

5***ABC Analysis and an Application in The Carpet Industry**

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Abstract

Businesses must respond rapidly to client demand, withstand competitive conditions, and preserve their existence in today's competitive climate. Stock management is one of the most important aspects of achieving these objectives. Businesses must first classify the raw materials or replacement parts that must be in stock before implementing balanced stock management. One of these classifying approaches is ABC analysis. The practice of reviewing inventory to determine how much stock to keep is known as ABC inventory analysis. This study is critical for effective inventory management in businesses. ABC analysis, one of the stock control methods, was used in this study in a carpet firm in Gaziantep, and the results were compared. In this study, ABC analysis, one of the stock control methods, was carried out in a carpet business operating in Gaziantep, and the differences between the current situation and the situation after ABC analysis were presented.

Keywords

ABC inventory analysis, multiple criteria for ABC, warehouse allocation.

1. Introduction

Stock management strategies are critical for lowering production costs and increasing production productivity. Many organizations face difficulties as a result of inadequate stock management. The size of the warehouse and the amount of material objects to be stored are both factors in the storage dilemma. This is a critical decision that will impact the stock. In many carpet factories, the raw material warehouse space creates a size constraint. It is necessary to keep some yarns more and some less in the warehouse. There are many applications used for stock management. The research tries to reveal the effect of using ABC analysis for the management of stocks, which is one of the most important economic values of the enterprise, which can be converted into cash.

Investments inventories play an important role in country and business economies. These investments represent an important potential for the further development of companies (Axsater 2006). Excess or scarcity of stock causes problems in the industry in terms of both cost and storage for companies in the yarn and carpet industry. Therefore, inventory management is carried out at all levels within the enterprise. It can be seen as an area that the manager should be interested in. The tendency of the units within the business to hold inventory may differ due to their different liabilities (Schroeder 1989). In this study, stock management practices in a carpet business were examined and it is targeted to create more effective stock management with ABC analysis, which is one of the stock management techniques.

2. Literature Review

ABC Analysis has been widely used for the inventory management and have a proper control mechanism (Annie Rose Nirmala et al. 2021). In 2020, Elifcan Dursun and Ender Gürgeç examined the stock management of spare parts and materials for equipment used in a sample container terminal in their study. Parts and materials were primarily classified by ABC Analysis according to their inventory values, then various criteria were included in

the study and reclassified with fuzzy classification. At the end of the study, the results were compared according to ABC Analysis and fuzzy classification and suggestions were presented.

In the study carried out by İrfan Ertuğrul and Yasemin Tanrıverdi (2013), ABC analysis was performed for a textile business, and then Analytical Hierarchy Process (AHP) method was used for multi-criteria stock classification. Differences between the results of AHP and ABC analysis method in stock classification have been revealed.

In the study by Erkan Kıyak, Oğuz Han Timuş and Mehmet Karayel (2015), ABC classification methods were investigated and Ng's model, one of the most widely used, was chosen for further research. An illustrative example is presented to demonstrate the usability of Ng's method.

In the study called multi-criteria ABC analysis in inventory management, published by Cevdet Ürencik in 2015, the importance of evaluation and analysis of more than one criterion and material classifications in enterprises was emphasized.

3. Method

The basis of stock control dates back to the 1920s. Regarding stock control little progress was made in studies until the Second World War, its development was observed after 1950. The main purpose of an effective stock control; in the desired quality at the desired price and to the desired seller, in order to purchase the desired amount of raw materials and materials, creates an order at the desired time. Stock control must meet the following conditions:

- Availability of raw materials and consumables should be sufficient to run business operations effectively.
- Maintaining a financially viable stock level.

With stock control, information about stocks is transferred to the management and stock balancing the costs of holding stock with the benefits of holding stock. It is tried to determine the optimum stock amount for the enterprise. Stock control; stock quantity and its varieties, according to the supply, production, sales and financial possibilities of the enterprise is revealed by stock control and handled by stock control. The processes are as follows (Hıçkım 2002):

- Determining the material requirements of the enterprise
- Selection of the material to be stocked
- Determining the amount in order for the production not to be interrupted and to be continuous
- Determining the ordering time
- Arrangement of stock registration transactions
- Calculation of the minimum capital required to be tied to inventories held.

Some of the simple stock control methods within the scope of stock control are:

- Visual inspection method
- Double box method
- Minimum-Maximum method
- ABC control system

In visual control method, stocks are periodically reviewed by an experienced warehouse clerk. Inventory items that fall below a certain level are immediately ordered. Small being left to the responsibility of a trained warehouse clerk who knows his job. It is a really practical and cheap stock control method with registration.

In the double bin system, every material in the warehouse is kept in two bins big box the material is used until it is empty. At the bottom of the big box, the materials are reordered. There is a request form for reordering. This renewal request is sent while the small box materials are used. When the delivery of the order is delayed or more material is used than expected there is sufficient safety stock in this case.

In minimum-maximum method, the rate of use of stocks and the time between order and delivery an ordering point is determined. The consumption rate of the substance will remain unchanged, it is based on assumptions that all ordered items will be delivered at once. If the order is not ready for use on time a certain amount is held as safety stock for use.

The ABC classification method, which is very valid in recent years and developed by General Electric Company in the 1950s, helps in stock management (Öztürk 2005). This method is a simple method for distinguishing stocks that require close control from stocks that do not require a control system. The ABC method divides the goods in stock into three separate groups:

Although Group A goods account for only 20% of total volume, they account for 80% of overall sales value. Group C items, on the other hand, account for 50 to 60 percent of the total amount but have a sales value of just 5% to 10%. The middle B group goods, on the other hand, account for 20% to 30% of overall sales and 15% to 20% of sales value (Top 2006).

This method is for any business that make a classification according to the characteristics of the stocks such as the amount, value and percentages. It has a flexible structure that allows it to be determined according to these criteria. Two basic rules should be taken into account in the application of the ABC method:

- Having a large amount of low-value items.
- Keeping the quantity of high-value items low and tightening their control

This categorization of stockpiled commodities makes stock management more efficient and cost-effective. Inspections should be performed more regularly, with a greater emphasis on A category goods. Because of the high value of these items, keeping the safety stock low will save money. Simple estimation approaches, less complex transactions, and a cost-effective order quantity model are suitable for Type B products. For C type items, on the other hand, a more flexible control mechanism is sufficient, and fixed time period inventory management is often deemed appropriate (Top 2006); (Öztürk 2005).

4. Yarn Types and Corresponding Consumptions

Today there are many carpets of different quality. Different yarns are used in carpet production in order to change the quality and durability and to meet different customer needs. There are 10 types of yarn commonly used in the factory where the application is made. These are; Jute, Warp, Cotton, Tencel, Fringe, Acrylic, Polyester, Polypropylene, Frieze and Viscose.

Cotton fiber: Is soft, but not stain resistant (shown in Figure 1.1). Cotton fiber absorbs moisture and is difficult to clean. In carpet production, cotton is generally used only for weft and warp. Cotton quickly wears out and becomes dull, so it looks old quickly.

Jute: is made from a brown plant and is often used on the floor of carpets (shown in Figure 1.2).

Acrylic Features: Acrylic (shown in Figure 1.3), which is a fiber type similar to wool with its structure, is to mold and resistant to the sun.

Polypropylene Features: Easy-to-clean Polypropylene (shown in Figure 1.4), is resistant to mold and moisture. For this reason, it can be used indoors and outdoors. It is much cheaper compared to the other three fibers. Being antistatic is the advantage of the product.



Figure 1.1. Cotton picture



Figure 1.2. Jute picture



Figure 1.3. Acrylic picture



Figure 1.4. Polypropylene Picture

The stocks are classified using ABC analysis based on the price and quantity purchased. The prices of these products vary according to their quality. Table 1 shows the price table for the ten product groups, while Table 2 shows the annual costs of these product groups.

Table 1. Annual Consumption of Yarns

| Yarns | Annual Consumption (Kg) |
|---------------|--------------------------------|
| Polyester | 2.213.980,54 |
| Polypropylene | 2.418.187,15 |
| Acrylic | 752.462,24 |
| Jute | 1.774.439 |
| Warp | 1.262.203 |
| Cotton | 1.282.285 |
| Viscose | 176.131,24 |
| Frieze | 524.608,75 |
| Fringe | 38.473 |
| Tencel | 4.158 |
| Total | 10.446.927,92 |

Table 2. Annual Costs of Yarns

| Yarns | Annual Cost (\$) |
|---------------|-------------------------|
| Polyester | 5.534.951,35 |
| Polypropylene | 5.440.921,09 |
| Acrylic | 3.762.311,20 |
| Jute | 3.548.878,00 |
| Warp | 2.208.855,25 |
| Cotton | 2.051.656,00 |
| Viscose | 1.144.853,06 |
| Frieze | 1.049.217,50 |
| Fringe | 50.014,90 |
| Tencel | 24.948,00 |
| Total | 24.816.606,35 |

5. Results and Discussion

In the table 3, ABC analysis of the yarns in the raw material warehouse has been made. The first column indicates the yarn type, the second column the usage amount, the third column the unit cost, the fourth column the annual consumption cost, the fifth column the cumulative, the fifth column the cumulative percentage, and the last column the classified warehouse definitions.

Table 3. Classification of Yarns by ABC Analysis

| PRODUCT | AMOUNT OF USAGE (kg) | COST (\$) | ANNUAL CONSUMPTION(\$) | CUMULATIVE | CUMULATIVE % | GROUP |
|---------------|----------------------|-----------|------------------------|---------------|--------------|-------|
| POLYESTER | 2.213.980,54 | 2,5 | 5.534.951,35 | 5.534.951,35 | 22,30341761 | A |
| POLYPROPYLENE | 2.418.187,15 | 2,25 | 5.440.921,09 | 10.975.872,44 | 44,22793465 | A |
| ACRYLIC | 752.462,24 | 5 | 3.762.311,20 | 14.738.183,64 | 59,38839272 | B |
| JUTE | 1.774.439 | 2 | 3.548.878,00 | 18.287.061,64 | 73,68880895 | B |
| WARP | 1.262.203 | 1,75 | 2.208.855,25 | 20.495.916,89 | 82,58952333 | B |
| COTTON | 1.282.285 | 1,6 | 2.051.656,00 | 22.547.572,89 | 90,85679392 | C |
| VISCOSE | 176.131,24 | 6,5 | 1.144.853,06 | 23.692.425,95 | 95,47004782 | C |
| FRIEZE | 524.608,75 | 2 | 1.049.217,50 | 24.741.643,45 | 99,69793251 | C |
| FRINGE | 38.473 | 1,3 | 50.014,90 | 24.791.658,35 | 99,89947054 | C |
| TENCEL | 4.158 | 6 | 24.948,00 | 24.816.606,35 | 100 | C |

In the table above, the most used threads and their economic values are determined. They are listed in order of importance by multiplying annual usage amounts and unit prices. According to this order, group A is the most important, group B is of medium importance, and group C is the group that can be considered unimportant.

6. Proposed Improvements

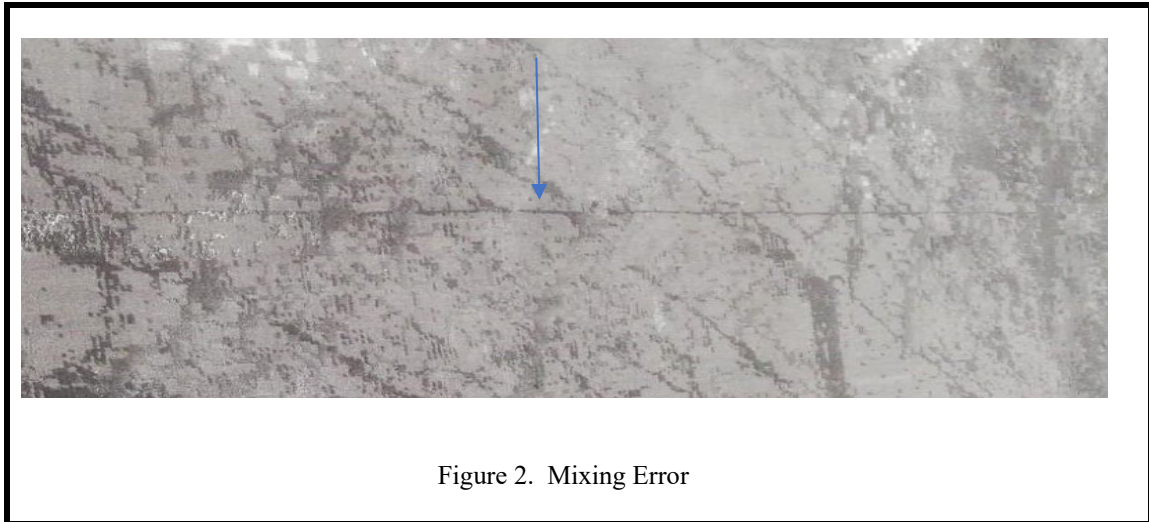
The most important group is A, according to the ABC analysis. It's the factory's most popular product category, as well as the most expensive. As a result, these vital products must be continuously monitored. Storage costs, security costs, and, most critically, raw material costs will all be incurred if these things are kept on hand. Around 20% of group A products should be in stock, with 80% of new orders coming from this category. When placing an order, remember to account for safety stock and deadlines. The term "deadline" refers to the time frame within which a job or assignment must be performed. The safety stock is kept in case the supplier, wholesaler, or distributor cannot supply raw materials.

B group products are medium-importance and moderately used products. Their annual costs are lower than those of A group's items. As a result, these items may be held in stock longer than products A. These items should account for 30% of existing inventory and 15% of new orders.

Finally, group C products are the least popular and the least expensive. This product group does not require a safety stock because the deadline is not critical. These products should account for 50% of existing inventory and 5% of new orders.

With this study, improvements that can be made in the purchasing policies in which the study was conducted were presented to the senior management.

It has been observed that the color mixing error, which constitutes 20% of the errors encountered in production, is related to yarn purchases and stock management. Supplying the yarn used from many different companies causes color mixing error in the carpet. (shown in Figure 2). It has been suggested to reduce the number of suppliers of the most commonly used yarn types with ABC analysis.



Stock amounts were examined, according to the analysis, stocks belonging to group A (polyester and polyp) constitute the highest stock. Stocks belonging to group C have the least stocks (shown in figure 3) It has been suggested to reduce the stock amount of the products in group A and to follow up continuously, and to stretch the follow-up by increasing the stock amount of group C.

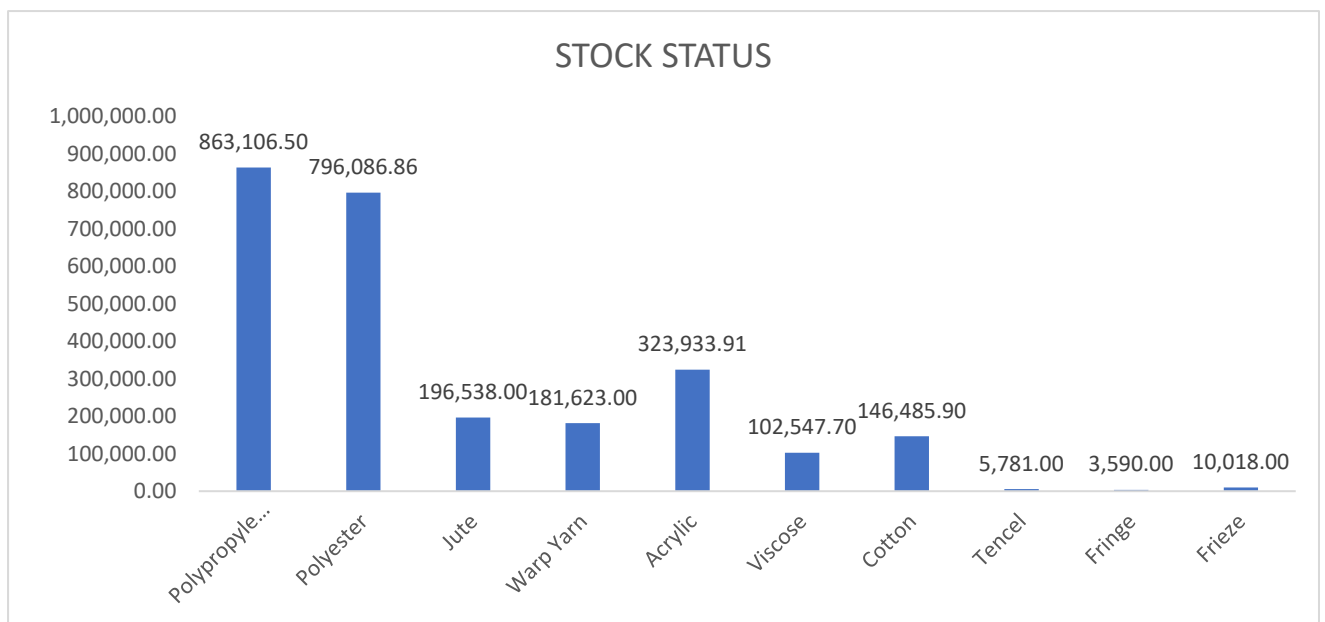


Figure 3. Stock Status

- It is suggested that warehouse layout should be done according to ABC analysis. It is recommended to position A class products close to the place where the production will be made (weaving area). With this positioning, it is aimed to prevent waste of transportation. It is recommended to position B class products in the middle part, and C class products to be positioned in the furthest place from the production point due to the low frequency of use. The sample drawing made is shown in figure 4.

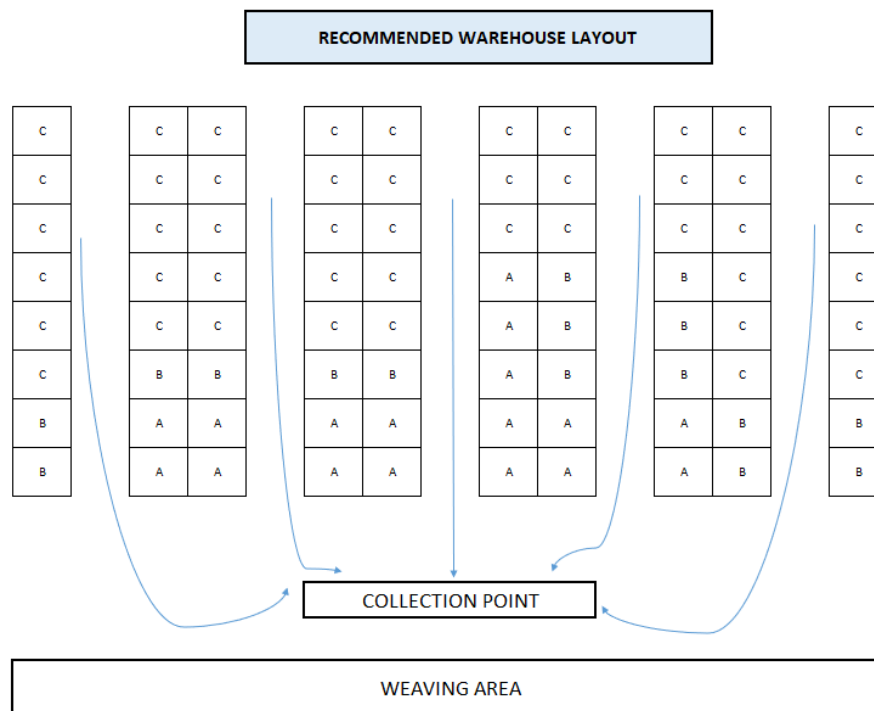


Figure 4. Recommended Warehouse Layout

7. Conclusion

In the study, 10 types of yarn used as raw material in the carpet factory were classified according to ABC analysis. The classical ABC analysis results according to the usage amount and cost criteria are shown in Table 3. Considering the usage amounts and costs, it has been determined which yarn type is more critical and these parts should be considered as important parts.

The study contributed to the process of examining the inventory in order to determine exactly how much stock to keep, and played an important role in the development of the inventory level of the enterprise. It is aimed that these results will also guide the raw material purchasing activities planned to be carried out in the future. In future studies several different stock classification approaches such as VED (Vital, Essential, and Desirable) can also be implemented.

This study was carried out for the main yarn types. The inability to reach clear information about the amount of use of colors in the enterprise is a limitation of this study. In order to provide maximum benefit in the amount of stock in the enterprise, it would be beneficial to conduct a study on colors in addition to the main yarn types. ABC analysis work on colors will be efficient in business yarn purchases. In addition, some businesses collect their stocks in more than three groups or determine subgroups within the ABC system. This stock analysis method will also offer a different perspective to the study.

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