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# An ABC-Analysis and JIT purchasing Implementation for Optimization of Non-Active Raw Materials in Inventory Management: A Case Study

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**Abstract -** *Inventory management of raw material is an important part of any manufacturing company, especially for capital cost point of view and the unusual or non-active raw material in inventory is wastage of money for raw material capital cost, especially in small scale industry. Based on the inventory management methods, some inventory management concepts were considered to minimize the uncertainty raw material capital costs and also improve the raw material purchasing strategy to improve their inventory performance. On the basis of a case analysis for an Induction Cooking Equipment Company which is located in Bangalore, some attempts were made to achieve the goal of minimizing raw material cost, inventory from purchasing activities and purchasing strategy points of view. Regarding the imbalanced inventory structure and imperfect inventory management system of Company, some new improvement solutions including ABC analysis, inventory replenishment method, and overall purchasing strategy were proposed in order to solve the current existing problems and promote the long-term development of the company. The recommended solutions described in the paper were presented based on JIT purchasing methodology, relevant literatures and theoretical calculations. Nevertheless, the new ideas and methods suggested in this paper will enhance the vision of purchasing executives during the decision-making process, aiming at minimizing the inventory costs and maximizing the services.*

***Key Words*: Inventory Management, ABC Analysis, Purchasing, Just-in-Time Management.**

## 1. INTRODUCTION

Inventory of raw material items in any type of manufacturing company is one of the tough works to how to manage their demand at exact time period. Raw material inventory is also a large capital carrying of any manufacturing companies. Especially in small scale industries if the production is job shop than it is very difficult to managed their raw material inventory, in case of a typical product manufacturing unit there are so many number of raw material are stored in the company storage that is also a part of inventory. The Large number of raw materials contains the company which is taken for case study, the case company involves into manufacturing of commercial induction cooking equipment and the present study is intended to determine the industry practice in inventory management to evaluate management performance. In order to evaluate the performance of the inventory management referring the monthly reports of the raw material inventory data. The collected data is a primary, case company originally faced, the such type of problem like year to year the increasing the cost of non-active raw material.

An effective raw material inventory management should:

- Ensure a continuous supply of raw materials to facilitate uninterrupted production.
- Minimize the wastage of raw materials.
- Maintain sufficient stocks of raw materials in periods of short supply and anticipated price changes.
- Minimize the non-active items cost.
- Control investment in inventories and keep it at an optimum level.
- It permits a better utilization of available stocks by facilitating interdepartmental transfer with in a company.

For the problem of inventory management and develop their purchasing strategy in this study with the reference of previous data study performed. Due to large number of increasing non active items, applying the ABC analysis and JUST IN TIME (JIT) purchasing theory for solve their problem.

### 1.1 ABC-analysis definition

ABC analysis is an inventory categorization method which consists in dividing items into three categories, A, B and C: A being the most valuable items, C being the least valuable ones. This method aims to draw managers' attention on the critical few (A-items) and not on the trivial many (C-items). The ABC approach states that, when reviewing inventory, a company should rate items from A to C, basing its ratings on the following rules: A-items are goods which annual consumption value is the highest. The top 70-80% of the annual consumption value of the company typically accounts for only 10-20% of total inventory items. B-items are the interclass items, with a medium consumption value. 15-25% of annual al consumption value typically accounts for 30% of total inventory items. C-items are, on the contrary, items with the lowest consumption value. The lower 5% of the annual consumption value typically accounts for 50% of total inventory items. [4]

### 1.2 JIT Purchasing Concept

As a buying process, the purchasing function is directly link to the inventory level control and cost management. The purchasing function plays a significant role in the whole supply chain, starting from the supplier selection to follow-up and evaluation. Even though the purchasing seems separated from some operations such as materials requirements planning, inventory management, incoming inspection and quality control, etc., in order to maximize the company's efficiency, purchasing operations are implemented interrelated with those activities. Especially in terms of the current global business environment, in which there are more competitions as well as cooperation, the purchasing function of an organization becomes increasingly critical towards the excellent performance of the organization and the whole supply chain.

## 2. Literature Review

It is possible to utilize the concept of ABC model in formation of rational inventory policy which should give the best possible service level to production while minimizing investment costs (Fuller, 2000) .ABC analysis tends to measure the significance of each item of inventory in terms of value. According to Onwubolu and Dube (2006), when ABC analysis is applied to an inventory situation, it shows the importance of items and level of control placed on the items. ABC classification is a method of classifying inventory items according to the money value to a firm [6]. Class A items though smaller volumes but tends to generate higher sales value followed by the class B items. The class C items are of a very large volume but generate a very small sales value. Class 'A' items normally range from 5% to 20% of all inventory items and account for between 50% and 80% of sales value. The class B items normally range from 20% to 40% of all inventory items and account for 20% to 40% of sales value. The class C items normally constitute 50% to 70% of all inventory items and account for 5% to 25% sales value. Reported that is the basis for material management processes and help to define how stock is managed and is an appropriate technique for classifying inventory items according to the importance of their contribution to the annual cost of the entire inventory system.

| Particulars | A items | B items | C items |
|---|---|---|---|
| Control | Tight | Moderate | Loose |
| Requirement | Exact Close | Exact Same | Estimated |
| check | Regular | Some | Little/No |
| Expenditure | Industrial | Individual | Group/None |
| Safety Stock | High | Medium | Rare |

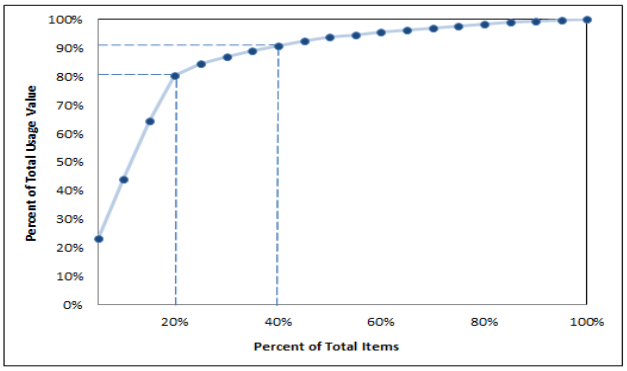


**Chart -1**: ABC analysis chart (*Source: Wannenwetsch (2006)[6]*

## 3. Methodology

The research was based on the case company. All the data were collected from the company's database, interviews of the personnel from the related departments and the company's website. By implementing an ABC analysis and update their inventory System, detailed information about Inventory items and transactions could be found. In addition, according to the expectations of the company, appropriate approaches needed to be found in order to eliminate the stocks with 0 turnovers and prevent the related problems from happening in the future. In terms of the inventory system, the overall structure could be thus optimized by adjusting the percentage distribution of active and non-active products. Meanwhile, the most suitable purchasing strategies were expected to be designed as well regarding different groups of items, in order to reduce inventory cost and improve efficiency. The main academic approaches include inventory management, JIT Management and Quality Management. Concerning the research and analysis methods, a combination of qualitative and quantitative methods was applied.

### 3.1 PROCESS OVERVIEW

Step1:- Collect Primary Inventory Data From Case Company.
Step2:- Data Observation.
Step3:- Historical Data Analysis.
Step4:- Present System Analysis.
Step5:- Carrying Cost Analysis.
Step6:- Apply ABC Analysis Method in Inventory Items.
Step7:- Update Inventory System.
Step8:- Apply & Suggest JIT Purchasing with ABC analysis as per aspect.

## 4. Data Collection, Analysis and Findings

Raw Material Inventory management of Lorman Technology pvt. Ltd. Bangalore: A case study.

Lorman technology pvt. Ltd. Located in Bangalore. The company is principally engaged in the business of

manufacturing and sales of commercial induction cooking equipment. The company manufactures various types of products which include Tawas, Deep Fryer, Rice Boiler, Stock Pot, Brit Pan, Thermic Boiler, Idly Pan etc.[3] The company has total 575 raw material items with 11 different aspects like circuit board, hardware, electronics, electrical, packing, coil winded, coil groove, bits, vessel, glass and wheels. To improve their Raw material inventory management system so as to be classifies the items in different aspects. The data used for calculation is collect from company. Table 1 shown below shows the summery of Available items cost, used items cost of raw materials from the month Nov-16 to Mar-17.

| | Nov-16 | Dec-16 | Jan-17 | Feb-17 | Mar-17 |
|---|---|---|---|---|---|
| Available Items Cost (in lakhs) | 53.15 | 80.81 | 70.07 | 56.31 | 43.77 |
| Used Items Cost (in lakhs) | 14.76 | 10.74 | 13.76 | 12.54 | 13.06 |
| Total Raw Material Cost (in lakhs) | 67.91 | 91.55 | 83.83 | 68.85 | 56.83 |

*Table: 1 Monthly Price Summery of Raw Materials*

ABC-Analysis performs for Mar-17 available raw materials inventory. The ABC Analysis done for all items but due to large amount of stock items this paper shows only circuit board items (in Annexure). Table 2 shown below shows the ABC analysis of 11 different items and also shows the non-active raw materials.

| SL No. | Particulars | Total Items | A-Class Items | B-Class Items | C-Class Items | No. of Non-Active Items |
|---|---|---|---|---|---|---|
| 1 | CIRCUIT BOARDS | 36 | 4 | 11 | 21 | 14 |
| 2 | HARDWARES | 101 | 18 | 37 | 46 | 43 |
| 3 | ELECTRONICS | 171 | 33 | 63 | 75 | 29 |
| 4 | ELECTRICAL | 96 | 14 | 30 | 52 | 40 |
| 5 | PACKINGS | 31 | 3 | 12 | 16 | 20 |
| 6 | COIL WINDED | 18 | 3 | 6 | 9 | 7 |
| 7 | COIL GROOVE | 18 | 2 | 6 | 10 | 7 |
| 8 | BITS | 18 | 3 | 5 | 10 | 8 |
| 9 | VESSEL | 44 | 6 | 13 | 25 | 40 |
| 10 | GLASS | 12 | 2 | 4 | 6 | 9 |
| 11 | WHEELS | 30 | 3 | 8 | 19 | 1 |
| | **Total** | **575** | **91** | **195** | **289** | **218** |

*Table 2 ABC-Analysis of 11 different aspects of items for Mar-17 Source: Raw material items form company (Lorman Tech.)[3]*

After ABC analysis performed for all items, categorized into three classes that are A-class, B-class, and C-class and also calculate the number of non-active items after that analyze and calculate the cost of non-active items as shown in table 3.

| | Nov-16 | Dec-16 | Jan-17 | Feb-17 | Mar-17 |
|---|---|---|---|---|---|
| Available Items Cost (in lakhs) | 53.15 | 80.81 | 70.07 | 56.31 | 43.77 |
| Used Items Cost (in lakhs) | 14.76 | 10.74 | 13.76 | 12.54 | 13.06 |
| Total Raw Material Cost (in lakhs) | 67.91 | 91.55 | 83.83 | 68.85 | 56.83 |
| Non-Active Material Cost (in lakhs) | 15.57 | 16.37 | 17.00 | 18.35 | 20.90 |

*Table 3 Cost summery of items including non-active raw* material cost

## 5. JIT purchasing implementation

**Just-in-time (JIT)** is an inventory strategy companies employ to increase efficiency and decrease waste by receiving goods only as they are needed in the production process, thereby reducing inventory costs. This method requires producers to forecast demand accurately. [7]

The list of methodologies of JIT purchasing that "is important but not exhaustive".

- Setup reduction
- Lot size of one
- Balanced flow
- Control by visibility
- Compact plant layout
- Elimination of defects
- House keeping
- Smoothing materials handling
- Purchasing control

**Findings:-**

Our analysis shows that company follows the ABC analysis for multiple items. It observed that there are 218 items out of 575 items are non-active and also increasing their non-active items in inventory, and month to month the cost of non-active items is increasing. JIT purchasing rule implementation is beneficiary for non-active item reduction.

## 3. CONCLUSIONS

In conclusion, this paper is focused on operations management in order to achieve inventory optimization and purchasing activities improvement for the case company. In general, the study paper is of great reference and the output of it is useful, since some recommended solutions were found to solve the current existing problems through in-depth investigation and comprehensive research, and some attempts were made to improve the current performance and prevent the problems recurrence in the future. The contribution for the company is optimizing the current inventory structure, eliminating non-active stocks, and improving the quality of purchasing activities and organization. And from a scholar point of view, the thesis

deeply analyzed the relationship between purchasing activities and inventory level control.

1. Due to undefined purchasing management system the non-active raw material cost is gradually increasing.
2. To keep down capital investment in inventories.
3. To minimize the possibility of disruption in the production schedules of firm for want of raw material, stock and spares.
4. To minimize the excessive carrying cost.
5. Minimize investment in inventories and minimize the carrying cost and time.

**Suggestion:**

1. For purchasing of raw material suggest the ABC analysis report.
2. Use JIT purchasing management system.

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**Annexure**

The ABC analysis perform for circuit board items as show below in table 4, in this table first we rank the all 36 items in accordance with the total value giving first rank to the items with highest total value and so on. And calculate the total monthly demand cost of Mar-17.

| Item No. | Material Name | Particular | Monthly Demand | Unit Cost | Monthly Cost of Used Items |
|---|---|---|---|---|---|
| 1 | SEMIKRON | SET | 38 | 3325 | 126350 |
| 2 | MODULE CARD READY | 5KWH | 23 | 3450 | 79350 |
| 3 | GEYSER READY | FC SMALL | 16 | 3325 | 53200 |
| 4 | POWER CARD READY | 0.3MF/4C/CC | 36 | 425 | 15300 |
| 5 | POWER SUPPLY READY | 3PHASE | 25 | 425 | 10625 |
| 6 | POWER CARD READY | 10MF/2C/CC | 25 | 396 | 9900 |
| 7 | RAILWAYS READY | 5KWH | 5 | 1873 | 9365 |
| 8 | BFW PCB | LORMAN-2A | 78 | 92.11 | 7184.58 |
| 9 | POWERCARD FULL BOARD | LT--3P30KW | 10 | 287.02 | 2870.2 |
| 10 | RAILWAYS | LT-RL3KW | 10 | 273.06 | 2730.6 |
| 11 | AUTOMATIC KEYPAD | LT--103 | 108 | 25 | 2700 |
| 12 | AUTOMATIC KEYPAD | 5KWH | 45 | 54 | 2430 |
| 13 | FLAT CARD READY | 5KWH | 2 | 838 | 1676 |
| 14 | POWER SUPPLY | LT--DRV | 64 | 24.69 | 1580.16 |
| 15 | MANUAL KEYPAD | LT--102 | 28 | 55 | 1540 |
| 16 | MODULE CARD | LT-RL3KWCON | 145 | 10 | 1450 |
| 17 | AUTOMATIC KEYPAD | BFW | 20 | 52 | 1040 |
| 18 | FLAT RC PCB | LT-- 1PMB3 | 1 | 787.2 | 787.2 |
| 19 | MANUAL KEYPAD READY | 5KWH | 13 | 32 | 416 |
| 20 | DRIVE CARD | LT--DRV1 | 20 | 20 | 400 |
| 21 | DRIVE CARD READY | 3PHASE | 2 | 150 | 300 |
| 22 | POWER CARD READY | 0.15MF/4C/CC | 40 | 5 | 200 |
| 23 | DRIVE CARD READY | LT-IGBT2C | 0 | 23.63 | 0 |
| 24 | POWERCARD | CAPACITOR SIDE | 0 | 287.2 | 0 |
| 25 | POWERCARD | TERROID SIDE | 0 | 430 | 0 |
| 26 | POWERCARD | CENTER PIECE | 0 | 430 | 0 |
| 27 | POWER CARD READY | 0.3MF/4C/WHC | 0 | 804 | 0 |
| 28 | POWER CARD READY | 0.3MF/2C/CC | 0 | 396 | 0 |
| 29 | POWER CARD READY | 10MF/2C/WHC | 0 | 564 | 0 |
| 30 | POWER CARD READY | 0.3MF/2C/WHC | 0 | 1128 | 0 |
| 31 | MANUAL KEYPAD READY | 3PHASE | 0 | 56 | 0 |
| 32 | MANUAL KEYPAD READY | BFW | 0 | 68 | 0 |
| 33 | AUTOMATIC KEYPAD | 3PHASE | 0 | 35 | 0 |
| 34 | BFW PCB READY | 2A | 0 | 1096 | 0 |
| 35 | DRIVE CARD READY | NEW | 0 | 23.63 | 0 |
| 36 | GEYSER | LT--SP3KW1 | 0 | 202.92 | 0 |

Table 4

| Category | Item No | Approximate Percentage of Items (%) | Percentage Usage (%) | Action |
|---|---|---|---|---|
| A | 1 To 4 | 15% | 82.74% | Close Control |
| B | 5 To 15 | 53% | 13.87% | Regular Control |
| C | 16 To 36 | 32% | 3.39% | Rarely Control |

| Item No. | Material Name | Particular | Monthly Demand | Cumulative % of Materials | Unit Cost | Monthly Cost | Cumulative % of total usage |
|---|---|---|---|---|---|---|---|
| 1 | SEMIKRON | SET | 38 | 5.039787798 | 3325 | 126350 | 38.12673671 |
| 2 | MODULE CARD READY | 5KWH | 23 | 8.090185676 | 3450 | 79350 | 62.07099123 |
| 3 | GEYSER READY | FC SMALL | 16 | 10.21220159 | 3325 | 53200 | 78.12435406 |
| 4 | POWER CARD READY | 0.3MF/4C/CC | 36 | 14.9867374 | 425 | 15300 | 82.74120464 |
| 5 | POWER SUPPLY READY | 3PHASE | 25 | 18.30238727 | 425 | 10625 | 85.94735088 |
| 6 | POWER CARD READY | 10MF/2C/CC | 25 | 21.61803714 | 396 | 9900 | 88.93472479 |
| 7 | RAILWAYS READY | 5KWH | 5 | 22.28116711 | 1873 | 9365 | 91.76065981 |
| 8 | BFW PCB | LORMAN-2A | 78 | 32.62599469 | 92.11 | 7184.58 | 93.92864232 |
| 9 | POWERCARD FULL BOARD | LT--3P30KW | 10 | 33.95225464 | 287.02 | 2870.2 | 94.79473935 |
| 10 | RAILWAYS | LT-RL3KW | 10 | 35.27851459 | 273.06 | 2730.6 | 95.61871139 |
| 11 | AUTOMATIC KEYPAD | LT--103 | 108 | 49.60212202 | 25 | 2700 | 96.43344973 |
| 12 | AUTOMATIC KEYPAD | 5KWH | 45 | 55.57029178 | 54 | 2430 | 97.16671423 |
| 13 | FLAT CARD READY | 5KWH | 2 | 55.83554377 | 838 | 1676 | 97.67245551 |
| 14 | POWER SUPPLY | LT--DRV | 64 | 64.32360743 | 24.69 | 1580.16 | 98.1492766 |
| 15 | MANUAL KEYPAD | LT--102 | 28 | 68.03713528 | 55 | 1540 | 98.61397921 |
| 16 | MODULE CARD | LT-RL3KWCON | 145 | 87.26790451 | 10 | 1450 | 99.05152387 |
| 17 | AUTOMATIC KEYPAD | BFW | 20 | 89.9204244 | 52 | 1040 | 99.36534901 |
| 18 | FLAT RC PCB | LT-- 1PMB3 | 1 | 90.0530504 | 787.2 | 787.2 | 99.6028905 |
| 19 | MANUAL KEYPAD READY | 5KWH | 13 | 91.77718833 | 32 | 416 | 99.72842055 |
| 20 | DRIVE CARD | LT--DRV1 | 20 | 94.42970822 | 20 | 400 | 99.84912253 |
| 21 | DRIVE CARD READY | 3PHASE | 2 | 94.69496021 | 150 | 300 | 99.93964901 |
| 22 | POWER CARD READY | 0.15MF/4C/CC | 40 | 100 | 5 | 200 | 100 |
| 23 | DRIVE CARD READY | LT-IGBT2C | 0 | 0 | 23.63 | 0 | 0 |
| 24 | POWERCARD | CAPACITOR SIDE | 0 | 0 | 287.2 | 0 | 0 |
| 25 | POWERCARD | TERROID SIDE | 0 | 0 | 430 | 0 | 0 |
| 26 | POWERCARD | CENTER PIECE | 0 | 0 | 430 | 0 | 0 |
| 27 | POWER CARD READY | 0.3MF/4C/WHC | 0 | 0 | 804 | 0 | 0 |
| 28 | POWER CARD READY | 0.3MF/2C/CC | 0 | 0 | 396 | 0 | 0 |
| 29 | POWER CARD READY | 10MF/2C/WHC | 0 | 0 | 564 | 0 | 0 |
| 30 | POWER CARD READY | 0.3MF/2C/WHC | 0 | 0 | 1128 | 0 | 0 |
| 31 | MANUAL KEYPAD READY | 3PHASE | 0 | 0 | 56 | 0 | 0 |
| 32 | MANUAL KEYPAD READY | BFW | 0 | 0 | 68 | 0 | 0 |
| 33 | AUTOMATIC KEYPAD | 3PHASE | 0 | 0 | 35 | 0 | 0 |
| 34 | BFW PCB READY | 2A | 0 | 0 | 1096 | 0 | 0 |
| 35 | DRIVE CARD READY | NEW | 0 | 0 | 23.63 | 0 | 0 |
| 36 | GEYSER | LT--SP3KW1 | 0 | 0 | 202.92 | 0 | 0 |
| | | | 754 | | | 331394.74 | |

*Table 5*