. Here we have tried to study the supply chain logistic management in manufacturing industry using XYZ analysis method.

Supply chain: Supply chain management (SCM) is the oversight of materials, information, and finances as they move in a process from supplier to manufacturer to wholesaler to retailer to consumer. Supply chain management involves coordinating and integrating these flows both within and among companies

Logistic: Logistics management is that part of the supply chain that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customer requirements.

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INTRODUCTION

Here we have applied the XYZ analysis techniques on an EMU manufacturing industry. Now to understand the application of the analysis on this particular industry we should have some basic knowledge about the Electric Multiple Unit (EMU) coaches. An Electric Multiple Unit (EMU) is a multiple unit train powered by electricity. The cars that form a complete EMU set is categorized on the basis of their function into four types – viz. Power Car that carries pantograph, transformers; Motor Car that carries traction motor; Driving Car that containing a drivers cab for controlling the train; Trailer Car that is similar to passenger car in a locomotive hauled train.

A complete rake consists of 9 coaches having 3 units or 12 coaches having 4 units. Each unit consists of one motor coach and two trailer coaches. Arrangement of a 9 coach rake is in the order as B-C-C-D-B-C-C-D-B and 12 coach rake being B-C-C-D-B-C-C-D-B-C-C-B : where, 'B', 'C', and 'D' represent motor cum trailer coach, passenger coach and vendor cum passenger coach respectively. The preparing shop of EMU has been divided in to four major sections namely Body Shell

where structural framework of the EMU is done i.e. roof, side and end assemblies, Under Frame assembly, Bogie Shop, and Furnishing Shop. The sub assemblies required for EMU assembly are 1) Roof assembly, 2) Side assembly, 3) End assembly, 4) Under Frame assembly, 5) Bogie assembly. We can categorize the items as a whole else we can categorize them according to the preparation of each sub assembly as well to perform the inventory analysis techniques.

Literature Review

Inventory management is the accurate tracking of all materials in the company's inventory. The company has purchased these items from another supplier. This analysis is based on the value of the stocks on hand (i.e. capital employed to procure inventory). Items whose inventory values are high are called X-category and whose values are low are called Z-items. Usually XYZ analysis is used in association with ABC analysis. Logistics is the integration and management of the product value chain from suppliers to the customer. It includes all aspects of the chain of production, including design, suppliers, financing, information, energy, transportation, distribution, and sales.

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Logistics management is the part of supply chain management that plans, implements, and controls the efficient, effective forward, and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customer's requirements.

Activities of logistics are involved in mostly all the fields such as:

- Food & beverages
- Hazardous materials
- Pharmaceutical goods
- Machinery & appliances
- Storage industries.

Table 1 shows us how an XYZ analysis is performed. Here at first average inventory cost of each item is calculated followed by calculating the percentage average inventory cost. The average inventory cost is calculated from the following formula-

$$\text{Average Inventory Cost of each item} = \text{Average Inventory of each item} \times \text{Unit Price of each item}$$

After that annual usage of each item is calculated followed by calculating the percentage annual usage of each item. Annual usage of each item is calculated from the following formula-

$$\text{Annual Usage of each item} = \text{Annual Demand of each item} \times \text{Unit Price of each item}$$

This is followed by calculating the percentage cumulative annual usage of each item. Percentage cumulative usage is calculated from the following formula-

$$\text{Percentage Cumulative Usage of 1}^{\text{st}} \text{ item} = \text{Percentage Annual Usage of 1}^{\text{st}} \text{ item.}$$

$$\text{Percentage Cumulative Usage of 2}^{\text{nd}} \text{ item} = \text{Percentage Cumulative Usage of 1}^{\text{st}} \text{ item} + \text{Percentage Annual Usage of 2}^{\text{nd}} \text{ item.}$$

From the analysis it has been found that about 17% of the items which contribute towards 24% of the total annual usage are classified as 'X' class items and about 83% of the items which contribute towards 76% of the total annual usage are classified as 'Z' class items. The following graph has been obtained from the above analysis. From the XYZ analysis of bogie stage items it has been found that about 2% of the items which contribute towards 21% of the total annual usage are classified as 'X' class items. About 2% of the items which contribute towards 13% of the total annual usage are classified as 'Y' class items and about 96% of the items which contribute towards 66% of the total annual usage are classified as 'Z' class items. From the XYZ analysis of Body Shell Stage items it has been found that about 2% of the items which contribute towards 25% of the total annual usage are classified as 'X' class items. About 2% of the items which contribute towards 17% of the total annual usage are classified as 'Y' class items and about 96% of the items which contribute towards 58% of the total annual usage are classified as 'Z' class items.

Table 1. XYZ Analysis of Under Frame Items

Sl. No.	ITEM	L	Q	Y	K	E	A	D	T	P	C	A	E	I	N	E	I	N	E	T	E	A	U	A	A	U	A	T	E	G
1	Cap for Side Bearer	8			2			16			5446		16			87143.7		25.873228			87144		24.1			24.10475927			X	
2	Tube	52			2			104			1030		80			82368		24.455313			107078		29.62			53.72364908			Z	
3	Bearing Bracket	3			2			6			11471		6			68827.2		20.435008			68827		19.04			72.76189819			Z	
4	Modified Arrangement of Side Buffer Base	4			2			8			5738		8			45901.4		13.628279			45901		12.7			85.45866703			Z	
5	Side Bearer Assembly	52			2			104			280.8		104			29203.2		8.6705202			29203		8.078			93.53654607			Z	
6	Modified Arrangement of Side Buffer Base	2			2			4			5842		4			23366.7		6.9376513			23367		6.463			100			Z	

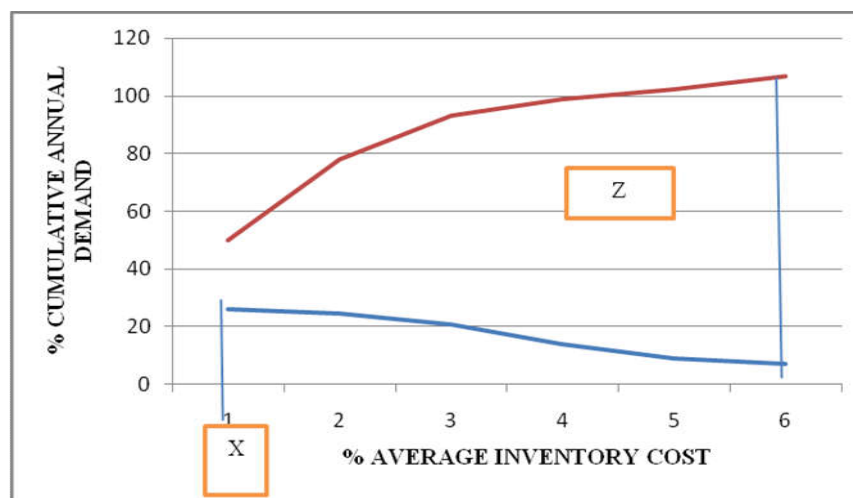


Figure 1. XYZ analysis of under frame items

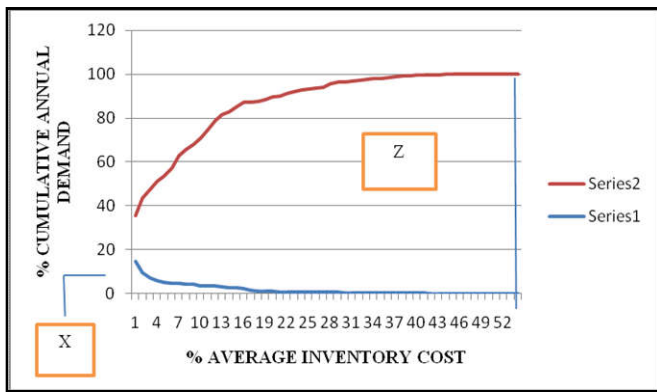


Figure 2. XYZ analysis of bogie items

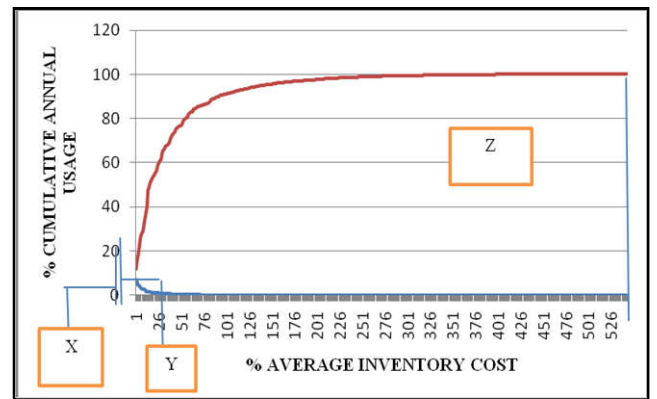


Figure 6. XYZ Analysis of an EMU Coach

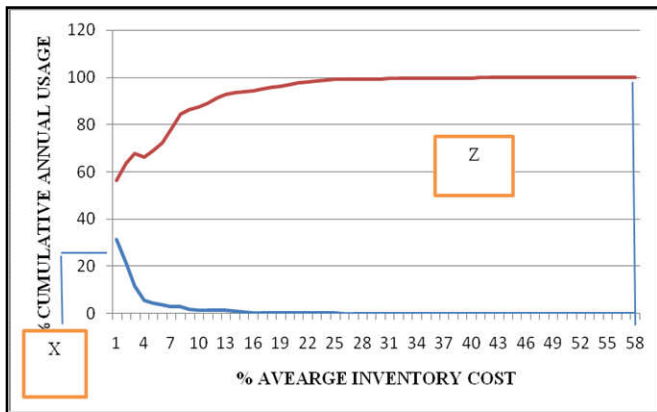


Figure 3. XYZ analysis of body shell items

From the XYZ analysis of Furnishing Stage Items it has been found that about 4% of the items which contribute towards 23% of the total annual usage are classified as ‘X’ class items. About 2% of the items which contribute towards 2% of the total annual usage are classified as ‘Y’ class items and about 6% of the items which contribute towards 75% of the total annual usage are classified as ‘Z’ class items.

From the XYZ analysis of completed stage items it has been found that about 1% of the items which contribute towards 18% of the total annual consumption are classified as ‘X’ class items. About 1% of the items which contribute towards 7% of the total annual consumption are classified as ‘Y’ class items and about 98% of the items which contribute towards 75% of the total annual usage are classified as ‘Z’ class items.

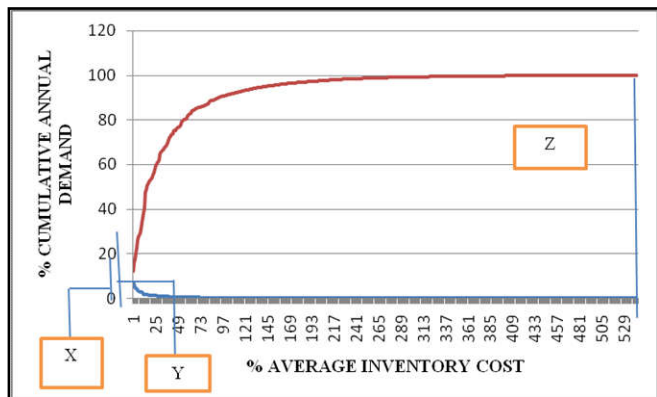


Figure 4. XYZ Analysis of Furnishing Stage Items

From the XYZ analysis of the items of an EMU coach analysis it has been found that about 1% of the items which contribute towards 22% of the total annual usage are classified as ‘X’ class items. About 1% of the items which contribute towards 4% of the total annual usage are classified as ‘Y’ class items and about 98% of the items which contribute towards 74% of the total annual usage are classified as ‘Z’ class items.

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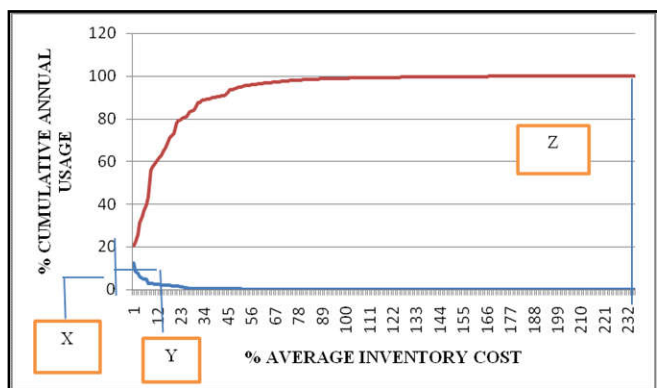


Figure 5. XYZ Analysis of Completion Stage Items