

# RESEARCH ON THE ZERO INVENTORY BASED ON THE JUST-IN-TIME SYSTEM OF SUPPLY-HUB

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**Abstract.** Inventory management is an important part of enterprise operation, and the model of Zero Inventory management can help enterprises reduce production cost and speed up the turnover of funds. With the method of consulting literature materials, this paper discussed the realization way of Zero Inventory. The Supply – hub is an effective operation model to realize Zero Inventory based on the JIT of Supply-hub in the manufacturing enterprises. Firstly, this paper introduced the definition of Zero Inventory and the foundations and conditions of Supply – hub. Secondly, on the basis of the JIT of supply-hub, the paper analyzed the operation mode of Zero Inventory. Finally, the paper pointed out the theoretical and economic significance of Supply-Hub and provided the reference for the Zero Inventory of manufacturing enterprises.

## Introduction

Today with market moving to the openly globalization, it will inevitably bring the change of enterprise management mode, and inventory management is always the important part of enterprise production and operation, not only affecting the management cost, but also restricting the further development of enterprise. For inventory management theory, it developed from the traditional inventory management reserving the raw materials of manufacture to avoid future uncertain demand, to vendor managed inventory (VMI) with the supplier mastering inventory management and control to reduce inventory levels and avoid the "bullwhip effect" in stock information, and then to the joint inventory management that upstream and downstream enterprises share the inventory information and coordinate inventory levels in the supply chain. As the distribution centers of a third party, the Supply - hub inventory management is on the basis of the joint inventory management operation, which attain the aim of zero inventory management and also enrich the theory of zero inventory management approach. by professional warehouse management system and timely supply system.

**The meaning of Zero Inventory.** The "zero" in the zero inventory can be understand from two angles, from the physical level understanding, that's the widespread sense of zero inventory, which is the absolute number of inventory as little as possible and infinite close to zero; from the legal level to understand Zero Inventory, namely the ownership of the inventory does not belong to you, that is, as long as the ownership does not belong to you it also can be called a zero inventory even if stock piled high with inventory. For example, by custody inventory the enterprise is no longer retaining stock if the goods are kept under the custody of specialized companies to which the enterprise pay escrow fee. The meaning of Zero Inventory refers to the flow state, not exists in the form of warehouse storage in the process of purchasing and production, namely there is no production inventory and goods turnover rate is very high. Zero inventory management point to the minimum of doing products, finished goods inventory quantity, to challenge the limit of "zero".

## Infrastructure and conditions

It's the foundation to realize Zero Inventory that manufacturers implement JIT (Just-In -Time) production, which is to seek and to eliminate process of worthless activities and waste by the method and principal of sending the appropriate material to necessary locations in the right way and

perfect quality. If the enterprise production system is in the state of just-in-time and the supplier is based on the timely Supply system based on Supply – Hub, then the inventory of manufacture can be reduced to a minimum. Of course, the use of just-in-time production methods will be constrained by some conditions. For example, the need of a reliable supplier to supply in time and quality, very strong flexibility of manufacturer's production system with ordinary repair and maintenance to prevent equipment failure and a stable market economy environment that can effectively forecast the market demand.

As a new increase node in the supply chain, Supply-Hub on the one hand have the support of advanced information platform, on the other hand should have strong ability of logistics operation. Manufacturers are to meet the following conditions to implement zero inventory management: firstly, manufacturers become the core of enterprise in the Supply chain; secondly, distribution center can significantly reduce the cost of the entire supply chain; finally, from the point of production characteristics, the main processing of manufacturer is the IT industry and car manufacturing. The supply-hub advantage can be showed only when there are more suppliers for manufacturers.

## **Operation mode**

### **(1) Characteristic of Supply-hub system**

The traditional supply system has three shortcoming: firstly, although manufacturers in this supply mode, effectively reduce the inventory of spare parts, which reduces the inventory related costs, the raw materials inventory management of suppliers will increase with manufacturers only transferring inventory to the upstream suppliers, and then the entire supply chain operating costs will raise significantly with multiple vendors repeated construction; secondly, manufacturers need to coordinate with several different suppliers about delivery batch and the problem of distribution of time in order to arrange the just-in-time production when there are more suppliers, but this kind of decentralized communication makes coordination harder, thus affecting the efficiency of the whole supply chain and just-in-time production of manufacturers; finally, under the condition of more than one supplier to distribution for a manufacturer, with the shortage of a raw material the production activities of using the raw materials and other supporting raw materials will not be continue to consume.

The supply – hub (distribution center) managed a third party Logistics Company arises in this situation and has made a more successful application in practice. It locates near by the manufacturer and is used to store all or part of material providing manufacturers with matching parts supply and sent straight location service. Specifically, this paper studies "supplier – Supply-hub - manufacturer" closely coordination of production and distribution problems in order to realize the requirement of just-in-time production and achieve the ultimate goal of zero inventory. Each supplier meets the requirements of the manufacturers by the way of mass production and partial delivery and sends a certain batch of raw materials to Supply – hub at regular intervals, and then the Supply – hub matches all kinds of raw materials straight to the manufacturer. The raw materials inventory cost of distribution centers are usually borne by the supplier, and after raw materials are utilized, the manufacturers pay fees to the supplier. As a node of Supply chain the Supply – hub mainly has two functions, one is set with function, which the Supply – hub purchases raw materials needed to put in storage and centralized distribution center inventory control and warehouse management; the other is coordination function, the Supply – hub implement the whole track and ensure delivery on time in order to reduce the uncertainty of Supply logistics links from the demand of the core manufacturing enterprise information release to the suppliers of components delivery and warehousing, and according to the daily or weekly demand plan of material, manufacturers make the corresponding distribution plan.

### **(2) just-in-time production operation mode**

Just-in-time production is to point that every link of enterprise production system process only when needed, according to the amount required amount needed to produce the products. “Kanban” control system is the important technical means to realize just-in-time production. Under the control

of “kanban”, production system is a pull production system different from traditional push production system, change process between the "deliveries" as the "pickup". The whole production process is the requirements for the traction drive process, implementing on-demand production. Based on “kanban”, just-in-time production operation pattern is shown in figure 1

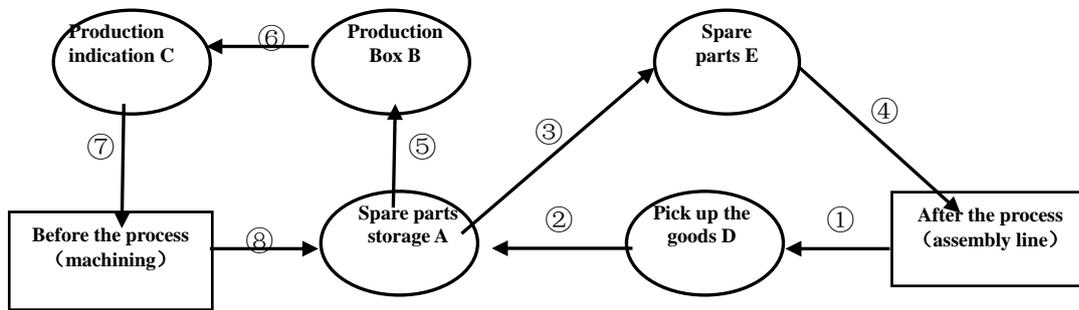


Figure 1 Just-in-time production operation pattern based on “kanban”

(3) The Supply - hub operation mode

The Supply - hub operation mode as shown in figure 2, the model is a many-to-many model, namely multiple suppliers and manufacturers, including solid lines representing the flow of raw materials and dashed line representing the flow of physical demand information. Logistics information platform is a set of warehouse management information system and logistics demand information system for the integration of logistics information. Under the environment of the logistics information platform, the purpose is to create a free flow and sharing information environment in supply chain.

From the view of multiple suppliers corresponding to a single manufacturer, we analysis set distribution center operating mode. Manufacturer transfer the information within the production instruction kanban to the logistics information platform, then the distribution center makes on time delivery for the manufacturer's production process according to the production instructions. The warehouse department of distribution center ship to the specific production line according to the requirement of the manufacturers of raw materials for sorting or value-added processing. Set distribution center check the raw materials and upload inventory information to the logistics information platform in time after each completed delivery. Based on inventory levels on the logistics information platform of logistics center, suppliers arrange their production schedule and timely collection of distribution center for delivery. Suppliers 1, 2... N, corresponding to different suppliers of raw materials and the main function of professional distribution center is accomplished for goods storage and distribution of high level and adjust the demand information of suppliers and manufacturers. When Supply - the Hub has enough specialization level of logistics operation ability, it can be implemented for multiple similar raw material manufacturers to achieve on-time delivery at the same time, in order to reduce operating costs to increase profits.

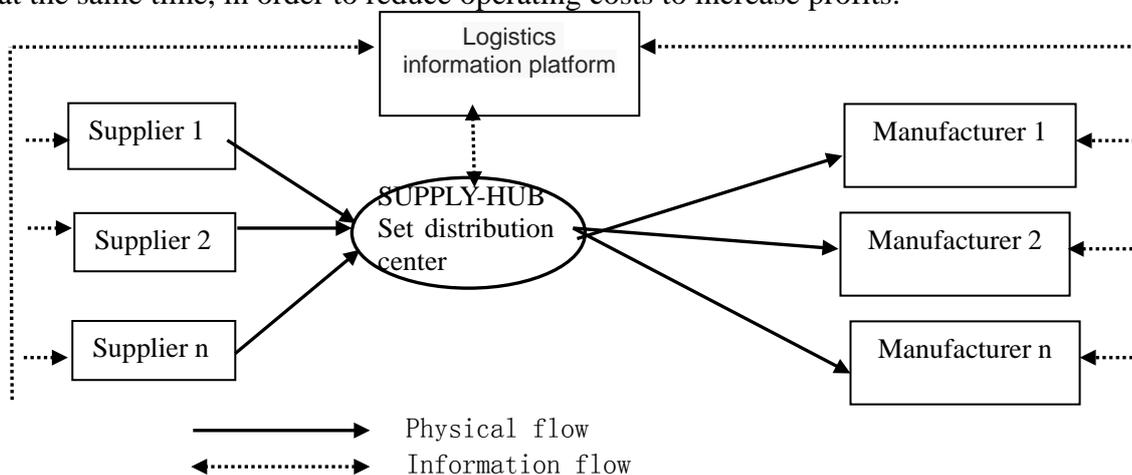


Figure 2 the Supply - Hub operation pattern

Supply - the Hub is of a kind of way to achieve Zero Inventory. First of all, set distribution center objectively connect the supply and demand of production and reduce the required the inventory with the method of "on-time delivery" to every link of the production system. Second, the number of regular reserve in manufacturing enterprise stock get to shrink so that tends to zero, thus presents the state of zero inventory. Finally, set distribution center can coordinate the supply of each supplier and deliver to manufacturers in the shortest possible time so as to realize zero inventory management by manufacturers reducing inventory of safety stock.

### **Economic significance**

(1) Reduce the total cost of supply chain:

under the JIT production mode of zero inventory, manufacturers are actually moving raw material inventory costs and risks to upstream suppliers in the supply chain, and suppliers tend to hold more inventory in order to cope with uncertainty, which does not reduce the whole cost of supply chain. Due to professional logistics advantage in supply-hub, the costs to maintain unit inventory are lower than in other suppliers or manufacturers, so as to realize the Pareto optimality of the whole supply chain effect.

(2) The promotion of Supply chain coordination:

The Supply-Hub operator communicate with the producers about production requirements planning and make distribution planning combined with the supplier's delivery quantity and frequency to implement Supply chain coordination.

(3) Rapid response to customer demand

From the perspective of Supply, Supply-Hub can achieve the purpose of quick response to customer demand change and actively guide to create a customer potential demand, through the way of reasonable inventory management and timely delivery. Studies have shown that in the case of many suppliers, Supply-Hub can fast respond to higher demand for manufacturers, which meet the needs of customers constantly changing.

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