Controlling Inventory by the Combination of ABC, VED and FSN Analysis in Plastic Industry

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ABSTRACT

Inventory management in production industries is one of the success stories of recent years and it is changing rapidly. It has a broad scope and affects many activities in an organization. Over the years, the idea of the stock framework has gained more significance in ventures. It is because of exceptional rivalry in the market, which has constrained associations to look for appropriate stock control strategy to lessen investments and by reducing the holding cost in inventory. The management and control of stock of raw materials and finished goods is challenging, and a common problem to all production companies. Inventory is classified into three sectors, raw materials inventory, in-process inventory, and finished goods inventory. Various strategies are used by individual companies to control the inventory. The present paper proposes a new inventory control approach called ABC - VED analysis for maintaining the inventory of raw materials and production and ABC - FSN analysis for maintaining the inventory of finished goods.

Introduction

Inventory management is one of the significant segments of working capital administration. The program involves the flow of raw materials to the finished product. Over 60% of the working capital will be generally invested in holding stock or inventory. There can be a drawback in holding either excessive or too little stock. As a result, stock management is very essential in acquiring precise balance between these two antitheses. For smooth flowing of activities, inventory is a must for all organizations. Inventory is linked to every sector, taking from raw materials to the distribution of the finished product. The responsibility of inventory is to manage and to check the availability of material and to minimize the investment in inventory. If there is inventory there will be risks related to the inventory and there are different techniques to overcome the risks to have flexibility in operating a system.

Inventory is classified into three divisions, raw materials inventory, in-process inventory and finished goods inventory. Raw materials inventories separate reliance among suppliers and plants. The work-in-process inventories evacuate reliance on machines and products. The completed product stock removes reliance among the plant and its clients.

In this competitive world of manufacturing, organizations are looking for better approaches for improving the business procedure. It has to full fill the client's requirements and try to remain ahead with its competitors. There are few inventory techniques, by implementing some, can obtain the needful. This is why the inventory needs to be maintained in every sector. There are strategies or tools of inventory control that is essential for maintaining the inventory.

1.2 Tools of inventory control

1.2.1 ABC analysis

It is an analytical method of stock control which concentrates on those items where attention is most needed. It is classified based on priority, the items having the highest values are given more importance and are more controlled then the low-value items. Under this, the materials loaded in the inventory might be grouped into various classifications as indicated by their significance, in other words, their value and rate of requirement during the period. The first category is classified as 'A' if the part has a small percent of total quantity but has a greater value. The second category is classified as 'B' and it is less important comparing it with ‘A’ item. In the third category, it is grouped as 'C' item, where the part has a large quantity of total percent but has a lower value.

Table 1.1 ABC classification

CATEGORY	% OF ITEMS	% OF STOCK COST
A	5-10	75-80
B	10-20	10-20
C	75-80	5-10

1.2.2 Economic Order Quantity (EOQ)

The economic order quantity alludes to the quantity requested to be bought at the most minimal absolute expense. This is the most affordable to buy orders which maintained the balance between procurement and carrying cost. EOQ is also known as economic lot size.

The conclusion is about how much quantity to be ordered and how frequently the quantity must be ordered plays an important role in inventory management. The ordering quantity must neither be too less or too high since, ordering cost and carrying cost is exceptionally high. EOQ is the size of the part to be bought which is economically feasible.

$$EOQ = \sqrt{(2 * DEMAND * RE\ ORDER\ COST) / (CARRYING\ COST)} \quad (1)$$

Where,

Demand is annual requirement of RM,

Re-order cost includes transport cost and maintenance cost and, Carrying cost is per RM cost into holding cost.

1.2.3 FSN analysis

FSN classification is mainly used for finished goods or parts ready to transport to the customer. It represents as fast-moving, slow-moving, and non-moving. 'S' and 'N' type group requires observation. There might be a few reasons why an item has been into 'N' class. For example, if a part is said to be obsolete then it is grouped as 'N' category. At the point when an FSN grouping is made, all such data stands apart conspicuously, empowering supervisors to act it to the greatest advantage of the association.

1.2.4 VED Analysis

VED represents vital, essential and desirable. VED represents vitally, essential and desirable. This sort of categorization is mostly applicable in the case of parts. The unique aspect of items is that they don't

follow the normal techniques; when the market pattern shifts abruptly it may get into difficulties. VED items are categorization in terms of importance or critical of the part during the plant's operation.

A reasonably large quantity of stocks may be required for 'V' items, while on the other hand no stocks are required for 'D' items, especially if the item is classified in 'A' or 'B' category. A tight control should be maintained on stocks for 'V' items of the 'A' classification, but if it is a 'C' item, then large volumes can be stored. The whole aim is to have special control over the selected parts and thus prudently extend time and energy.

Table 1.2 VED classification

MATERIAL in %	CLASS	VALUE in %	PRIORITY in %
10	A	70	V - 70 E - 20 D - 10
20	B	20	V - 70 E - 20 D - 10
30	C	10	V - 70 E - 20 D - 10

1.2.5 Inventory turnover ratio

The turnover ratio of inventories calculates how often a company sells its inventory during the year. A company with a high inventory turnover ratio shows how it performs best in selling its goods economically. Inventory turnover is an indicator where it shows the potential of management to make productive and efficient use of resources. Precise inventory management and safeguarding is a crucial activity for a profitable and well-managed organization.

Inventory turnover ratio = Cost of Goods Sold ÷ Average Inventory

$$ITR = COGS / AI \quad (2)$$

Where,

COGS = Beginning Inventory + Net Inventory Purchases – Ending Inventory AI = (Beginning Inventory + Ending Inventory) ÷ 2

If a turnover rate of six turns per annum does not mean that each item's stock turns six times. Some stocks might rate up to 12 turns per annum which is the most popular, first preference or, fast-moving goods turns more frequently than the rest. Slow-moving items may, or may not, turn even once.

1.2.6 Just in time system

Just in time refers to inventory concerns from manufacturers. The term literally implies a method where products are manufactured only in case of need. While this is an oversimplification it serves its purpose for illustrating the defects of western style manufacturing methods.

The just-in-time inventory process, while conceptually very promising, but it's difficult to execute because a major shift is involved in the overall manufacturing and management structure. It requires some of the factor such as

- To have a good production facilities, a strong and reliable relationship with local suppliers.
- To have a dependable or reliable transport facilities.
- Quick physical access in the form of sufficient doors and strategically positioned ports and storage facilities to suit the needs of the assembly line with incoming materials.

Just-in-time inventory is focussed on reducing the cost of ordering and the safety stock by having a stronger relationship with the suppliers. As a result, both components decrease and this means the average amount of inventory is lower. Then the 50 per cent of foundation is followed by HML process.

1.2.7 SDE Analysis

Analysis of SDE is conducted specifically for the issues of ordering raw materials. Some of the problems occurs while purchasing such as lack of availability, shortages, and longer production time, economically scattered, unstable Materials or Supply etc.

Consequently, identifying the materials that cause problems would be better if the managers assign these problematic materials other subordinates who can handle their procurement purposes. So, SDE analysis is categorized in to 3, scare material, difficult material, and easy material.

1.2.7 GOLF Analysis

This approach is implemented to classify raw materials similar to the SDE analysis and is influenced by the nature of the suppliers and the market type from which purchases are made, because they decide the type of payment, mode of transport, production lead time, and the reliability of the service and the classification involved. The term GOLF refers to government suppliers, ordinary or non-government suppliers, local suppliers, foreign suppliers.

1.3 Objective

- To minimize the ordering cost of Raw material and to set a minimum holding raw material before ordering in a plastic molding industry.
- To minimize holding, and carrying costs of inventories.

Literature review

Aashna Sharma et.al [1] claimed that inventory is needed by any organization for the smooth running of operations. They divided inventory into 3 i.e. raw materials, work in progress (production) and inventory of finished products. Inventories are connections between the raw materials and the method of distribution. The task of inventory management is to verify the stock of the item and when the quantity of the product is necessary and whether the expenditure in the product can be minimized. Authors stated some of the problems faced in inventory due to improper monitoring of inventory or usually caused problems like

ordering quantity for the given period of time, to have efficient production, holding inventory due to large size. It ensures that money will be tied up before the inventory exits the business as purchased goods, due to the large scale of inventories owned by companies are expected to retain the sum of funds. So, some of the inventory techniques were studied such as ABC analysis, VED analysis, economic order quantity (EOQ), FIFO. If such strategies have been followed, a strong and effective inventory can be available. With this study they concluded that businesses should obey the quantity of economic order for optimum purchase and can retain component safety stock to avoid storage conditions and aid in the continuous flow of production. That will lower the cost and increase the income. Stock management should be secure, based on ABC research. If it is correctly implemented and follow all the inventory management strategies, would be able to maximize the income with minimal cost.

The goal of **Junaid Ali Khan et.al** [2] and other authors was to investigate the effect of inventory turnover on performance variables of profit margin percentage and sales surprise in one of Hubei Province China's retail companies. Inventory turnover research is influenced by profit margin percentage and sales surprise are equally across all segments and operating modes in retail companies. This was then checked on their theory about data from a large local supermarket chain located in China's Hubei province. They also had many supermarkets in the regions of Tier 1 and Tier 2 cities. Authors analyzed the association of inventory turnover with percentage profit margin and surprise sales across various categories and operating modes. The findings of this study suggest that the inventory turnover has a negative relation with percentage profit margin and a strong relationship with sales surprise with varying growth rate.

C. Madhusudhana Rao et.al [3] and Researchers aimed at measuring the effect of inventory turn-over ratio on supply chain efficiency in India's leading battery producing organization. They initially addressed the issues faced in inventories such as non-moving parts, quantity of material ordering, modifications and variation in supply chain management supplies, inappropriate process, design and type changes without clear lead time etc. The researchers' aim is to increase the ITR, so they got the ITR initially. The firm has defined a series of alternatives for rising ITR after identifying the output differences in terms of ITR. The alternatives optimized for implementation are presented a) Revision of the A class materials stocking policy to maintain stocks for 15 to 20 days of utilization, b) Review of the purchasing procedure for B & C type products as per the buying department's lead time and EOQ, C) MRP estimate as per 1 Plus 2 month effective production, d) Reducing forecast marketing variance, e) Model and model modifications with reasonable lead times and specific action to dilute available stock. For 3 years there has been a tremendous increase in ITR in the battery division industry through the implementation of the alternatives. Researchers concluded that a successful ITR can be achieved by enhancing internal performance and removing the non-moving and unnecessary inventory.

Ching-Wu Chu et.al [4] and other Researchers have introduced a new inventory management method called ABC – Fuzzy Classification (ABC – FC), that can control items of either nominal or non-nominal

attributes, integrate manager skills, evaluate inventory identification and can be easily implemented. ABC – FC method was implemented on the basis of data obtained at Keelung Port. The paper sought to provide a detailed description of the sections based on their value. The three classifications are categorized that is very important, important, and unimportant. This work was carried out in the port of Keelung for 12 months and data were collected and grouped according to ABC-FC classification. There were a total of 192 sections that classified 59 items as very important, listed 69 items as important, and classified the remaining 64 items as unimportant. Researchers concluded that the accurate value will be known by applying ABC – FC analysis and helps to concentrate on the required area or critical parts.

Shibamay Mitra et.al [5] and other Researchers carried out case studies on the manufacturing of EMU coaches by controlling inventories using ABC and HML analyses. Researchers have stated that inventory management is the effective tracking of all components in the inventory of the firm. The company purchased those products from another manufacturer. Three possible loss areas are popular by efficient inventory management: shrinkage, misplacement, and short shipments. Inventory can be managed using different techniques, and researchers focusing on ABC and HML analysis in this journal. 'A' is said to be critical in ABC research, holding 10-15% of items and contributing 60-70% of total inventory income, while 'B' covers 20-25% of items and contributes 20-30% of total consumption value, while 'C' holds 60-70% of items and contributes 10-15% of total consumption. HML is graded according to the price of their unit. Studies from this case study also found that the item preferences change according to various methods of inventory analysis. The company management determines which mechanism to follow taking into account their budget, supply, demand, carrying capacity of inventories, etc.

Robert Obermaier et.al [6] and other researchers investigated firm performance while keeping an inventory and having zero inventory and its effects. The study was conducted either at the firm level using statistical information or at the industry level using tabulated data to analyze inventory performance over time. This research is focused on statistics at the firm level, mainly to protect against a bias in aggregation, i.e. firms that cancel each other out differently in each field. In most cases, company-level details are only open to the public for stock-listed firms, which display just a fraction of the total number of German companies. All the data used were taken from the World scope Global Database at Thomson Financial. They later measured the carrying stock through relative inventory metrics and one of the most commonly used ratios is stock to sales. Measuring the output is huge, so Altman's classic Z-score approach had to undergo three theoretical processes, i.e. objective-oriented approach, measurement problems. The inventory is categorized according to quantities in three separate groups: high, medium, and small. The authors, therefore, concluded that the idea of terms such as 'just-in-time' or 'zero-inventory' is that inventory represents excess and should be removed, leading to improved productivity. Indeed, empirical findings show that keeping inventory costs money, which is not always a drawback, as inventories often have benefits. Therefore the concept 'less stock is better' is empirically dismissed.

M.C. Bonney et.al [7] discussed patterns in controlling inventories. He listed some of the problems faced in the inventory, such as tying up work capital and resources, and it can suffer from defective products, degradation, and shrinking, order quantity, and effective production. Researchers recommended a few other tactics for managing inventories. The first phase is inventory modeling, also known as EOQ, where models of inventory are commonly used to decide when and how much to order. He discussed the problems faced by having large or large inventories and various approaches to stock management. They concluded by saying that inventory management strategies and an appreciation of the consequences would be necessary ingredients in the fundamental rethink required to solve the problems of both at the same time rich and poor, both in abundance and in short supply, and to throw away society.

Devnani M et.al [9] and other authors conducted analyzes of ABC and VED in a pharmacy store to categorize and obtain annual item consumption. For the year 2007-08, the annual usage and expense incurred for each pharmacy element was evaluated and inventory management techniques, i.e. Analysis of the Matrix ABC, VED, and ABCVED. The pharmacy's drug formulary consisted of 421 products. The gross annual expenditure on drugs (ADE) for products published in 2007-08 was Rs. 40,012,612. Analysis of ABC showed 13.78 percent, 21.85 percent, and 64.37 percent of products in the categories A, B, and C respectively, representing 69.97 percent, 19.95 percent, and 10.08 percent of pharmacy ADE. VED review reported 12.11 percent, 59.38 percent, and 28.51 percent, respectively, of products in the groups V, E, and D, representing 17.14 percent, 72.38 percent, and 10.48 percent of pharmacy ADEs. On the review of the ABCVED matrix, 22.09%, 54.63%, and 23.28% of products were found to be products in categories I, II, and III, respectively, comprising 74.21%, 22.23% and 3.56% of the pharmacy's ADE. The ABC and VED strategies have to be implemented as a standard procedure to maximize resource use and reduce out-of-stock situations in pharmacy.

Shibamay Mitra et.al [10] and other researchers conducted a case study on inventory control using FSN analysis in a manufacturing couch industry in the EMU. The preparation of an EMU is divided into 4 different parts i.e. body cover, under frame assembly, bogie shop, and shop for furnishing. It also includes subassemblies. FSN analyzes are classified based on the inventory turnover ratio, where FSN is a fast-moving, slow-moving, and non-moving or dead stock. Through this study, it was found that according to various inventory analysis methods the preferences of the goods are shifting.The company management determines which process to implement taking into consideration its budget, supply, demand, and inventory capability.

R. A. Lancioni et.al [13] and other researchers explained the concept of inventory characteristics, types of inventory and inventory analysis. This paper has attempted to address the basic concepts of inventory management system. A good inventory system of stock control must be designed in such a way that it doesn't affect the shortage of inventory.

G. Brindha et.al [14], and other researcher discussed on the inventory management techniques. The concepts such as ABC classification, the Economic ordering cost, forecasting root cause of problem faced, periodic review and ordering period and control, and requirements planning for dependent demand. Some of the factors such as effect of investment on customer service, carring stocks, and safety stocks. Researcher concluded that by implementing the inventory management policies and the variables of the inventory and through exchange curves it is possible to have a good control over the inventory.

Handanhal Ravinder et.al [15]**,** and other authors had researched on implementation of ABC analysis and its application. There was strong consensus that more than one criterion should be considered for an ABC analysis. Once the relevant criteria have been identified the methodology involves three main steps. The first is to determine the weights to be assigned to the various criteria and the second is to score each item on the criteria. If the parameters are calculated on a number of scales this second step may include rescaling the results to a scale of 0-1 or 0-100. The final step is to merge weights and scores to get the weighted score produced. The authors study the existing literature and conclude that ABC multi-criteria research is a mature method that needs to be integrated into textbooks. Authors will update their reporting to provide a thorough description of ABC multi-criteria definition and methodology

P. JONSSON et.al [16], The researchers are focusing on the use of inventory planning approaches to monitor the movement of material to inventories of purchased goods. The ways a material planning approach is applied affects its assumed efficiency. In particular, the manner in which safety stocks and lead times are calculated and checked is of great importance for the planning success of MRP methods, while the determination and review of order points, review frequencies and run-out times is important for the reorder point methods. The research concluded that the usage of material planning strategies varies depending of where they're implemented in the material flow, whether the product is located in a manufacturing firm or in distribution operations and between companies of various sizes. The ways a material planning approach is applied influence its perceived output. Researchers used subjective measurements of the planning performance in this study and it needed to further establish instruments for measuring the direct and indirect performance planning.

Sayali Sudhir Mahagaonkar et.al [17], The objective of this work is to emphasize the importance of material management, since materials account for a considerable proportion of annual capital costs and their technique. It was found that, parts that were categorized according to their use, and the cost of discovering the critical items that needs high protection. The findings showed that using the methodology of material management helps in efficient material movement, increased quality control and of material wastage.

Construction products production requires huge quantities of time and money and wasting of such products should be minimized.

Observation from Literature survey

- It was found that by implementing Tools of inventory management, a good performance and can have a firm manufacturing industry.

- If we can properly implement and adopt all the inventory management strategies, we would be able to raise the profit with minimal cost.

- EOQ plays an important role in maintaining the order quantity and minimum quantity, which helps in minimizing the ordering cost and inventory stock.

Methodology

As inventory is a large sector that can be subdivided into 3 categories namely, raw material inventory, work in progress inventory, and finished goods inventory. It has to be maintained carefully by minimizing the losses. The process followed in the present analysis to optimize the inventory control in a plastic industry is shown in figure 3.1.

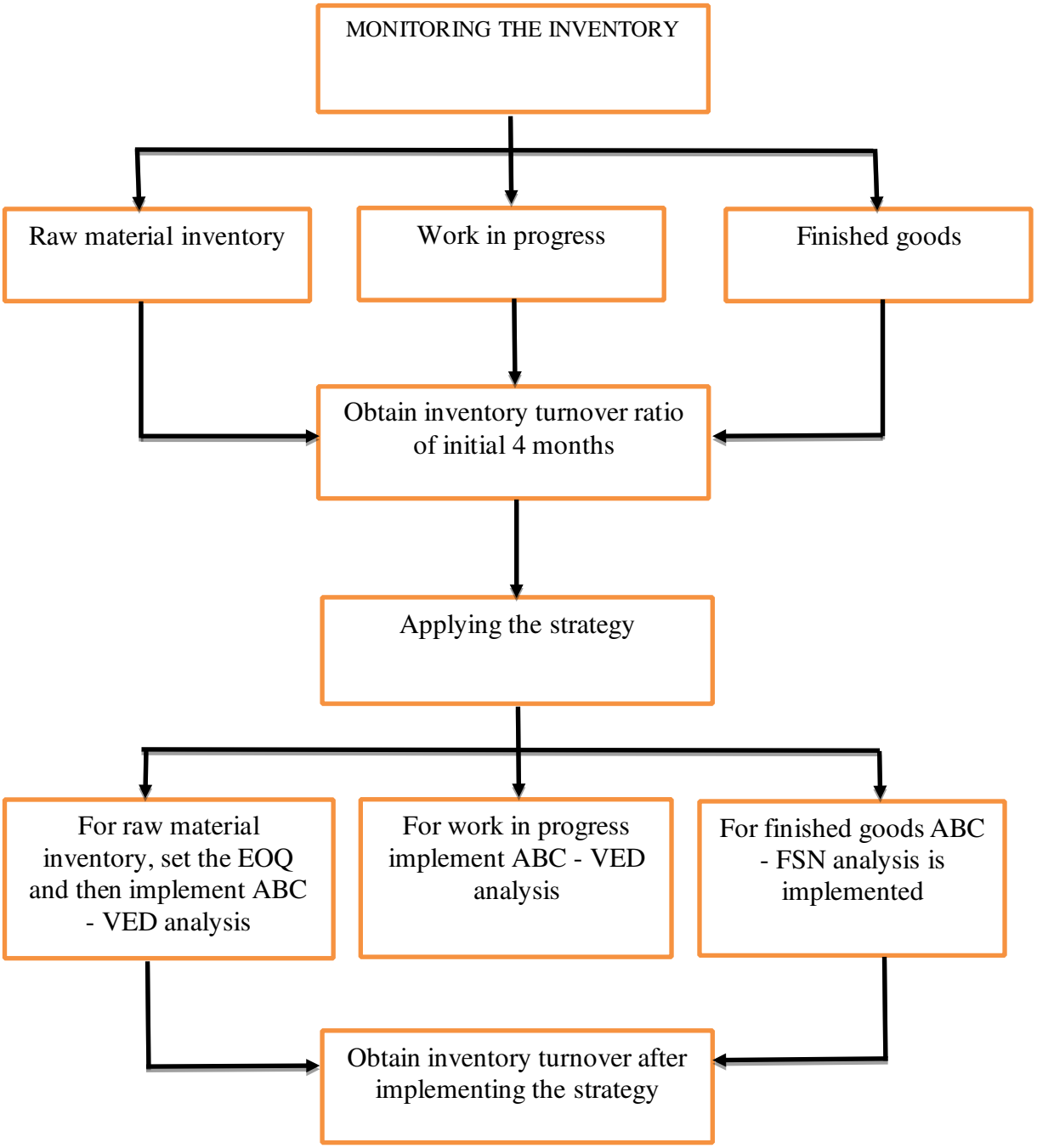

Fig Process flow in inventory analysis

In the beginning, the inventory was monitored (August to November 2019 on the monthly basis) individually and collected the required data to obtain inventory turnover ratio. ITR shows the number of times the company has sold and replaced the inventory in each period of time. Once the ITR is obtained it can be found that how good or bad is the turnover of the company. The next stage is to implement the techniques to the inventory. For the raw material inventory, EOQ had to be set for ordering of RM economically and then ABC – VED analysis was implemented. This analysis categorizes the RM based on

priority and importance. For the production inventory, ABC – VED analysis was implemented where products are classified based on priority. For finished goods inventory, ABC – FSN analysis was implemented and the items were classified based on weightage i.e. for ex. 10% of items gives 75% of whole company's profit then these items are given high priority. After implementing these techniques, the inventory was monitored (from December 2019 – March 2020 on the monthly basis) and obtained the required data to find the ITR.

Initially in the first stage, for the past 4 months (August, September, October, and November in the year 2019) all 3 sectors were monitored and data of incoming raw material, production, and dispatch was collected and then found the inventory turnover ratio of aforementioned four months. The inventory turnover ratio for four successive months in the year 2019 is shown in Fig 3.2.

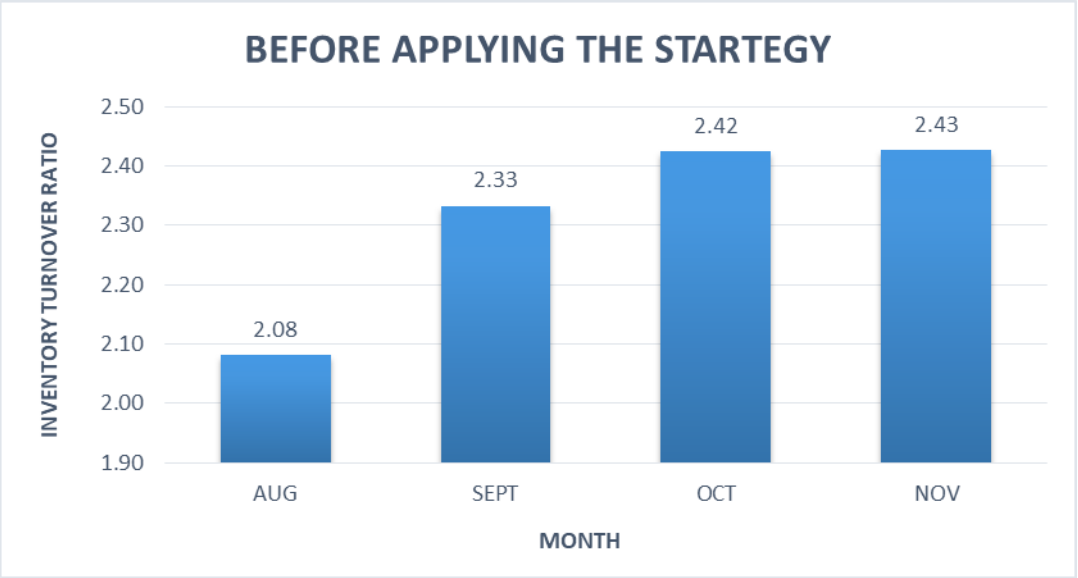

Fig :Inventory turnover ratio v/s month

Researchers have claimed that if the turnover ratio is between 4 and 5% then it is a satisfactory good inventory turnover. ITR calculated for the present analysis based on the data collected was between 2 and 2.5. Such a low value of ITR was due to improper monitoring of inventory, overstocking, ordering without setting min or max EOQ, no part location or part tracking, etc.

3.2 Setting EOQ for raw materials

Initially EOQ value had to be set for RM i.e. minimum ordering quantity and maintain the inventory. The EOQ approach is used to minimize the ordering cost and overall incremental cost for each raw material to reduce the total inventory cost of purchasing. To maximize the profit, the company should not invest more on each procurement and inventory process. The EOQ has been set for all the RMs using the equation (3) and shown in table 3.1.

i.e.

$$EOQ = \sqrt{\left((2 * DEMAND * RE\ ORDER\ COST) / (CARRYING\ COST)\right)} \qquad (3)$$

Where,

Demand is annual requirement of RM,
Re-order cost includes transport cost and maintenance cost and, Carrying cost is per RM cost into holding cost.

Table 3.1: EOQ for Raw materials

S.NO	MATERIAL NAME	RM consumed per month in Kg	RM consumed Annually in Kg	Min RM stock in Kg	EOQ in Kg
1	MASTER BATCH	9343.75	112125	934.38	**3056.75**

2	MIRATAHNE	4074.25	48891	407.43	**2854.56**
3	DESMOPAN 3972 AW	1687.5	20250	168.75	**1700.84**
4	ZYTEL 45HSB NC010	1655.125	19861.5	165.51	**1485.54**
5	POLYURTHANE	1053	12636	105.30	**1343.56**
6	RAMTAL PM3007G2NT	1040	12480	104.00	**1442.22**
7	CELCON M90	933.625	11203.5	93.36	**1366.47**
8	SGF 15% BLACK	481.25	5775	48.13	**1127.84**
9	PP 15% TALC	433.5	5202	43.35	**1573.89**
10	PP 20% GF	306.25	3675	30.63	**1322.88**
11	NYLON 66 RXXIC	206.25	2475	20.63	**658.95**
12	APARRENE - TPE	176	2112	17.60	**726.64**
13	PP XA10234 GREEN	112.5	1350	11.25	**834.19**
14	ABSOLAC 120 IFB WHITE	104.5	1254	10.45	**511.13**
15	ASA BLACK	103	1236	10.30	**507.44**
16	PPCP MI 3530	62.5	750	6.25	**628.28**
17	NYLON 6 SXXIC	53.125	637.5	5.31	**364.43**
18	ABS HI 121 H	37.5	450	3.75	**400.89**
19	XA1009 (30%) TF	31.25	375	3.13	**422.58**
20	SB30W1XXX BLACK	27.75	333	2.78	**269.06**
21	ZYTEL 70G50 HSL	23.75	285	2.38	**243.67**
22	LLDPE	12.5	150	1.25	**261.12**
23	RGR 30% BLACK	11.25	135	1.13	**171.31**
24	PP 10% TALC	11	132	1.10	**169.40**
25	TPR NATURAL	11	132	1.10	**169.40**
26	LDPE	10.5	126	1.05	**239.32**

When the RM reaches the minimum stock, the minimum quantity is obtained set by the EOQ. Economic order quantity is the ideal quantity where the costs of inventory relatively lowered to the costs to purchase. EOQ is used to minimize the aforementioned actual costs of inventories. Ultimately, it keeps the balance between high inventory counts and low inventory counts are of all significance.

3.3 Implementation of ABC – VED analysis for raw materials

Once the EOQ is set ABC – VED analysis is implemented to keep close control in the RM inventory. For ABC classification, RM is classified on the basis of demand or quantity of

RM used where 'A' is 76.18%, which requires a large quantity of stock as well as inventory. 'B' is 19.31%, which requires a small quantity and inventory. 'C' holds very small percent of inventory i.e. 4.52%, doesn't need much close control on these items.

A large quantity of stocks is required for 'V' category RM, while no stocks are needed to be held for the 'D' category, especially if the item is classified in 'A' or 'B.' Tight control on stock rates should be maintained for 'V' products of classification 'A.' The RM classification is given in table 3.2.

Table 3.2: ABC – VED Classification of raw materials.

SINO	RM NAME	CLASSIFICATION	PRIORITY	
1	MASTER BATCH	A 76.18	V	80.06
2	MIRATAHNE			
3	DESMOPAN 3972 AW		E	19.95
4	ZYTEL 45HSB NC010			
5	POLYURTHANE	B 19.31		
6	RAMTAL PM3007G2NT		V	75.24
7	CELCON M90			
8	SGF 15% BLACK			
9	PP 15% TALC		E	24.74
10	PP 20% GF			
11	nylon 66 RXXIC	C 4.52		
12	APARRENE - TPE		V	70.61
13	PP XA10234 GREEN			
14	ABSOLAC 120 IFB WHITE			
15	ASA BLACK			
16	PPCP MI 3530			
17	nylon 6 SXXIC ABS			
18	HI 121 H			
19	XA1009 (30%) TF		E	23.72
20	SB30W1XXX BLACK			
21	ZYTEL 70G50 HSL LLDPE			
22				
23	RGR 30% BLACK PP			
24	10% TALC		D	5.66
25	TPR NATURAL			

26	LDPE

3.4 Implementation of ABC – VED analysis for production

For ABC classification, parts are classified based on the demand of customer requirement, where 'A' holds 74.68% of total production, which requires large quantity of stock as well as inventory. 'B' holds 15.99% of production and 'C' holds very small percent of production i.e.
9.33%. The production classification is given in table 3.3.

Table 3.3: ABC – VED Classification of production

Sl. No.	Component Name	ABC CLASSIFICATION		VED CLASSIFICTION	
1	COVER AIR FILTER BOX				
2	PIECE MUDGUARD ASSY -ABS			V	79.16
3	SIDE COVER CLASSIC - BODY WORK				
4	SWING ARM BUSH				
5	NT51 CHAINPAD	A	74.68		
6	RR HUB SPACER ASSY				
7	CHAINPAD ASSY				
8	COVER TUBE BUSH				
9	SIDE COVER BULLET - PLASTIC			E	27.93
10	CAP SWING PIVOT				
11	STATER MOTOR COVER SILVER GREY (BIG)				
12	OIL TROUGH				
13	CHAIN GUARD CLASSIC			V	76.26
14	OIL FILLER CAP				
15	BALL RACE COVER	B	15.99		
16	CHAIN GUARD				

17	FRONT MUDGURD BOTTOM(D71)				
18	COVER STATER MOTOR 350CC (BIG BLACK)			E	23.76
19	BLOW MOULD RESONATOR BOX				
20	PIECE MUDGURADD71				
21	INFILL REAR MUDGUARD				
22	RESERVOIR COVER				
23	CAP SWING ARM PIVOT				
24	CAP SWING PIVOT				
25	CABLE STRAP6				
26	CHAIN GUARD P1E				
27	TB-PIECE MUDGURAD				
28	FRONT HUB SPACER ASSY(NR61)	C	9.33	V	75.18
29	AIR FILTER BODY-BULLET				
30	CABLE STRAP8				
31	SPACER SHAFT GEAR LEVER				
32	CAP SWING PIVOT (T.B)				
33	CHAIN GUARD(D71)				
34	UTILITY BOX(D71				
35	CAPSWING PIVOT BLACK SMALL			E	19.03
36	NUMBER PLATE(D71 37 D71RR SPACER 38 LID AIR FILTER 39 D71 DUST CAPCONNECTOR 40 D71 DUST CAP FRAME 41 CAP ENGINE MOUNT BOSS 42 CHAIN GUIDE(D71) 43 CAP SWING ARM BOSS 44 COVER COCKPIT TOP(D71) 45 COVER COCK PIT RH(D71) 46 COVER COCK PIT LH(D71) 47 TRAFFICATOR BRACKET 48 REFELCTOR BASE (SPARE/EXPORT) 49 MUDGURAD EXTENSION 50 PLASTIC WASHER (D71) 51 DUMMY CAP AIR FILTER BOX(NR61) 52 ADAPTOR THOROTTLE BODY 53 BRACKET REFECTOR 54 WASHER SIDE PANNEL 55 ADAPTER PURGE VALVE LH 56 NEW COVER STARTER MOTOR-584948/B 57 BODY COMP TOOL BOX(BLACK) 58 FRONT MUDFLOP 59 ADAPTER PURGE VALVE RH					
D					5.81

Implementation of ABC – FSN analysis for finished goods

Finished goods is final product ready for the dispatch towards the customer end. Here ABC is classified based on priority in other words, first priority is given to items with the highest values and then the low-value items which have to keep in close control. 10% of items gives

74.68% of total value which is classified as 'A'. Where 'B' obtains 15.99% and 'C' obtains 9.33% of total value of final inventory. In FSN classification, 'N' category is not applicable for 'A' and 'B' category, since all the parts are movable. There are some obsolete parts kept as spare, moveable only if there is costumer requirements and these are classified as 'nonmoving' parts. ABC – FSN classification is shown in table 3.4.

Table 3.4: ABC – FSN classification for finished goods

ABC Sl. No. CLASSIFICATION	Component Name	FSN CLASSIFICATION
	1 COVER AIR FILTER BOX 2 PIECE MUDGUARD ASSY –ABS 3 SIDE COVER CLASSIC – BODY WORK FAST-MOVING 4 SWING ARM BUSH 5 NT51 CHAINPAD 6 RR HUB SPACER ASSY 7 CHAINPAD ASSY 8 COVER TUBE BUSH SLOW-MOVING 9 SIDE COVER BULLET – PLASTIC 10 CAP SWING PIVOT 11 STATER MOTOR COVER SILVER GREY (BIG) 12 OIL TROUGH 13 CHAIN GUARD CLASSIC 14 OIL FILLER CAP 15 BALL RACE COVER B 15.99 16 CHAIN GUARD 17 FRONT MUDGURD BOTTOM(D71) 18 COVER STARTER MOTER 350CC SLOW-MOVING 19 BLOW MOULD RESONATOR BOX 20 PIECE MUDGURADD71 21 INFILL REAR MUDGUARD 22 RESERVOIR COVER 23 CAP SWING ARM PIVOT 24 CAP SWING PIVOT 25 CABLE STRAP6 26 CHAIN GUARD P1E 27 TB-PIECE MUDGURAD 28 FRONT HUB SPACER ASSY(NR61) 29 AIR FILTER BODY-BULLET 30 CABLE STRAP8 31 SPACER SHAFT GEAR LEVER 32 CAP SWING PIVOT (T.B) 33 CHAIN GUARD(D71) 34 UTILITY BOX(D71 35 CAPSWING PIVOT BLACK SMALL 36 NUMBER PLATE(D71 37 D71RR SPACER 38 LID AIR FILTER 39 D71 DUST CAPCONNECTOR 40 D71 DUST CAP FRAME 41 CAP ENGINE MOUNT BOSS 42 CHAIN GUIDE(D71) 43 CAP SWING ARM BOSS 44 COVER COCKPIT TOP(D71) 45 COVER COCK PIT RH(D71) 46 COVER COCK PIT LH(D71) 47 TRAFFICATOR BRACKET	
A	74.68	FAST-MOVING
C	9.33	FAST-MOVING

SLOW-MOVING

48 REFELCTOR BASE (SPARE/EXPORT) 49 MUDGURAD EXTENSION 50 PLASTIC WASHER (D71) 51 DUMMY CAP AIR FILTER BOX(NR61) 52 ADAPTOR THOROTTLE BODY 53 BRACKET REFECTOR 54 WASHER SIDE PANNEL 55 ADAPTER PURGE VALVE LH 56 NEW COVER STARTER MOTOR 57 BODY COMP TOOL BOX(BLACK) 58 FRONT MUDFLOP 59 ADAPTER PURGE VALVE RH 60 PIECE MUDGURAD-C5SMALL 61 BODY COMP TOOL BOX ASSY MB 62 BODY COMP TOOL BOX(DESERT) 63 PIECE MUDGURAD(NR61) 64 CHAIN GUARD(NR61 65 UTILITY BOX(NR61) 66 BODY COMP TOOL BOX(GREEN) 67 COVER STRATER MOTOR PLATING 68 BODYCOMPTOOLBOX (BLUE) 69 PIECE MUDGURAD BIG 70 BS4PIECE MUDGURAD 71 TCONNECTOR 72 REFLECTOR MTG CAP 73 HOSE INSERT 74 DUST CAP FRAMENR61 75 CAP FRAME(NR61) 76 DUST CAPTOP YOKE(NR61) 77 DUST CAP BOTTOM YOKE(NR61) 78 NYLON BUSH(NR61) 79 GROMMET CLIPON(NR61) 80 REAR CHAIN PAD(NR61 81 COVER STATER MOTOR 500CC BLACK 82 ADAPTER PURGE VALVE STRAIGHT 83 PLASTICS BULLET CHAIN GUARD 84 REFECTOR RH 85 BELLOW STIFFNER 86 BATTERY COVER ASSY 87 AIRTELBOX 88 CAP SWING PIVOT BIG W/P 89 STATER MOTOR COVER SILVER GREY W/P 90 EXTENSION TRAFFICATOR EXPORT 91 EXTENSION TRAFFICATOR DOMESTIC 92 REAR MUDFLOP 93 REFELCTOR BRACKET LH

NON-MOVING

4.1 Inventory turnover ratio

By keeping close control on all 3 sectors inventory can be controlled and results are obtained in terms of inventory turnover ratio. After applying the analysis for 4 months (December, January, February and March 2020), it showed a considerable improvement. Previously without implementing the strategy, ITR was between 2.08 – 2.43% and after implementing the analysis it was found between 3.01 – 4.23%. By keeping close control and minimizing the inventory holding cost, ITR was improved. Graph of inventory turnover ratio is shown in fig 4.1.

Equation,

Inventory turnover ratio = Cost of Goods Sold ÷ Average Inventory

$$ITR = COGS / AI \quad (4)$$

Where,

COGS = Beginning Inventory + Net Inventory Purchases – Ending Inventory AI = (Beginning Inventory + Ending Inventory) ÷ 2

Fig : ITR v/s month

Conclusions

Many researchers revealed that inventory technologies, tools of inventory, and supplier customer relationship, significantly influence inventory turnover performance. Production Companies can boost their internal productivity by removing non-value-added activities and by reducing the expenses on maintaining inventories to achieve high inventory turnover. This can be achieved by implementing the techniques effectively in all the organizational activities. Through, combination of ABC-VED and ABC-FSN classification it made easier to categorize the raw material and the items, and identify the critical items

where more concentration was required. In addition by setting the EOQ for the order of quantity it made easier to maintain the minimum level of inventory for the raw material. Ultimately through inventory turnover ratio it was found to have improvements of about 3.01 – 4.23% when compared to previous turnover in a plastic moulding business.

Future scope of work

The complexity of the management system of inventories depends on the size of the organization. Big companies, for example, use more complicated inventory management systems such as ERP that help handle the whole business from manufacturing to human resources, and thus provide more features that widen the system's reach.

- This will help the company to plan about inventory i.e. what to order, when to order and how much to order.
- This helps in deciding operating and volume of inventory.
- It helps in recognize the goods in terms of high, medium and low usable items. It helps in dealing with forecasting of inventory and asset management

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