Multi products storage using randomness

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ABSTRACT: *The following Project shows the benefits of a research established into a multi-products warehouse belongs to an automotive industry supplier. The main goal was applied a tool recognizing the rules for distribution and material storage. Once the research was completed, the benefits were, the idle times reduction per hours/week by the two initial processes. The politics for storage assignment and location, propose a system to improve the space into this areain order to avoid material management and flow issues. It is important to mention, the system proposed could be applied into warehouses with storage size and space restricted by sorting area, also different material types, production settings and physical specifications for which set warehouses with traditional management of distribution without slack, involves lack of materials, pieces without records, incorrect location assigned, stock error.*

KEYWORDS: *Multi-products, Random, Storage, Location Warehouse*

I.   INTRODUCTION

The products are sorted according to sales volume, in order to get different service level to apply in a stock system by probabilistic demand, that increases the value got from the sales forecast into a many standard deviations as corresponding to probability issued with the service level quoted per each class, that could be interpreted as "Purchasing and inventory management trough Holt-Winters forecasting and variance on service level by ABC sorting. (Marin, Garcia, & Gomez, 2013) Noted the randomness does not figure into of this kind of rules, due to the difficult to handle uncertainty by operational process, because these ones issue human error or incorrect decisions. In order to get positively results with this information management implies evidence the randomness to establish decisions standards to solve any scenario. In spite of the last comments, any system with randomness should use lean software and active the human sense to detect issue in area, create solutions for different problems y get a standard to making decisions.

This causes that more complex to understand and solve the issue. This scenario exposes a control path and randomized management, focus on establish bounds per each scenario, namely, the operator from this area get knowledge and standardized activities, also review friendly information, which help to design the storage process and supply material, improving space optimization and pick-up timing.

Automated Identification Systems: The Automated Identification Systems (AIS), almost always the bar code format allows the quick and accurate identification of material. Once the automated identification systems work together with effective systems to manage information, the operation managers know the quantity and location per each unit. The information is used with human operators or storage systems and automated recovery in order topick-up material anywhere in the warehouse, randomized way.

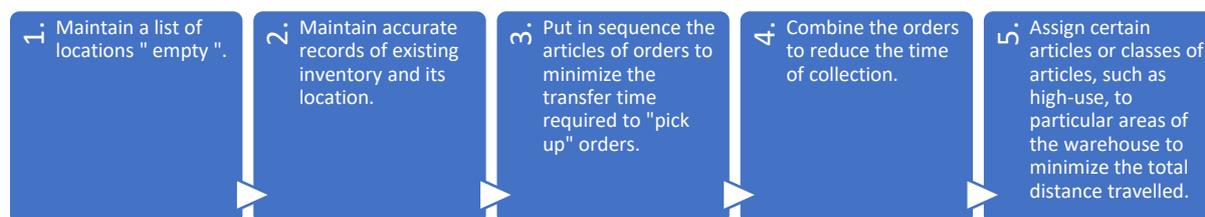Shows the activities of computerized system of randomized storage

Figure 1. Activities of computerized storage system

The randomized storage systems are allowed to increase the facility usage and decrease the labor cost, but accurate records are mandatory.(Render Barry, 2014) The multi-products warehouses are handled by automotive industry, due the multiple automobile designs and different assembly plant settings, also chemical and structural composition, shape, and extra component, etc., which becomes into a huge list with different requirement per Tier 1 (Direct supplier of OEM (Original Equipment Manufacturer)) once this list is received by Tier 1, another huge list is expedited to next steps into the Supply Chain, the Tier 2, Tier 3, and raw material suppliers with details of the requirements.

The randomized doesn't work against to the traditional system, but the traditional ABC systems use a no-bound process because the random is no allowed to make decisions, once the ABC system is being applied into a multi-products warehouse the following list of issue can be appearing, some of them listed below.
● Empty locations, waiting assigned matetial.
● Lost Material
● Longer timing to response demand variance
● Incorrect material handling
● 60% location usage, material without record, no empty racks assigned to that material.

The most common root cause of those issues due to sort the warehouse according to product settings and demand volume belonging to different products, that becomes to a hard-work, due to the details in the location assignment analysis per each one.

II.   STUDY CASE
The high performance requested by automotive industry is being based on five pivot or goals.
1. Quality Assurance System
2. System Capability.
3. Continuous Performance.
4. Customer Satisfaction.
5. Continuous Improvement.

The goals toward to reduce waste and process costs into the supply chain per each member due to the assembly requirements on the Tier´s performance should be considered as the main profit to gain.

The internal warehouses are common by Tier 1, Tier 2, Tier 3(Tier 1 is a direct supplier of OEM (Original Equipment Manufacturer), the supplier or provider of Tier 1 becomes to the Tier 2 and then the Tier 3 is the supplier of Tier 2), due to they keep sub-assembly products before the next processes, the management doesn't review this type of area as an essential part into the material flow, but this a terrible mistake because the internal warehouse controls the takt time quoted by customer, therefore, the materials outputs/inputs should be considered as vital importance to meet with the five pivots mentioned previously in order to get the minimal setting established by International Automotive Task Force (IATF) to gain the recognition as Automotive Supplier.

As mentioned, the goal was getting an optimal operation and reduce costs regarding to establish a traditional management into an internal multi-productswarehouse with not enough space capacity to stock the entire requirements from customer. Based on before information, Randomized Warehouse will be used as main tool to manage the warehouse toward 100% usage capacity goal.

III.   DEVELOPING AND IMPLEMENTING OPTIMAL MODEL
The internal warehouse is located by two areas, those area are the beginning of the manufacturing process. The first area transforms the raw material. The second area add the principal chemical setting to the products, both processes are the most critical and important activities into the factory, they have the takt time control and the output of finished goods to be used by customer. The first area (extrude) produces around of 250 product groups, each one with different settings, the product portfolio managers around 800-900 products to be manufactured by next area, each one belongs to different families according to the weekly order volume, High Runner 50%, Medium Runner 30% and Low Runner 20%, also the fluctuation by customer orders should be added. That means implement traditional A, B, C management is almost impossible.

Due to the analysis on both areas, the second area keeps an idle time of 8K-9K hours/week, the root cause of this idle is the "No material available" by 86%, the warehouse doesn't supply material. The research is based on genchigenbutsu, Value Stream Mapping and Ishikawa analysis, it shows storage occupation around 50%-60% during the week. Adding to this analysis, material without records waiting to be located into the warehouse. The top management claims the storage usage due to the material without record located out of the warehouse but 60% usage capacity, not at full. Both scenarios are contradicted due to a available empty racks into warehouse both not usable because they were assigned to another material.

Top management forces to warehouse supervisor to storage all the material even though the product has been not assigned to that available empty location and ignore the A, B, C rules established before. Randomized Storage tool is implemented in order to get accurate location records of both classes, full and empty locations, also clearly visual identification areas, FIFO rule and storage material to the first empty location available, bar code identification or scanners usage, new lean and friendly software to manage warehouse.

Steps to get Randomized Warehouse listed below.
● A, B, C and Pareto tool, toward to identify high and low inventory rotation per product.
● Identify product groups or families with similar production settings and destination.
● Max/Min per family according to weekly demand average,
● Establish records for safety stock and supply point per product.
● Locate and categorize rack per each family sorting them from Largest to Smallest.
● Develop and use software to bar codes.
● Develop input/output control tool, FIFO mandatory.
● Randomized Storage rules are mandatory.

The following figure 2 shows the differences by ABC warehouse vs Randomized Storage. The first one uses detail on locate product per rack, no slack to store material, each product should be placed into a specific space or rack, the second one storage similar setting products, same destinations, with slack to locate the material into a specific zone or area, without string attached to specific rack or space like the first one, while the space is empty and belongs to the zone assigned to material, the rack could be used. The figure 2 shows, example A1, A2, … A12 located into and specific location or rack, ABC warehouse instead of the Randomized Warehouse which assigns all the product A into a zone, products A could be use rack A, while both belong to A group.
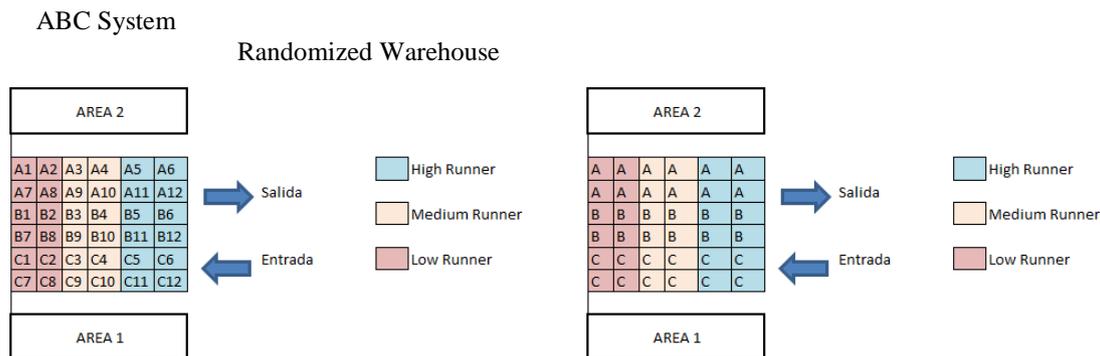

Figure 2. ABC System vs Randomized Warehouse

In order to get a randomized control, it was defined a standard layout to show the specific location per each product according to the ABC analysis, in order to storage the material out of place according to layout once the production line has been finished the process.

IV. CONCLUSION

Both systems ABC and randomized tool can be used simultaneously getting the better results from each other and reducing weakness, improving the management; example, randomized excessively usage will cause no-control through the entire system, besides, control at full will generate limits and no-slack to handle demand fluctuation also it will create blindness through the process. It is mandatory for any storage system implement software to release the outputs and inputs record as equal to define the specific areas and zones per each product or family/group. Signpost and visual aids are friendly tool to understand the process by the operator. Besides, layout is the most important visual tool to resume the process, the activities, instructions and established rules.

Randomized warehouse or Randomized Storage tool implementing is a complex process if the warehouse activities don't stop, because the storage area works according to takt time and reducing idle time is critical for this area. This is a powerful tool but the main resource to manage the activities directly is the operator, all the functions are controlled and reviewed by the operator, whereby necessary define and lead the operators about the importance and knowledge on this tool. The training is very important during this step, also create and usefull manual along with visual aids in order to reduce complexness. Set of mind to implement this tool will turned on a chaotic process, due to the taboo, radical changes and the uncertain to establish y hold the top result for this new way to work. The training and continuous improvement begins from the operator through the supervisors and managers, in order to get visual and friendly help. AMEF and 8D´s are used to get a standard process, also reduce the failures. The idle time was reduced from 9K to 1K hours/week, becoming productivity increases once the idle time was reduced by "Material no available", also the activities were reduced, besides the searching time into the warehouse was improved and the warehouse usage get increased from 60% to 80-90%, accurate material records, output/input process time reduced

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