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# Managing Inventory Waste Through Lean Tool: A Case Study

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**ABSTRACT : Inventory is the worst form of all the seven wastes of Lean Manufacturing (7 Muda's). It is making products in too great a quantity or before it is actually needed leading to excessive inventory. Principle of Lean Manufacturing is application of what is required and when is required by the customer, pulling only what is ordered through the work flow. Heavy inventories lead to cash crunch leading to failure of business houses as lot of money has already been put in the inventory lying idle. Inventory concerns two major aspects regarding storage of material and its movement therefore, it needs people and the equipments including storage facilities to move around. All of this is a cost to business and can be converted to useful savings and uplifting the profits. In the present study an attempt has been made to identify and reduce inventory wastage with the application of Inventory Management Tool in an automobile parts manufacturing industry. In this study, XYZ is a company manufacturing shockers for automobile industry. Company faces many problems like large inventory of WIP, production lead time, lead-time, worker motivation and unsystematically production approach. The study was conducted to categorize models in three categories i.e. Vital, Essential and Desirable.**

**Key words:** Managing inventory, automobile parts WIP.

## I. INTRODUCTION

Inventory is the menace in any organization since; the organizations continue to follow the production practices as was being done in the past. The fundamental cause of such a phenomenon is based on the fact that all the machine/equipment and also the available manpower have to be kept busy irrespective of actual requirements. Almost all the managers in production houses have a wrong notion that large batch sizes reduce the element of setup time that is reduction in throughput time. In fact, the results achieved go contrary to expectations. One of the important reasons is wide variety of products, varied demand for each category including rationalization of production numbers by the planning department to match with the marketing requirements. e.g. If market demand is for 23 numbers then the planning department plans for 30 numbers generating overproduction to the tune of 25%.

The inventory leads to unnecessary accumulation of materials at each stage of production, involving huge engagement of funds, without the knowledge as to when this investment will be encashable. Another matter associated is of serious nature as many materials may get dumped and come out as the material either for rework or for scrap. Such a situation calls for intelligent application of inventory management as per customer requirement to suit expedient disposal with prompt service.

The VED techniques need to be adopted as a routine practice for optimal use of resources and elimination of out-of-stock situations in the production house. The said business house is manufacturing 185 types of products to cater the needs of various customers which is quiet huge so far as the variety is concerned. These situations understandably may follow the lines of overproduction. The situation can be tackled by simple application of VED control tool i.e. categorizing the requirements in vital variety (10% of total) with strict material controls, essential variety (20% of total) with moderate controls, and balanced desirable category of 70% with loose controls. This will facilitate planning department to engage entire energy to limited area only leading to reducing overproduction to bare minimum including best utilization of funds [2, 5].

In present scenario, the main focuses on improved system productivity with concentration on improving quality, delivery and cost. This is essential to survive in the present competitive market where in the costs are major concerns. Therefore, in order to remain competitive, waste from inventory must be identified and eliminated so to run system with maximum efficiencies.

The process of production is to follow order to produce large numbers of different products and each in relatively small volume. A Production shop is commulligration of various sub centers and each with a fundamentally different activity. The problems of assembly shops are delayed deliveries, long queues, and high work in process inventories, improper utilization etc. Such activities generate increased overall cost of production. He curtailment of cost can be carried out by reducing the lot size and making the system as "Pull System" contrary to existing "Push System" which is nothing but overproduction. The implementation of small batch size leads to efficient utilization of resources i.e. machines, men, with reduced inventories, process variability and WIP. The throughput time shall get reduced and further reducing the lead times which shall help in

achieving competitive manufacturing. This is the need of hour to be an essential part of existing market.

The management of inventories is very crucial wherein the product variety is very high and unpredictable nature of volumes. Therefore, the material flow has to be regulated with effective control and intelligent planning through restrictions imposed on varieties i.e. the varieties need to be segregated and categorized as per their contribution to the turn over. The very few varieties may be 10% of total may be put under the lens with slight control on next 20%. This application shall lead to 80% control on inventories. This will generate lot of space for storage, accident free movements in aisles with minimum movement, easy identification, low rework and scrap including low engagement of material handling facilities.

## II. LITERATURE REVIEW

Lean is a systematical approach to identify and eliminate waste through continuous improvement following the product at the pull of customer in pursuit of perfection. In lean manufacturing, the value of product is defined solely by the customer [2]. Goal of lean manufacturing is to reduce the wastage in any form such as human effort, inventory, time to market, space to become highly responsive to customer demand. Value added activities make the product more closely resemble what the customer wants. Non value Non-value added activities do not create customers value. Anything that is not adding value is defined as waste.

The processing in small batch sizes necessitates the adjustment in the flow of production through different processes as per their processing speeds. In addition it requires close monitoring of processes to reduce process variability (defect free production), efficient planned maintenance of all machines (for increased availability) and reduction in non value added activities such as setup times, movement of material in between the work processes and additional processing of material. The efficient utilization of machines while producing in reduced WIP inventories, reduced throughput times and reduction in lead times leads to competitive manufacturing. The forms of overproduction wastes are:

- Waste of Inventory, Waste of Transport, Waste of Waiting, Waste of Space, Waste of Motion, Waste of over processing, Waste of Defects, Waste of Resources, Waste of Talent

Womack et. al, (1990) explained the several features of lean, According to studies that were initially performed in the automobile industry [8].

1. Lean is a dynamic process of change driven by a systematic set of principles and best practices aimed at continuously improving;
2. Lean refers to the total enterprise, from the shop floor to the executive suite, and from the supplier to customer value chain;
3. Lean requires rooting out everything that is non- value-added; and
4. Becoming lean is a complex business - there is no single thing that will make an organization lean.

Shah (2002) examines the effects of three contextual factors, plant size, plant age and unionization status, on the likelihood of implementing lean production systems. Further findings results four “bundles” of inter-related and internally consistent practices; these are just-in-time (JIT), total quality management (TQM), total preventive maintenance (TPM), and human resource management (HRM). Results are empirically validating these bundles and investigate their effects on operational performance.

Pavnaskar et al (2003) proposed scheme of classification for lean manufacturing tools and allied detailing. This scheme of classification is structured around seven levels: system, object, operation, activity, resource, characteristic and application. Each level is linked systematically so that lean manufacturing tools are classified in a meaningful and logical way.

Burton and Boeder (2003) reported the five lean manufacturing principles are as under:

1. Accurately specific values from the customer’s perspective for both products and services.
2. Identify the value stream for products and services and remove non-value-adding waste along the value stream.
3. Make the product and services flow without interruption across the value stream.
4. Authorize production of products and services based on pull by customer.
5. Strive the perfection by constantly removing the waste.

A majority of articles on the topic of lean production system focus on the relationship between implementation of lean and performance. Thus, lean is basically all about getting the right things, to the right place, at the right time, in the right quantity while minimizing waste and being flexible and open to change [1].

## III. CASE STUDY

Definition of Problem Application of lean tools to control waste of overproduction to facilitate free movement, unnecessary occupancy of space, reduction in movement of material, reduction in unnecessary holding of funds, and reduction in salvage/rework/scrap.

The objective of this study is to manage inventory effectively:

1. To identify wastes in the production.
2. To analyze this wastes from lean considerations.
3. To recommend the appropriate lean tools and their implementation process.
4. To suggest the improvements in the inventory management leading to cost benefits.

## IV. ANALYSIS

The task of Inventory Management is quiet daunting in the area wherein there is large variety of products i.e. numbering 185 in the present case **(**As per Annexure-VIII). Also, the movement of men and materials is virtually none existing because of huge accumulation of in processing material on the shop floor. Therefore, there is an urgent need to identify and block the areas which are leading to overproduction. During the investigations, it was detected the area of inventories need to be probed to curtail waste and have the smooth running of operations based on "Pull System" and not the prevalent "Push System".

It was observed there is no firm plan to cater to needs of customer and there is frequent change in plans. The new plans are introduced without nay verification of the availability of the concerned materials. The production numbers are frequently rounded off to achieve only the overproduction. The supervisory staff is always on run to cater the needs of assembly lines. It has further been observed that the lot size (500 Numbers) is too large for the kind of product and its variety. The average production per month is 2.28 Lacs with average 110 types of items per month. The variance in demand and production is very large and almost 50% of average numbers of items per month are being produced on regular basis.

On basis of VED analysis, it has been observed that 17 items are vital and need strict control. These items contribute towards 56% of the total monthly production. Further, another 11 items are of essential nature and need regular control. These items contribute additional 13%. Therefore, 28 items out of 185 items do constitute 15% of total models and further this quantity pertaining to these 28 models is 69% of the total numbers produced in any given month. Further the analysis reveal that 87% of the total production can be decontrolled leading to very effective inventory management by just controlling 28 items (15%) and generating huge savings in investment, space, material handling and enhancing MH equipment utilization including effective working of available man power. The categorization of all the models with their model no is given in Annexure-I. & Annexure II.

**Steps To Implement Our Objectives.** The methodology for the present work will include the following main steps:

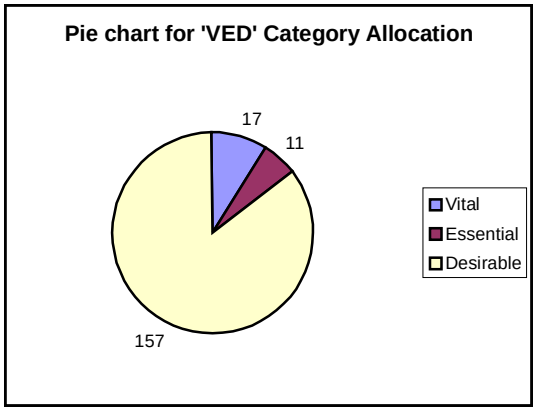
1. Lot size (presently 500 numbers) to be brought down and suggested lot size is 250 numbers.
2. The suggested 17 Items ("V" Class Items) as per Annexure-I are of prime importance and need to be monitored at least once a day.
3. 11 items ("E" Class) as per Annexure-I are to be controlled minimum on alternate days.
4. Existing WIP lying on shop floor need to be identified and numbered with a sole motive of using this inventory and bringing this WIP to bare minimum level.
5. Production for new items to be taken up only after verifying the existing list of WIP.
6. The assembly line production must be planned a day in advance to avoid unnecessary/undesired running around by most of stuff.
7. Evaluate the benefits obtainable from the lean production techniques.
8. The fixtures on machines to be redesigned for accurate, easy and positive location of components with prime objective to reduce set-up time and improve in process quality

**Annexure-I : Summary of VED analysis**

| Classs | Total No. of Models | Models No. | Remarks |
|---|---|---|---|
| V | 17 (9% of Total) | 3350, 3351, 3712, 2728, 3711, 6226, 3504, 3727, 6241, 3280, 3720, 3900, 6213, 3558, 6283, 3549, 3511 | 9,00,884 No. per month |
| E | 11 (6% of Total) | 3240,3289,3542,3543,3751,6222,6151,3371,6202, 4314,6284 | 2,16,119 No. per month (13% of Total) |
| D | 257 (85% of Total) | 3101, 3102, 3103, 3107, 3128, 3129, 3176, 3208, 3220, 3221, 3224, 3226, 3227, 3228, 3229, 3232, 3234, 3241, 3244, 3245, 3246, 3247, 3251, 3252, 3260, 3262, 3263, 3267, 3316, 3317, 3329, 3337, 3343, 3344, 3345, 3354, 3357, 3358, 3364, 3365, 3366, 3367, 3379, 3380, 3382, 3383, 3407, 3417, 3418, 3419, 3423, 3424, 3427, 3435, 3438, 3453, 3457, 3472, 3473, 3475, 3476, 3484, 3510, 3512, 3513, 3519, 3520, 3526, 3527, 3528, 3536, 3562, 3569, 3570, 3598, 3599, 3601, 3700, 3713, | 4,77829 No. per month (31% of Total) |

3714, 3715, 3721, 3725, 3726, 3729, 3730, 3732, 3733, 3735, 3736, 3737, 3748, 3749, 4117, 4119, 4120, 4122, 4123, 4126, 4127, 4128, 4129, 4133, 4134, 4135, 4136, 4315, 4321, 6124, 6127, 6131, 6132, 6133, 6135, 6136, 6137, 6138, 6143, 6144, 6145, 6154, 6156, 6157, 6160, 6161, 6162, 6169, 6170, 6171, 6175, 6178, 6186, 6194, 6198, 6201, 6203, 6204, 6211, 6212, 6215, 6216, 6225, 6227, 6228, 6229, 6235, 6236, 6237, 6240, 6268, 6269, 6278, 6282, 6288, 6289

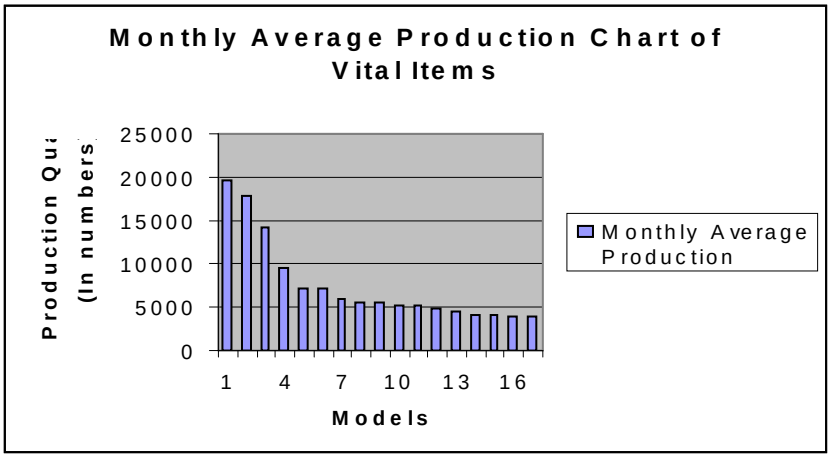
**Annexure-II**




**Annexure-III : List of Vital Items.**

| Model No. | Jun'11 | Jul'11 | Aug'11 | Sep'11 | Oct'11 | Nov'11 | Dec'11 | Total |
|---|---|---|---|---|---|---|---|---|
| 3350 | 24000 | 22000 | 20000 | 20000 | 19500 | 15350 | 17000 | 137850 |
| 3351 | 22000 | 22000 | 20000 | 20000 | 13500 | 13000 | 14000 | 124500 |
| 3712 | 12000 | 15500 | 17500 | 18000 | 20000 | 6250 | 10000 | 99250 |
| 3728 | 10000 | 12000 | 10000 | 8000 | 10000 | 6450 | 10600 | 67050 |
| 6226 | | | 11114 | 25200 | | 2200 | 12000 | 50514 |
| 3711 | 6000 | 7500 | 10000 | 9000 | 10000 | 3000 | 5000 | 50500 |
| 3504 | 6200 | 7500 | 8000 | 6000 | 3850 | 4000 | 6100 | 41650 |
| 3727 | 6500 | 6000 | 5000 | 4000 | 5800 | 4800 | 7000 | 39100 |
| 6241 | 4000 | 8000 | 7250 | 5000 | 5500 | 4100 | 5100 | 38950 |
| 3280 | 5000 | 7500 | 6500 | 6500 | 8100 | 1500 | 1500 | 36600 |
| 3720 | 3500 | 6600 | 6020 | 5700 | 4200 | 4650 | 5400 | 36070 |
| 3900 | 5000 | 5500 | 6400 | 5000 | 3500 | 3300 | 5400 | 34100 |
| 6213 | | | | 12300 | | 7200 | 12000 | 31500 |
| 3558 | 4300 | 5000 | 6000 | 5000 | 3000 | 2600 | 3100 | 29000 |
| 6283 | 7000 | 10000 | 3650 | 4000 | 4000 | | | 28650 |
| 3549 | 4300 | 4500 | 6000 | 5000 | 3000 | 2500 | 3000 | 28300 |
| 3511 | 4700 | 5500 | 5000 | 1000 | 3500 | 3000 | 4600 | 27300 |
| Totals | 124500 | 145100 | 148434 | 159700 | 117450 | 83900 | 121800 | 900884 |

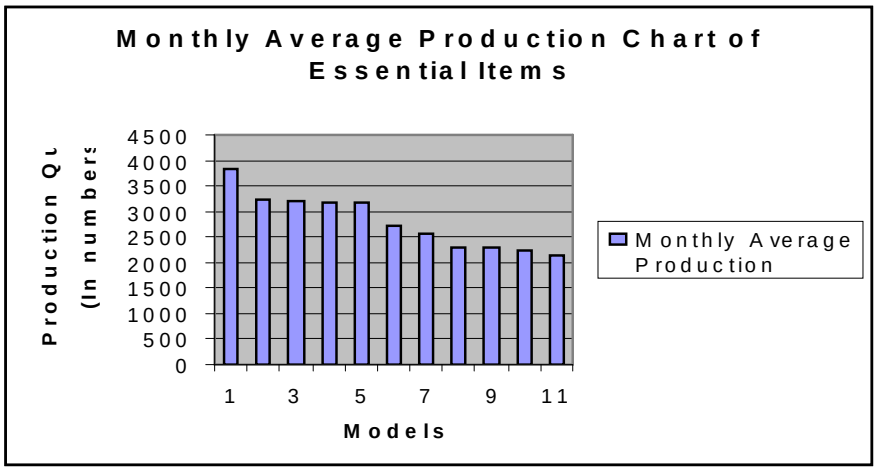
**Annexure-IV**




**Annexure-V : List of Essential Items.**

| Model No. | Jun'11 | Jul'11 | Aug'11 | Sep'11 | Oct'11 | Nov'11 | Dec'11 | Total |
|---|---|---|---|---|---|---|---|---|
| 3240 | 5000 | 7000 | 5000 | 3000 | 4800 | 2000 | | 26800 |
| 3289 | 6200 | 5500 | 7500 | 500 | 2000 | 600 | 300 | 22600 |
| 3542 | 4300 | 4000 | 4700 | 3500 | 2100 | 1150 | 2660 | 22410 |
| 3543 | 4300 | 5000 | 4000 | 3000 | 1900 | 1500 | 2600 | 22300 |
| 3751 | 750 | 17500 | 850 | 600 | 600 | 1000 | 1000 | 22300 |
| 6222 | 2500 | 4800 | 4074 | 3000 | 2100 | 1000 | 1500 | 18974 |
| 6151 | 6816 | 5586 | 2039 | 500 | | | 3000 | 17941 |
| 3371 | 2000 | 4000 | 5000 | 2500 | 1000 | 800 | 850 | 16150 |
| 6202 | 5774 | 6044 | 2426 | 900 | | | 900 | 16044 |
| 4314 | 2000 | 500 | | 3600 | 3000 | 3000 | 3500 | 15600 |
| 6284 | 5000 | 4000 | 1600 | 2000 | 2400 | | | 15000 |
| Totals | 44640 | 63930 | 37189 | 23100 | 19900 | 11050 | 16310 | 216119 |

**Annexure-VI**



**Annexure-VII : List of Desirable Items.**

| Model No. | Jun'11 | Jul'11 | Aug'11 | Sep'11 | Oct'11 | Nov'11 | Dec'11 | Total |
|---|---|---|---|---|---|---|---|---|
| 3101 | 500 | 1200 | 1200 | | | 700 | 1000 | 4600 |
| 3102 | | | | | 500 | 1200 | 1500 | 3200 |
| 3103 | 500 | 800 | 1000 | 800 | 300 | | 300 | 3700 |
| 3107 | | 500 | 500 | | | | | 1000 |
| 3128 | 1000 | | | 500 | 1300 | 1500 | 1500 | 5800 |
| 3129 | | | | | 300 | 600 | 550 | 1450 |
| 3176 | | | | | | 300 | 300 | 600 |
| 3208 | 500 | 500 | 300 | | | | | 1300 |
| 3220 | | 300 | | | | 2500 | 2500 | 5300 |
| 3221 | 500 | 500 | 500 | 500 | 1000 | 1350 | 400 | 4750 |
| 3224 | 300 | | | | | | | 300 |
| 3226 | 400 | | | | | | | 400 |
| 3227 | | 500 | 400 | | 500 | 600 | 700 | 2700 |
| 3228 | | | | 500 | 500 | 300 | 350 | 1650 |
| 3229 | 300 | | | | | | | 300 |
| 3232 | 1000 | 300 | 1800 | 2500 | 1200 | 750 | 1400 | 8950 |
| 3234 | 2000 | 500 | | 1500 | 1200 | 2000 | 2000 | 9200 |
| 3241 | | | | | | 1000 | 1500 | 2500 |
| 3244 | | 300 | | | | 700 | 750 | 1750 |
| 3245 | | 3200 | 1500 | 1500 | 2000 | 2500 | 4000 | 14700 |
| 3246 | 500 | 1200 | 356 | | 300 | | | 2356 |
| 3247 | | | | | 300 | 550 | 550 | 1400 |
| 3251 | | | | | | 500 | | 500 |
| 3252 | | 700 | 200 | | | 300 | 200 | 1400 |
| 3260 | | 500 | 700 | 500 | 250 | 200 | 400 | 2550 |
| 3262 | 1000 | 1000 | 1000 | | 600 | | | 3600 |
| 3263 | 400 | | | | | | | 400 |
| 3267 | | 500 | 300 | | 300 | 350 | 500 | 1950 |
| 3316 | 1000 | | | 500 | 700 | 900 | 800 | 3900 |
| 3317 | 600 | | | | | | | 600 |
| 3329 | 400 | 500 | 200 | 200 | | 400 | 300 | 2000 |
| 3337 | 400 | 500 | 700 | 500 | 500 | | 100 | 2700 |
| 3343 | 1500 | | | | | | 700 | 2200 |
| 3344 | 800 | 1200 | 1200 | 1000 | 750 | 1200 | 1000 | 7150 |
| 3345 | 800 | | | 500 | 1000 | 1200 | 800 | 4300 |
| 3354 | 800 | | | | | | | 800 |
| 3357 | 400 | 500 | 600 | 500 | 500 | 500 | 250 | 3250 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3358 | 800 | 500 | 400 | 800 | 800 | 400 | 400 | 4100 |
| 3364 | | | | | 400 | 400 | 200 | 1000 |
| 3365 | | | | | 400 | 400 | 200 | 1000 |
| 3366 | 800 | 1500 | 1000 | 1000 | 600 | 600 | 800 | 6300 |
| 3367 | 800 | 1500 | 1000 | 1000 | 600 | 600 | 800 | 6300 |
| 3379 | 500 | 600 | 800 | 500 | 750 | 200 | 330 | 3680 |
| 3380 | 800 | 700 | 1500 | 1500 | 800 | 400 | 380 | 6080 |
| 3382 | | | 750 | | | | | 750 |
| 3383 | 1000 | 571 | 537 | | | | | 2108 |
| 3407 | 400 | 1000 | 1000 | 500 | | 450 | 400 | 3750 |
| 3416 | 400 | | | | | | | 400 |
| 3417 | 10 | | 700 | | | | | 710 |
| 3418 | 500 | | 500 | | | | | 1000 |
| 3419 | 500 | | 300 | | | | | 800 |
| 3423 | 1000 | 1000 | 200 | | 500 | 600 | 600 | 3900 |
| 3424 | 600 | 500 | | | | | 250 | 1350 |
| 3427 | | | | | | 200 | | 200 |
| 3435 | 600 | 1000 | 1200 | 1500 | 1000 | 300 | 250 | 5850 |
| 3438 | | | | | | | 150 | 150 |
| 3453 | | 400 | 400 | 400 | | 400 | 400 | 2000 |
| 3455 | | 400 | 400 | 400 | | 400 | 400 | 2000 |
| 3457 | | 400 | 400 | 400 | | 400 | 400 | 2000 |
| 3472 | | 400 | 400 | 400 | | 400 | 400 | 2000 |
| 3473 | | 400 | 400 | 400 | | 400 | 400 | 2000 |
| 3475 | 600 | 500 | | | | | | 1100 |
| 3476 | 800 | | | | | | 250 | 1050 |
| 3484 | | | | | | 100 | | 100 |
| 3510 | 500 | 2000 | 2200 | 1500 | 2050 | 1500 | 2100 | 11850 |
| 3512 | 500 | 1000 | | | | 1740 | 2000 | 5240 |
| 3513 | 1000 | 1000 | | | | 1740 | 2000 | 5740 |
| 3519 | 500 | 300 | | 2400 | 2600 | | | 5800 |
| 3520 | | | | 2000 | | | | 2000 |
| 3526 | 1500 | 1500 | 429 | | | | | 3429 |
| 3527 | 1050 | 1050 | 787 | | | | | 2887 |
| 3528 | 1650 | 1650 | 683 | | | | | 3983 |
| 3536 | | | | | | 2000 | | 2000 |
| 3562 | 200 | 1000 | 800 | | 600 | | 600 | 3200 |
| 3569 | 800 | | | 500 | 300 | 250 | 270 | 2120 |
| 3570 | 400 | 500 | | 500 | 200 | 100 | 300 | 2000 |
| 3598 | 500 | 500 | 500 | 500 | 400 | 500 | 300 | 3200 |
| 3599 | 500 | 500 | 500 | 500 | 400 | 500 | 300 | 3200 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3601 | | | | 6000 | | 4000 | 6000 | 16000 |
| 3700 | | | | | 500 | | | 500 |
| 3713 | | | | | | 3000 | 2500 | 5500 |
| 3714 | | | | | | 500 | 2000 | 2500 |
| 3715 | 1250 | 500 | 500 | 500 | 1100 | 1850 | 1350 | 7050 |
| 3721 | 1000 | 800 | 800 | 700 | 800 | 1000 | 1050 | 6150 |
| 3725 | 600 | | | | | | | 600 |
| 3726 | 700 | 1200 | 900 | 500 | 500 | 600 | 600 | 5000 |
| 3729 | | | | | | 600 | 600 | 1200 |
| 3730 | | | | | | 300 | 300 | 600 |
| 3732 | 400 | 500 | 200 | | 100 | | 100 | 1300 |
| 3733 | 140 | 140 | 140 | | | 140 | | 560 |
| 3735 | 140 | 140 | 140 | | | 140 | | 560 |
| 3736 | | | | | 100 | | | 100 |
| 3737 | 2000 | 2000 | | | | | | 4000 |
| 3748 | | 1000 | 600 | 500 | 300 | 600 | 600 | 3600 |
| 3749 | | 1500 | 1100 | 1000 | 600 | 1000 | 1000 | 6200 |
| 4117 | | | | | | | 200 | 200 |
| 4119 | | 500 | 500 | 300 | | 300 | 200 | 1800 |
| 4120 | | | | | | 300 | 200 | 500 |
| 4122 | | 500 | 300 | | | 200 | 150 | 1150 |
| 4123 | | 500 | 300 | 200 | | 200 | 150 | 1350 |
| 4126 | 600 | 500 | 400 | 200 | | | 150 | 1850 |
| 4127 | 600 | 500 | 300 | 400 | | | 150 | 1950 |
| 4128 | | | | | | | 150 | 150 |
| 4129 | | | | | | 150 | 200 | 350 |
| 4133 | 600 | 500 | | | | | | 1100 |
| 4134 | | 500 | | | | 150 | 350 | 1000 |
| 4135 | | 500 | | | | | | 500 |
| 4136 | | 500 | | | | 500 | 300 | 1300 |
| 4315 | 1000 | | | | | 1000 | 2500 | 4500 |
| 4321 | 1000 | 500 | | 600 | 500 | 350 | 1010 | 3960 |
| 6124 | | 200 | 56 | | | | 250 | 506 |
| 6127 | | 100 | 100 | | | | | 200 |
| 6131 | | 300 | 60 | | | | | 360 |
| 6132 | | 300 | 84 | | 500 | 800 | 800 | 2484 |
| 6133 | 1000 | 4500 | 2000 | | | | | 7500 |
| 6135 | | 200 | 200 | | | | | 400 |
| 6136 | | | | | | 600 | 800 | 1400 |
| 6136 | | 200 | 20 | | | | | 220 |
| 6138 | | 200 | 200 | | | | | 400 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6143 | 2300 | 920 | 565 | 600 | | 600 | | 4985 |
| 6144 | 1183 | 341 | | | | 300 | 1200 | 3024 |
| 6145 | 6718 | 3214 | 280 | 450 | | 500 | 2000 | 13162 |
| 6154 | 3289 | 666 | 148 | | | | | 4103 |
| 6156 | 100 | 100 | 600 | | 525 | | | 1325 |
| 6157 | 2400 | 271 | 750 | | | 300 | 600 | 4321 |
| 6160 | | 300 | 300 | | | | | 600 |
| 6161 | | 200 | 200 | | | | | 400 |
| 6162 | 1810 | 1810 | 592 | | | | 600 | 4812 |
| 6169 | 1000 | 3000 | 1500 | 500 | | | 1500 | 7500 |
| 6170 | 1000 | 3000 | 1500 | 2500 | | | 500 | 8500 |
| 6171 | 800 | 1000 | | | | 1000 | 1500 | 4300 |
| 6175 | 1389 | 590 | 984 | | | 150 | | 3113 |
| 6178 | | | | | | 300 | | 300 |
| 6186 | 270 | 170 | | | 160 | | | 600 |
| 6194 | | 5000 | 229 | | 5500 | | | 10729 |
| 6198 | 1200 | 942 | 652 | | | | | 2794 |
| 6201 | | 2000 | 2000 | | | | | 4000 |
| 6203 | 5254 | 5507 | 2383 | 600 | | | 900 | 14644 |
| 6204 | | 300 | 80 | | | 250 | 400 | 1030 |
| 6211 | | 300 | 300 | | | | | 600 |
| 6212 | | | 1000 | | 1800 | 3000 | 2500 | 8300 |
| 6215 | 2883 | 2586 | 359 | | | | 300 | 6128 |
| 6216 | | 300 | | | | | | 300 |
| 6225 | | 2000 | 500 | 500 | | | | 3000 |
| 6227 | | | 122 | 1800 | | 3000 | 1500 | 6422 |
| 6228 | 775 | | 2000 | | | | | 2775 |
| 6229 | 959 | | | | | 1200 | 1200 | 3359 |
| 6235 | 359 | | 680 | | | | | 1039 |
| 6236 | | | | 600 | | 600 | | 1200 |
| 6237 | 100 | | 380 | 600 | | 900 | | 1980 |
| 6240 | | | | | | 500 | | 500 |
| 6268 | 518 | 270 | | | | | | 788 |
| 6269 | 176 | 176 | 123 | | 270 | | 370 | 1115 |
| 6278 | 500 | 500 | 500 | | 100 | | | 1600 |
| 6282 | 2400 | 3600 | 1198 | 600 | | 600 | | 8398 |
| 6288 | | | | | | | 3800 | 3800 |
| 6289 | | | | | | | 2200 | 2200 |
| Totals | 83223 | 95414 | 59067 | 47850 | 39755 | 68560 | 83960 | 477829 |

**Annexure-VIII : Model Wise Monthly Data List.**

| Model No. | Jun'11 | Jul'11 | Aug'11 | Sep'11 | Oct'11 | Nov'11 | Dec'11 | Total |
|---|---|---|---|---|---|---|---|---|
| 3101 | 500 | 1200 | 1200 | | | 700 | 1000 | 4600 |
| 3102 | | | | | 500 | 1200 | 1500 | 3200 |
| 3103 | 500 | 800 | 1000 | 800 | 300 | | 300 | 3700 |
| 3107 | | 500 | 500 | | | | | 1000 |
| 3128 | 1000 | | | 500 | 1300 | 1500 | 1500 | 5800 |
| 3129 | | | | | 300 | 600 | 550 | 1450 |
| 3176 | | | | | | 300 | 300 | 600 |
| 3208 | 500 | 500 | 300 | | | | | 1300 |
| 3220 | | 300 | | | | 2500 | 2500 | 5300 |
| 3221 | 500 | 500 | 500 | 500 | 1000 | 1350 | 400 | 4750 |
| 3224 | 300 | | | | | | | 300 |
| 3226 | 400 | | | | | | | 400 |
| 3227 | | 500 | 400 | | 500 | 600 | 700 | 2700 |
| 3228 | | | | 500 | 500 | 300 | 350 | 1650 |
| 3229 | 300 | | | | | | | 300 |
| 3232 | 1000 | 300 | 1800 | 2500 | 1200 | 750 | 1400 | 8950 |
| 3234 | 2000 | 500 | | 1500 | 1200 | 2000 | 2000 | 9200 |
| 3240 | 5000 | 7000 | 5000 | 3000 | 4800 | 2000 | | 26800 |
| 3241 | | | | | | 1000 | 1500 | 2500 |
| 3244 | | 300 | | | | 700 | 750 | 1750 |
| 3245 | | 3200 | 1500 | 1500 | 2000 | 2500 | 4000 | 14700 |
| 3246 | 500 | 1200 | 356 | | 300 | | | 2356 |
| 3247 | | | | | 300 | 550 | 550 | 1400 |
| 3251 | | | | | | 500 | | 500 |
| 3252 | | 700 | 200 | | | 300 | 200 | 1400 |
| 3260 | | 500 | 700 | 500 | 250 | 200 | 400 | 2550 |
| 3262 | 1000 | 1000 | 1000 | | 600 | | | 3600 |
| 3263 | 400 | | | | | | | 400 |
| 3267 | | 500 | 300 | | 300 | 350 | 500 | 1950 |
| 3280 | 5000 | 7500 | 6500 | 6500 | 8100 | 1500 | 1500 | 36600 |
| 3289 | 6200 | 5500 | 7500 | 500 | 2000 | 600 | 300 | 22600 |
| 3316 | 1000 | | | 500 | 700 | 900 | 800 | 3900 |
| 3317 | 600 | | | | | | | 600 |
| 3329 | 400 | 500 | 200 | 200 | | 400 | 300 | 2000 |
| 3337 | 400 | 500 | 700 | 500 | 500 | | 100 | 2700 |
| 3343 | 1500 | | | | | | 700 | 2200 |
| 3344 | 800 | 1200 | 1200 | 1000 | 750 | 1200 | 1000 | 7150 |
| 3345 | 800 | | | 500 | 1000 | 1200 | 800 | 4300 |
| 3350 | 24000 | 22000 | 20000 | 20000 | 19500 | 15350 | 17000 | 137850 |
| 3351 | 22000 | 22000 | 20000 | 20000 | 13500 | 13000 | 14000 | 124500 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3354 | 800 | | | | | | | 800 |
| 3357 | 400 | 500 | 600 | 500 | 500 | 500 | 250 | 3250 |
| 3358 | 800 | 500 | 400 | 800 | 800 | 400 | 400 | 4100 |
| 3364 | | | | | 400 | 400 | 200 | 1000 |
| 3365 | | | | | 400 | 400 | 200 | 1000 |
| 3366 | 800 | 1500 | 1000 | 1000 | 600 | 600 | 800 | 6300 |
| 3367 | 800 | 1500 | 1000 | 1000 | 600 | 600 | 800 | 6300 |
| 3371 | 2000 | 4000 | 5000 | 2500 | 1000 | 800 | 850 | 16150 |
| 3379 | 500 | 600 | 800 | 500 | 750 | 200 | 330 | 3680 |
| 3380 | 800 | 700 | 1500 | 1500 | 800 | 400 | 380 | 6080 |
| 3382 | | | 750 | | | | | 750 |
| 3383 | 1000 | 571 | 537 | | | | | 2108 |
| 3407 | 400 | 1000 | 1000 | 500 | | 450 | 400 | 3750 |
| 3416 | 400 | | | | | | | 400 |
| 3417 | 10 | | 700 | | | | | 710 |
| 3418 | 500 | | 500 | | | | | 1000 |
| 3419 | 500 | | 300 | | | | | 800 |
| 3423 | 1000 | 1000 | 200 | | 500 | 600 | 600 | 3900 |
| 3424 | 600 | 500 | | | | | 250 | 1350 |
| 3427 | | | | | | 200 | | 200 |
| 3435 | 600 | 1000 | 1200 | 1500 | 1000 | 300 | 250 | 5850 |
| 3438 | | | | | | | 150 | 150 |
| 3453 | | 400 | 400 | 400 | | 400 | 400 | 2000 |
| 3455 | | 400 | 400 | 400 | | 400 | 400 | 2000 |
| 3457 | | 400 | 400 | 400 | | 400 | 400 | 2000 |
| 3472 | | 400 | 400 | 400 | | 400 | 400 | 2000 |
| 3473 | | 400 | 400 | 400 | | 400 | 400 | 2000 |
| 3475 | 600 | 500 | | | | | | 1100 |
| 3476 | 800 | | | | | | 250 | 1050 |
| 3484 | | | | | | 100 | | 100 |
| 3504 | 6200 | 7500 | 8000 | 6000 | 3850 | 4000 | 6100 | 41650 |
| 3510 | 500 | 2000 | 2200 | 1500 | 2050 | 1500 | 2100 | 11850 |
| 3511 | 4700 | 5500 | 5000 | 1000 | 3500 | 3000 | 4600 | 27300 |
| 3512 | 500 | 1000 | | | | 1740 | 2000 | 5240 |
| 3513 | 1000 | 1000 | | | | 1740 | 2000 | 5740 |
| 3519 | 500 | 300 | | 2400 | 2600 | | | 5800 |
| 3520 | | | | 2000 | | | | 2000 |
| 3526 | 1500 | 1500 | 429 | | | | | 3429 |
| 3527 | 1050 | 1050 | 787 | | | | | 2887 |
| 3528 | 1650 | 1650 | 683 | | | | | 3983 |
| 3536 | | | | | | 2000 | | 2000 |
| 3542 | 4300 | 4000 | 4700 | 3500 | 2100 | 1150 | 2660 | 22410 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3543 | 4300 | 5000 | 4000 | 3000 | 1900 | 1500 | 2600 | 22300 |
| 3549 | 4300 | 4500 | 6000 | 5000 | 3000 | 2500 | 3000 | 28300 |
| 3558 | 4300 | 5000 | 6000 | 5000 | 3000 | 2600 | 3100 | 29000 |
| 3562 | 200 | 1000 | 800 | | 600 | | 600 | 3200 |
| 3569 | 800 | | | 500 | 300 | 250 | 270 | 2120 |
| 3570 | 400 | 500 | | 500 | 200 | 100 | 300 | 2000 |
| 3598 | 500 | 500 | 500 | 500 | 400 | 500 | 300 | 3200 |
| 3599 | 500 | 500 | 500 | 500 | 400 | 500 | 300 | 3200 |
| 3601 | | | | 6000 | | 4000 | 6000 | 16000 |
| 3700 | | | | | 500 | | | 500 |
| 3711 | 6000 | 7500 | 10000 | 9000 | 10000 | 3000 | 5000 | 50500 |
| 3712 | 12000 | 15500 | 17500 | 18000 | 20000 | 6250 | 10000 | 99250 |
| 3713 | | | | | | 3000 | 2500 | 5500 |
| 3714 | | | | | | 500 | 2000 | 2500 |
| 3715 | 1250 | 500 | 500 | 500 | 1100 | 1850 | 1350 | 7050 |
| 3720 | 3500 | 6600 | 6020 | 5700 | 4200 | 4650 | 5400 | 36070 |
| 3721 | 1000 | 800 | 800 | 700 | 800 | 1000 | 1050 | 6150 |
| 3725 | 600 | | | | | | | 600 |
| 3726 | 700 | 1200 | 900 | 500 | 500 | 600 | 600 | 5000 |
| 3727 | 6500 | 6000 | 5000 | 4000 | 5800 | 4800 | 7000 | 39100 |
| 3728 | 10000 | 12000 | 10000 | 8000 | 10000 | 6450 | 10600 | 67050 |
| 3729 | | | | | | 600 | 600 | 1200 |
| 3730 | | | | | | 300 | 300 | 600 |
| 3732 | 400 | 500 | 200 | | 100 | | 100 | 1300 |
| 3733 | 140 | 140 | 140 | | | 140 | | 560 |
| 3735 | 140 | 140 | 140 | | | 140 | | 560 |
| 3736 | | | | | 100 | | | 100 |
| 3737 | 2000 | 2000 | | | | | | 4000 |
| 3748 | | 1000 | 600 | 500 | 300 | 600 | 600 | 3600 |
| 3749 | | 1500 | 1100 | 1000 | 600 | 1000 | 1000 | 6200 |
| 3751 | 750 | 17500 | 850 | 600 | 600 | 1000 | 1000 | 22300 |
| 3900 | 5000 | 5500 | 6400 | 5000 | 3500 | 3300 | 5400 | 34100 |
| 4117 | | | | | | | 200 | 200 |
| 4119 | | 500 | 500 | 300 | | 300 | 200 | 1800 |
| 4120 | | | | | | 300 | 200 | 500 |
| 4122 | | 500 | 300 | | | 200 | 150 | 1150 |
| 4123 | | 500 | 300 | 200 | | 200 | 150 | 1350 |
| 4126 | 600 | 500 | 400 | 200 | | | 150 | 1850 |
| 4127 | 600 | 500 | 300 | 400 | | | 150 | 1950 |
| 4128 | | | | | | | 150 | 150 |
| 4129 | | | | | | 150 | 200 | 350 |
| 4133 | 600 | 500 | | | | | | 1100 |
| 4134 | | 500 | | | | 150 | 350 | 1000 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4135 | | 500 | | | | | | 500 |
| 4136 | | 500 | | | | 500 | 300 | 1300 |
| 4314 | 2000 | 500 | | 3600 | 3000 | 3000 | 3500 | 15600 |
| 4315 | 1000 | | | | | 1000 | 2500 | 4500 |
| 4321 | 1000 | 500 | | 600 | 500 | 350 | 1010 | 3960 |
| 6124 | | 200 | 56 | | | | 250 | 506 |
| 6127 | | 100 | 100 | | | | | 200 |
| 6131 | | 300 | 60 | | | | | 360 |
| 6132 | | 300 | 84 | | 500 | 800 | 800 | 2484 |
| 6133 | 1000 | 4500 | 2000 | | | | | 7500 |
| 6135 | | 200 | 200 | | | | | 400 |
| 6136 | | | | | | 600 | 800 | 1400 |
| 6136 | | 200 | 20 | | | | | 220 |
| 6138 | | 200 | 200 | | | | | 400 |
| 6143 | 2300 | 920 | 565 | 600 | | 600 | | 4985 |
| 6144 | 1183 | 341 | | | | 300 | 1200 | 3024 |
| 6145 | 6718 | 3214 | 280 | 450 | | 500 | 2000 | 13162 |
| 6151 | 6816 | 5586 | 2039 | 500 | | | 3000 | 17941 |
| 6154 | 3289 | 666 | 148 | | | | | 4103 |
| 6156 | 100 | 100 | 600 | | 525 | | | 1325 |
| 6157 | 2400 | 271 | 750 | | | 300 | 600 | 4321 |
| 6160 | | 300 | 300 | | | | | 600 |
| 6161 | | 200 | 200 | | | | | 400 |
| 6162 | 1810 | 1810 | 592 | | | | 600 | 4812 |
| 6169 | 1000 | 3000 | 1500 | 500 | | | 1500 | 7500 |
| 6170 | 1000 | 3000 | 1500 | 2500 | | | 500 | 8500 |
| 6171 | 800 | 1000 | | | | 1000 | 1500 | 4300 |
| 6175 | 1389 | 590 | 984 | | | 150 | | 3113 |
| 6178 | | | | | | 300 | | 300 |
| 6186 | 270 | 170 | | | 160 | | | 600 |
| 6194 | | 5000 | 229 | | 5500 | | | 10729 |
| 6198 | 1200 | 942 | 652 | | | | | 2794 |
| 6201 | | 2000 | 2000 | | | | | 4000 |
| 6202 | 5774 | 6044 | 2426 | 900 | | | 900 | 16044 |
| 6203 | 5254 | 5507 | 2383 | 600 | | | 900 | 14644 |
| 6204 | | 300 | 80 | | | 250 | 400 | 1030 |
| 6211 | | 300 | 300 | | | | | 600 |
| 6212 | | | 1000 | | 1800 | 3000 | 2500 | 8300 |
| 6213 | | | | 12300 | | 7200 | 12000 | 31500 |
| 6215 | 2883 | 2586 | 359 | | | | 300 | 6128 |
| 6216 | | 300 | | | | | | 300 |
| 6222 | 2500 | 4800 | 4074 | 3000 | 2100 | 1000 | 1500 | 18974 |
| 6225 | | 2000 | 500 | 500 | | | | 3000 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6226 | | | 11114 | 25200 | | 2200 | 12000 | 50514 |
| 6227 | | | 122 | 1800 | | 3000 | 1500 | 6422 |
| 6228 | 775 | | 2000 | | | | | 2775 |
| 6229 | 959 | | | | | 1200 | 1200 | 3359 |
| 6235 | 359 | | 680 | | | | | 1039 |
| 6236 | | | | 600 | | 600 | | 1200 |
| 6237 | 100 | | 380 | 600 | | 900 | | 1980 |
| 6240 | | | | | | 500 | | 500 |
| 6241 | 4000 | 8000 | 7250 | 5000 | 5500 | 4100 | 5100 | 38950 |
| 6268 | 518 | 270 | | | | | | 788 |
| 6269 | 176 | 176 | 123 | | 270 | | 370 | 1115 |
| 6278 | 500 | 500 | 500 | | 100 | | | 1600 |
| 6282 | 2400 | 3600 | 1198 | 600 | | 600 | | 8398 |
| 6283 | 7000 | 10000 | 3650 | 4000 | 4000 | | | 28650 |
| 6284 | 5000 | 4000 | 1600 | 2000 | 2400 | | | 15000 |
| 6288 | | | | | | | 3800 | 3800 |
| 6289 | | | | | | | 2200 | 2200 |
| Totals | 252363 | 304444 | 244690 | 230650 | 177105 | 163510 | 222070 | 1594832 |

## V. CONCLUSION

The segregation of product with less number of varieties will certainly help in controlling waste and production shall be customer oriented. This shall help in creating Pull System according to the customer demand. This pull system shall help to control the production and raw material delivery using Kanban system, where-so-ever possible the process need to be linked within a single cell to assure continuous production between them.

In this study the stress is on waste, reduction under crucial circumstances, of very high variety and the variable quantities. Therefore, the study was conducted to categorize models in three categories that is Vital, Essential and Desirable. The 17 types of models which that fall under vital category (As per Annexure-III and IV) need to be closely monitored on daily basis. The 11 types of models fall under essential category (As per Annexure-V and VI) also need control and may be monitored on bi-weekly basis. The balance 157 items falling under desirable category (As per Annexure-VII) may be controlled on bi-monthly basis.

The implementation of this Inventory management programme shall help in effective cost control, better utilization of resources, and on-time service to the customer. This will further enhanced the profitability of organization which shall result in motivated work-force.

The items falling under vital category need to be monitored at G.M. level. The items which are essential to be controlled through D.G.M. and items at desirable level may be controlled through Senior Manager/Manager.

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