

# Multi-Level Stock Management System

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## ABSTRACT

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In the petrochemical, chemical and pharmaceutical industries, supply chains generally consist of multiple phases of production facilities, inventory/distribution centers and customers. Supply chain staging in the face of various market and technical uncertainties is usually measured by service level, i.e., the expected fraction of demand that the supply chain can satisfy within a predefined allowable delivery time window. Safety stock is introduced into supply chains against uncertainty to provide customers with an assured service level. Although a higher safety stock level guarantees a better service level, it does increase the supply chain operating cost and thus these levels must be suitably optimized.

**Keywords:** Stock Management Application, Inventory Management, Supply-Chain, Network Marketing, Rewards, Multi-Level Inventory Control, Bonus Points.

## I. INTRODUCTION

Inventory is a key asset that represents hog-tie capital; managing stock effectively enables a business development to free up capital. Efficient stock management requires a better understanding of the mix of different kinds of stock and conceding the demands on that stock. This helps to keep stock at a reasonable level, balancing the need for additional supplies with the need to reduce hog-tie capital.

In reality, how well a business manages its inventory can have a crucial impact on its overall success. The highly optimized and efficient inventory management system provides massive benefits. Similarly, the opposite is also true – many businesses have failed

largely due to the continuing maladministration of their inventory.

Since stock costs constitute a notable portion of the costs a firm faces, the objective of stock management has been ensuring a high level of customer service by holding the minimal possible amount of inventory. Although the main focus of stock management ranges from single locations to multiple locations and from a single product to customized products (product differentiation), in most cases the demand from multiple sources is handled uniformly. However, just as different customers may require different product specifications, they may also require different service levels as well. Particularly, for a single product, different customers may have different stockout costs

and/or different minimum service level requirements or different customers may simply be of different importance to the supplier by similar measures.

The computer is used to calculate, share and provide this information. This method of inventory management is called Material Requirement Planning (MRP). The MRP system is a practical inventory control method developed around 1960 to handle large amounts of record-keeping, material requirement data, inventory status of material and their cost, interlinking the production with procurement of materials, controlling the stock and deliveries. It controls the manufacturing resources and flow of material much more efficiently and accurately. In the Material Requirement Planning system lot of sizing is required for fulfilling end product demands which are unconventional.

The demand for sub-assemblies, parts, and raw material stock is derived from the pre-planned production level of end products and is strictly dependent on end-product demand. Such multi-level stock management involves planning and production based on the cost of final products and the time spend in the master schedule. The level 0 represents the end product and its demand is fixed by customer order and forecasted as per market needs. The single-level portion technique would be applied to the first level. Level 0 is fixed and level-1 is controlled by some portion rule. The multilevel portion problem is to determine the production of bottom levels in the hierarchy.

Stock control means, making the desired items of required quality and quantity, available to various departments when needed. But it requires further optimization of inventory. The massive amount of inventories creates a problem of their storage, huge investment and the maintenance of stored items. But low inventory leads to chances of termination of production, increases the overheads and disturb the entire production process. So, inventory must be properly handled so that only right item is available

in right quantity, of right quality and that too with better economy.

Rapid change in industrialization causes a number of management problems, specifically cost reduction and cost control. Since the cost of material accounts for nearly more than 50% of the total cost in production and construction industries, materials are produced and stocked in the shape of inventories. It is necessary to hold inventories such as a raw material, work-in-progress, spares and equipment, finished goods to act as a shield between supply and demand, both of which will normally vary to facilitate steady and efficient plant operation and enable the firms to keep their production cycle running smoothly.

## II. RELATED WORK

When finding your inventory becomes difficult, you have several inventory look-up problems. Lack of visibility is one of the most common inventory management problems. Identifying the correct item in the right place as quickly as possible is essential to inventory. If optimal stock management is a part of the supply chain for manufacturing, it can impact the operations of the entire manufacturing process. If the inventory stock is being accessed for shipping and cannot be located, it leads to incomplete or wrong shipments and severely impacts customer satisfaction. Either way, inventory show-off problems have a severe impact on the performance of the business and are one of the symptoms of poor inventory management.

Implementing a stock management solution such as “Multi-Level Stock Management” helps you easily locate any item that is required. It also gives you complete data about the required item and its availability. Being able to locate stock items improves the efficiency of the company or organization and at the same time helps in rapid business development. At the management level, the ability to visualize stocks helps in better decision-making and

prioritizing to streamline the process. Managers can easily visualize previous trends and base their forecasts and planning on actual figures.

Management of stock through inventory management software reduces human error and provides accurate and up-to-date data. A computerized inventory management system such as Tally lets you know exactly where your inventory items are. Inventory data is updated and accurate in real-time.

### III. PROPOSED SYSTEM

When you use an inventory management system such as Stock Management, you have a better handle and control over the stock levels. You can easily track items that are being unnecessarily stored-up. Even if you have outdated inventory, it is tracked by the system to avoid buying more of what you already have. Inventory management through software such as Stock Management is also a good cost control measure. Efficient inventory management prevents issues such as over-stocking that locks up significant capital.

#### A. Architecture

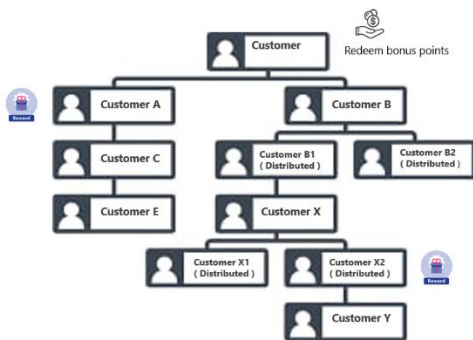


Fig. 1 Architecture of Mutli-Level Stock Management System

The software enhances the productivity of inventory management and warehouse personnel. The software also lets you use your warehousing space optimally. Empty and unused warehouse

storage is a waste of money that can be prevented by properly visualizing and locating stocks.

#### B. Demands

In the system we consider, the customers with positive demand lead times constitute the non-critical demand class, while the customers with zero demand lead times constitute the critical demand class. Therefore, we must use a policy that could provide a higher service level to the demand class with negligible demand lead times. Rationing is such a policy. In the standard policy, whenever on-hand inventories drop below a certain level - usually called critical level, rationing level, or threshold level of the associated customer class- the demands of the lower class are not prioritized in accordance with high priority class customer demands.

#### C. Literature

The literature about rationing begins with Veinott' who was the first to consider the problem of several demand classes in inventory systems. He analyzed a periodic review inventory model with n demand classes and zero lead-time with limited ordering and introduced the notion of a critical level policy.

Hariharan et al, (1995) then coined the name demand lead-time to describe inventory distribution systems where customers do not require immediate delivery of orders and allow for a fixed delay[3]. The key observation of both papers is that a demand lead-time works just as the opposite of supply lead-time reducing the inventory required for achieving a required service level.

Frank et.al, 2005 considered a periodic review inventory system with two priority demand classes, one deterministic and the other stochastic[8]. He suggested that the inevitable demand must be supplied immediately while probabilistic demand is not satisfied and lost in transit. Thus at each decision stage, one has to decide how much demand to fill

from the stochastic source along with the usual replenishment decisions. They first prioritize the optimal policy and then depicts that it has a complex state dependency. Therefore, they proposed a simpler policy, called  $(s; k; S)$  policy,  $k$  being the static critical level determining how much stochastic demand to satisfy, and provided a numerical study which shows that this simpler policy works very well[8]. In order to establish these manufacturing inventories providing accurate information about the requirement of material, time at which it is required, quantity of material on hand i.e. inventory and work in process and quantity of stocks requirement to be ordered for manufacturing were taken care of.

#### D. Conducting the review.

##### 1) Simplified Stock Management

The biggest benefit of using Stock Management System is that it makes the process of managing your stock a whole lot easier, saving you time and money.

##### 2) Reduce Risk of Overselling

Overselling is a major challenge for online sellers, often resulting in loss of control, so it will take care of that and works perfectly.

##### 3) Multiple Price groups

Price groups can be customized for the same product that is sold in different quantities.

##### 4) Quality assessment

Quality checks are done on a priority basis to deliver the best and most optimized management system. For this purpose, some analytical tools are built in the system which keeps track of the previously sold item and reward points.

##### 5) Analysis and synthesis

In this section, the final results of the system are depicted by the pie-chart, relating the total cost of carrying and ordering.

The following pie-chart shows the comparison between existing models and our model. The existing models do not provide benefits at each level while our project is multi-level as it offers customers to earn bonus points based on the hierarchy in which it is defined. Every individual will earn bonus points if their descendants purchase or make orders from the store thus making points for the introducer or the parent of that person.

Fig. 2(a) shows the customer who doesn't have any customer introduced by him under his tree, so he is not getting any points, while Fig. 2(b) shows the pictorial representation of the customer who has defined multiple customers under his tree.

Thus, it results in earning Bonus Points even if he's not doing any purchasing but due to his vast network and the orders made by his network makes him more Bonus Points.

##### 6) Algorithm for point calculation

###### a. Theory behind the Bonus Points

The biggest benefit of using Stock Management System is that it helps customer to get heavy discount in the form of Bonus Points which they can use it in further purchasing.

###### b. How to get more Bonus Points

Calculation of Bonus Points is done using the hierarchy in which the customers are being introduced, when the customer makes an order then the customer's ancestors in the hierarchical tree gets Bonus Points. So the key is to introduce more and more customers in own(customer's) tree to earn more Bonus Points.

###### c. Calculating Points of the Customers

Initially, find all the customers that lie under the customer for whom we're going to calculate points. Then, select all the orders under their hierarchy. Along with, getting the orders made by the customer itself, calculate all those points which are associated with different levels recursively. Then, sum up all the points (Customer's own points + Points that get generated if his children in the tree had made any order).

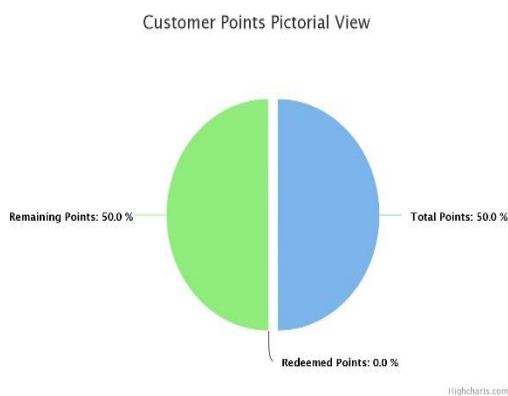
d. How to Maximize Profit

In order to maximize the profit or to get more and more Bonus Points one has to introduce more and more customers under his tree which then if make orders then the person who has introduced them will gain Bonus Points. So the more vast one's tree is the more he will earn.

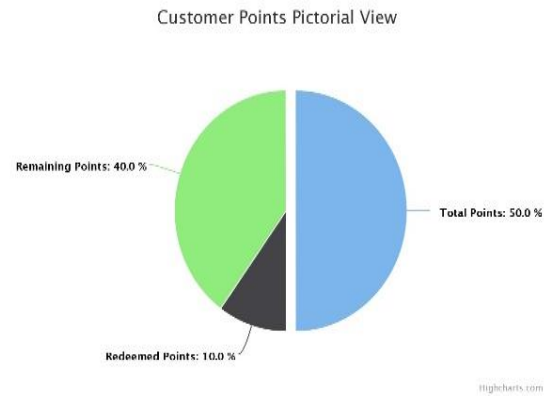
e. Calculations

In this section, the reason for introducing more and more customers under his tree is proved.

**Table 1.** Points history of all the customers.



**Fig. 2(a)** Existing model



**Fig. 2(b)** Our Model

**IV. CONCLUSIONS AND FUTURE WORK**

Multi-level marketing or network marketing businesses continue to remain hugely successful and very popular. Today, they are subjected to far more regulations and scrutiny than they ever were. They are far more legitimate and ethical today. One cannot ignore the success of organizations like Anyway and Mary Kay, given their vast global network with billions of distributors[23]. Like any other business, an MLM business requires relentless hard work and patience. Rewards are sure to follow, if people do not expect success overnight and are willing to commit to the cause.

Customer Name	Total Points	Redeemed Points	Remaining Points	Redeemed Date
Cust1	40	0	40	null
Cust1	40		35	04-03-2022
Cust1	40	3	32	06-03-2022
Cust1	40	2	30	07-30-2022

It also manages its financial sources and data which will make him hassle free while working on different



projects. The system is designed to reduce human labour and efficiently maintaining the stock. It provides flexible and powerful reports regarding items, sales, purchase and ledger.

Shopping today may not always mean going to a store and looking at a vast amount of stock, it can mean trusting an expert to pick out selection of items. In future, it can automate this process easily as it's provides rating to the sellers and one need not to think much about the seller. As consumers increasingly expect better shopping experiences, you don't want to disappoint them with stockouts, which would lead to losing sales, so it will let them to manage their stock beforehand. One can also predict their sales easily by using some analytics tools on previously sold items, which is a tedious task in physical stock management companies.

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