

## Measures to Improve the Inventory of Steel Industry in Supply Chain Environment

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### Abstract

Iron and steel industry as a pillar industry has made a significant contribution to our country's economic development. But in the early two years, steel industry appeared a downward trend because of the factors such as overcapacity and so on, therefore, the revitalization of China's steel industry has become the focus of economic development, and the steel inventory has become a hot research issue. Reasonable inventory can reduce the time of the business process activity, make the enterprise speed up the reaction of the market, promote the production and business operation of the enterprise efficiency, reduce unnecessary inventory and related costs, and speed up the turnover of funds of the enterprise. Inventory control is an important part of the iron and steel enterprise's third profit source, which directly affects the enterprise's profit level and core competitiveness. Hence how to obtain reasonable inventory through using advanced management methods and mathematical models; how to meet customers' service requirements through promoting production capacity of iron and steel enterprises in the industry should be the pursuit of the goal. This is also the article main research task to analyse the common problems based on the characteristics of iron and steel enterprise inventory in China and the management of "high cost, low profit", use the measures of agile supply chain inventory control model, to solve the problems of the inventory control. Optimize each enterprise inventory and production logistics equilibrium of the chain, in order to achieve "win-win" of the cost and time, improve the efficiency of the whole steel industry under the environment of supply chain, make it out of the trouble and develop rapidly.

**Key words:** Supply chain; Agile supply chain; Inventory; Iron and steel industry

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### INTRODUCTION

The steel industry is always an important part of national economy in our country, which is the leading industry to realize speeding up the industrialization. The most countries which have implemented industrialized in the world are almost putting priorities to develop basic industries including steel industry. Our country also invests a large number of money through a variety of financing channels, in order to improve the competitiveness of steel industry. As the global information technology develops and market competition intensifies, steel industry is struggling in recent years with many domestic steel enterprises operating performance declining, and even some appearing huge losses. Reported by Chinese steel association, in past two years, Chinese steel industry's annual production sales profit margin is less than 3%, well below the industry average profit level which is 6% (Liu, 2012). For that, steel logistics industry have carried out deep introspection, constantly to find their own problems, and then to get into internal industry structure to do some change. For instance, many companies have established a new management style and business processes under the supply chain, to improve the economic benefit, changing the competitive pressure into the driving force for the development of the iron and steel industry. That is to say that it is imperative to improve inventory. Inventory refers to the goods or commodities at the storage state, and all of the raw materials, semi-finished products and finished goods in process of the supply chain have the function of integrating supply and demand and maintaining the activities smoothly going (Li, 2006). In the unceasing

circulation process of procurement, production, sales process, reasonable inventory make it possible that each link is relatively independent economic activity, and also adjust the change caused by the mismatch between the variety of demand and supply and quantity. It can handle all kinds of uncertainties such as requirements change, the leading time, cargo transportation situation, production time, etc ( Ma & Chen, 2001). On the contrary, the unreasonable inventory will cause many problems, such as steel product backlog, serious supply chain “bullwhip effect” phenomenon, seriously affecting the overall development of industry. Therefore, analyzing from the perspective of steel industry supply chain, especially the inventory control model under agile supply chain, is of great significance to research on steel enterprise supply chain’s inventory problem.

## 1. THE CHARACTERISTICS OF STEEL INDUSTRY SUPPLY CHAIN INVENTORY

If we want to come out a reasonable inventory control

scheme, we must analyze the characteristics of the steel industry supply chain inventory first, only that we can be targeted. Steel industry generally in the upstream of the supply chain, is a typical Process industry. Process industry usually refers to the industry that achieve value-added in the continuous production process from raw materials to manufactured goods, with physical and chemical changes. Its characteristic is less raw materials, similar processing route, and many kinds of final products. In general, each enterprise has relatively fixed suppliers and customers, from whom around 75% of its supply and sales come. In the environment of production and sale, for the steel industries which are dominated by the process, it is particularly important to establish customer relationship management, to organize enterprises producing from the customer as the center, and to strengthen enterprises management. The steel supply chain is different from the general assembly enterprise supply chain, the characteristics of the steel supply chain inventory as follows:

**Table 1**  
**The Characteristics of the Steel Supply Chain Inventory**

Logistics form	The main performance of the logistics activity
Procurement of raw materials suppliers	A variety of raw material, a large quantity, high cost of material. Need a long-term partnership with key
Raw material storage	Raw material into the furnace pretreatment for third party logistics processing occurs, absolutely not allow material shortage
Finished products, semi-finished products storage	Raw material yard with storage field, processing operations at the scene, the output using a yard “the Trinity” function
Semi-finished and finished products transport	Iron and steel scrap and scrap steel and other waste materials as raw material for production of recyclable
	Each phase dispersed in the production of semi-finished product inventory, and finished products warehouse at the end or the finished product library management center library
	Company's products are relatively heavy and large volume, but also some semi-finished goods in transit are still in the condition of high temperature, increase the transportation difficulty
	The majority of iron and steel enterprises have a fixed customer base, so we need to establish long-term relations of cooperation with large customers lose difficulty

## 2. ANALYZING THE INVENTORY PROBLEMS OF STEEL INDUSTRY UNDER SUPPLY CHAIN

Based on the characteristics of the steel industry supply chain, we can know the lack of effective supply chain mechanism. The end users of steel products mostly are the manufacturing industries, and the vast majority of products are in need of further deep processing. Users have a clear demand to varieties, specifications, prices of steel product, and iron and steel enterprises transport goods mainly by waterway and railway, with long distance, long time, and high freight price. The increase of product inventory will ultimately affect the steel industry enterprise’s business benefit. On the basis of general steel product storage process, we analyze the inventory problem:

### 2.1 Steel Industrial Concentrations are Low

This is one of the important factors that affect the effectiveness of steel industry supply chain mechanism. The specific methods to measure the concentration and corresponding indicators are a lot, and here we use absolute concentration (CRn) as the index to measure market concentration. The CR4 of Hebei iron and steel group in 2008 after the restructuring, but when it was in 2010, it was less than 30%. From that although Chinese steel industry concentration is rising, the overall is low[4]. Chinese top ten big steel companies’ concentration was increased to 42.6%. According to the Bain classification, if the industry concentration  $CR4 < 30\%$ , the industry is competitive, so our iron and steel industry is a highly competitive industry (Yang, 2012). Every enterprise occupies a small part of market, and enterprise scale is

not large enough to rein in the market, leaving many small businesses compete against large enterprises for raw materials, energy, the market and funds, etc. Especially in joint foreign sourcing and negotiations hard to form resultant force, it makes the effect of supply chain can't display, chain enterprises widespread the phenomenon of excess capacity-inventory backlog.

## 2.2 The Information Asymmetry Between the Companies

At the moment, due to some enterprises under the steel industry supply chain lack of information exchanging and sharing, or a number of important databases not implementing effective link, some companies cannot grasp the real needs of the downstream and the supply capacity of upstream. And at the same time supply chain cannot realize goods exchanging and transiting, only to have large inventory. And moreover inventory management of some small steel industry is still in the situation of artificial recording and transferring information, affecting many enterprises' information system's compatibility, so that it is not well to be integrated. In addition, some information in the process of calling and transmission may delay, causing the prediction error and then influencing the accuracy of the inventory quantity, leaving it difficult to implement short term production plan, making production enterprises to manufacture outdated products and leading to huge inventory (Zhong & Xu, 2004). Therefore, how to convey information effectively is the problem to solve to improve the performance of supply chain inventory management.

## 2.3 Lack of Perfect Inventory Management System

### 2.3.1 Inventory Management Concepts are Backward

Iron and steel enterprises are mostly owned inventory, easy to cause inventory amplification between the subordinate enterprises step by step, formatting "bullwhip effect". In order to get the demand for raw materials in time and to avoid the shortage of raw materials, supply department usually equip a lot of safety stock, and set two-stage inventory management (Wang, 2004). This will increase the enterprise cost, causing part of materials inventory repeated, ting up raw materials and funds, bearing the interest burden, and also having to pay for the storage, custody fees, with the loss, deterioration, and obsolescence risk. At the same time, as the inventory management still existing management man-machine coexisting, sometimes with the phenomenon which can't get inventory history data accurately, eventually it build up the backlog of inventory or inventory shortage.

### 2.3.2 Inventory Organization Structure is not Reasonable

The structure of inventory organization unreasonable situation exists in most enterprises of our country's iron and steel industry, sector crossing, unclear responsibilities,

the problems existing in the various stages of enterprise development. Various departments' functions in enterprise are different, also different to the respective requirements. For the sales department, they'd like diverse steel types of products, so that enterprise can quickly open the market, while the production sector hope to manufacture single variety but mass production steel product with the operation as simple as possible. Purchasing department hopes that order quantity is the more the better, thus they can reduce procurement cost and price negotiation, sampling business, while logistics departments hope small but many batches arrival, so that they can reduce inventory, and lessen the difficulty of inventory management. Conflicts between departments will lead to further decline business sales forecast accuracy rate, to increase procurement volumes, to increase inventory levels and inventory costs, to slow down logistics turnover, and eventually affecting the business efficiency and management level (Liu & Xie, 2006).

### 2.3.3 Lack of Demand Inventory Forecasting

According to the statistics, Chinese steel industry has more than 5000 steel markets. There are only 4% of the iron and steel market's steel products trading of more than one hundred million Yuan, while these steel enterprises' sale spots are amounted to more than 80000 outlets, and sales go up at the same time also bringing tremendous sales cost. Obviously, Chinese iron and steel logistics lacks a proper supply chain service platform, in the process of getting market volatility internal information, iron and steel enterprises always in the tend to rely on interpersonal relationships in the industry. Lack of scientific and reasonable prediction program, part of the enterprise inventory demand forecasting are still in the experience management phase. So, once the fluctuated message transmits between competing enterprises, price of steel and steel sales demand forecasting will be not accurate, resulting in firms to sell or hoarding steel, procurement costs and sales costs increasing, along with the increase of inventory.

### 2.3.4 Unreasonable Inventory Control

At present, most of Chinese iron and steel enterprises lack of statistical science reasonable analysis means, often to make procurement plan according to the sales and shipments of each stage of the varieties of steel. And in the storage process, individual work delayed and violated and steel products are piled in a mass, to find that the time to look for the stock goods is too long so that the enterprise cannot realize the inventory control methods of first-in first-out (FIFO), and waste a lot of manpower, material resources, and financial resources. Nowadays, the control function for inventory system to front line sales is weakening (Liu & Xie, 2006). For instance, business member only care about the adequacy of inventory, while they don't pay enough attention to whether can be timely delivered to customers. Each regional manager from the

sales department rarely require every member forecast the number of varieties and demand of raw materials the customer want, or actively communicate with clerks about customers' and enterprise's inventory situation. It leads that enterprise's market information cannot effectively update. In addition, for profit in some departments, the salesman will prefer to increase the order quantity, thus causing the overall inventory too large.

### **3. TO CONSTRUCT THE INVENTORY CONTROL MODEL OF STEEL ENTERPRISES IN AGILE SUPPLY CHAIN**

According to many problems existing in the Chinese steel industry, the author thinks that it should lead the theory of agile supply chain into the steel industry, which is said to state and analyze the agile supply chain and inventory control theory, and then on the basis of theoretical analysis, to make sure the problems involved in inventory control of steel industry and the internal and external factors. It will help enterprises in light of its own actual situation to analyze and inspect the key problem about the aspect of inventory control arising in the enterprises and the supply chain where the enterprises are, and in accordance with the inventory control target to take the corresponding inventory control measures. Analyzing the cost and time of supply chain multi-echelon inventory control, it proposed the multi-echelon inventory control model and the cost time optimization model, which is used to illustrate under the agile supply chain environment, the reasonable inventory of each member enterprise and the optimal inventory of whole supply chain, for the existing steel industry inventory control providing inventory model which can be operated better.

#### **3.1 Under agile Supply Chain Inventory Control Theory**

In Agile Supply Chain strategy management, it makes the enterprise's order-driven production organization mode, which is producing what the customer needs, come into being successfully (Cheng, Wang & Tian, 2003).Based on agile manufacturing technology and information technology, effectively reducing the inventory on the whole supply chain. It should improve the rapid response capability of enterprises. Its formation is based on the core enterprise, making suppliers, manufacturers, distributors, users and other entities into dynamic network of supply and demand which is more seamless and can quickly respond to market changes. In the net, the enterprise ally with each other based on a premise of the same strategic goals, making business goals and interests completely consistent. And more over core enterprise should according to the dynamic market demand integrate supply chain, and promote and realize to share information, so that eventually all stages of the supply chain inventory

will be the minimum, with transaction costs to a minimum, achieving the overall optimum. The basic idea of inventory control is put forward before the concept of supply chain, implemented by the enterprise only, with the inventory control as the specific series of work revolving around meeting users' demand and decreasing cost. With the conception of supply chain proposed, especially the idea of agile supply chain, it makes the meaning of inventory control to undergo tremendous changes. It requires the enterprise change from the traditional logistics control which only focuses on their own to whose purpose is process control, so that enterprises can pay attention to the whole supply chain inventory control. Each enterprise or department should try best to achieve seamless connection, avoiding demand magnifying phenomenon as far as possible, forging relationship between the strategic alliances, realizing information sharing and collaborative work, speeding up the level promoting of supply chain enterprises' customer response and reducing operating costs, eventually to achieve a win-win situation (Wu & Zhang, 2007).It is the thinking revolution of inventory control.

#### **3.2 Steel Industry Chain Core Enterprise Inventory Control Model in Agile Supply Chain**

According to node enterprises' actual operation of supply chain in steel industry, the agile supply chain always has more than one supplier and seller even multiple distribution systems, with a complex network structure, whose inventory management is a centralized and multi-echelon inventory control (Wang, 2007).According to the different goals of inventory control optimization, it can be divided into cost optimization and time optimization. Due to the complexity and dynamic, we can't and also need not to sate all situations. So it still takes the typical three layer structure of core businesses in the supply chain as an example, the structure model and operation principle as follows:

##### **3.2.1 Cost Model of Core Enterprises' Inventory Control Under Agile Supply Chain**

At first, we need to define and analysis the cost the model involving. It should be pointed out that, the supplier is an important member of the multi-stage supply chain, but in inventory cost control analysis dominated by the core enterprise, supplier's inventory cost is generally undertaken by themselves (Jaruphongsa, Cetinkaya & Lee, 2004). So when analyze the cost, we take the typical manufacturers-distributors-retailers three-stage inventory as an example, determining the supply chain cost structure as follows:

**Table 2**  
**The Total Cost of Three-Stage Supply Chain Inventory Control System**

Three-stage supply chain cost	The cost of each node enterprise
Manufacturers inventory cost ( $C_Z$ )	Inventory holding cost ( $C_{zh}$ ) Ordering cost ( $C_{zo}$ ) Production costs ( $C_p$ ) The cost of stock loss ( $C_{sz}$ )
Distributor inventory cost ( $C_{fi}$ )	Inventory holding cost ( $C_{fhi}$ ) The ordering cost for distributors ( $C_{foi}$ ) The cost of stock loss ( $C_{fsi}$ )
Retailer inventory cost ( $C_l$ )	Inventory holding cost ( $C_{lh}$ ) Ordering cost ( $C_{lo}$ ) The cost of stock loss ( $C_{sl}$ )

It will be seen from above that the total cost of three-stage supply chain inventory control system is:

$$TC = C_Z + \sum_{i=1}^m C_{fi} + \sum_{j=1}^n C_{ij} \quad (1)$$

Theoretically, total inventory cost of each three-stage supply chain is  $TC_{ij}=C_Z+C_{fi}+C_{ij}$  (2), which is a mesh and whose level is unlimited, from one-stage suppliers, two-stage suppliers and even N-stage suppliers, to the core enterprises (Manufacturing enterprises), and then to distributors and retailers, finally reaching the end users (Sun & Peng, 2008). Finally, putting all the  $TC_{ij}$  income into normalization, the results are  $TC'_{ij}(i=1,2,\dots,m; j=1,2,\dots,n)(0 < TC'_{ij} \leq 1)$  (3).

### 3.2.2 Time Model of Core Enterprises' Inventory Control Under Agile Supply Chain

Time optimization, as another goal of inventory control under agile supply chain, is studied less, and this point is also the key point for agile supply chain, that is to say that we should start from the chain time analysis and then build a multi-echelon inventory total time model. In this paper we do not consider this special case, thinking all retailers place orders with distributors instead. Therefore, inventory control time optimization model is based on the supplier-manufacturers-distributors-retailers four stages supply chain structure to consider. It keeps the whole supply chain collaborative operating, so that the overall efficiency of the supply chain can be improved.

$$TT = T_A + \sum_{k=1}^p TG_k + \sum_i TZ'_{kj} + \sum_{i=1}^n TF_i + \sum_{j=1}^m TL_j + T_B \quad (4)$$

Among them,  $TT(TT_{kij})$  represents the total inventory time of whole supply chain when we choose the k suppliers, i distributors and j retailers.  $T_A$  represents a virtual beginning inventory time, and its value is 0.  $TG_k$  represents the stock time of k suppliers.  $TZ'_{kj}$  is on behalf of manufacturers' inventory time when we choose the k suppliers, i distributors and j retailers.  $TF_i$  represents the stock time of i distributors.  $TL_j$  represents the stock

time of j retailers. And TB represents the virtual terminal inventory time with value 0 (Li & Li, 2008). Finally, putting all the  $TT_{kij}$  into normalization, the results are

$$TT'_{kij} (k=1,2,\dots,p; i=1,2,\dots,n; j=1,2,\dots,m) (0 < TT'_{kij} \leq 1) \quad (5).$$

### 3.2.3 Costs—Time Overall Model Controlled by Inventory

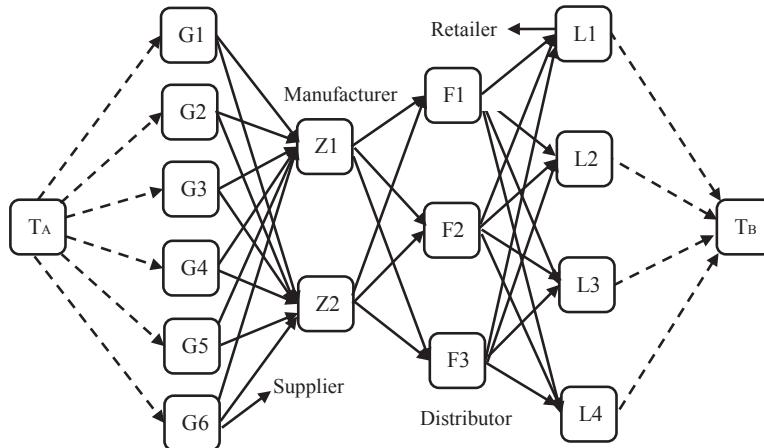
Based on the establishment of cost optimization model and time optimization model, it aims to improve customer satisfaction as the ultimate goal of inventory control. It regards cost and time as two variables, and assigns them relative weights, forming a cost-time overall model, as an important index to evaluate the performance of supply chain. The model can be expressed as:

$$T_m = \min(aTC'_{ij} + bTT'_{kij}) \quad (6)$$

In the formula above,  $T_m$  is cost-time coefficient.  $TC'_{ij}$  is the total cost of inventory after normalized any supply chain.  $TT'_{kij}$  is the total time of inventory after normalized any supply chain.  $a$  represents cost weights while  $b$  is the time weight ( $a+b=1$ ). According to its own characteristics, the steel industry is to determine the sensitivity and the relative importance of cost and time from supply chain and the different values of  $a$  and  $b$ . In addition, the supply chain channel represented by  $T_m$  in the cost or time single considerations may not be the best, but if we can consider two aspects at the same time, we will get overall optimum, which are our purposes to establish model. And it also reached the ultimate goal that time and cost we used is much less, and the level of customer satisfaction is higher. What we need to pay attention to is the value of  $T_m$  is negatively related to customer satisfaction.

### 3.3 Numerical Example

Suppose there is a level steel industry supply chain system (As shown in the figure 2), Among them, the number of the suppliers are 6, G1, G2, G3, G4, G5, G6; Distributors are three, F1, F2 and F3; Retailers are L1, L2, L3 and L4; Z is manufacturers, 144 pathway in total.



**Figure 1**  
**Level Steel Industry Supply Chain Network**

**Table 3**  
**The Numerical Example Node Time Parameter**

Supplier G	Manufacturer Z	Distributor F	Retailer L	Unit (Day)
G <sub>1</sub> 20			L <sub>1</sub> 15	
G <sub>2</sub> 21	Z <sub>1</sub> 45	F <sub>1</sub> 15	L <sub>2</sub> 12	
G <sub>3</sub> 26		F <sub>2</sub> 14	L <sub>3</sub> 14	
G <sub>4</sub> 24				
G <sub>5</sub> 23	Z <sub>2</sub> 40	F <sub>3</sub> 12	L <sub>4</sub> 11	
G <sub>6</sub> 22				

There holds that, General supplier's inventory cost shall be borne by their own unconcerned with the core enterprise. But both sellers and distributors are retailers. And also the provider of the market information. So the inventory is close to the core enterprise.

**Table 4**  
**Numerical Example Node Cost Parameters**

Supplier G	Manufacturer Z	Distributor F	Retailer L	Unit (RMB)
0			L <sub>1</sub> 2000	
0	Z <sub>1</sub> 30000	F <sub>1</sub> 4000	L <sub>2</sub> 1600	
0		F <sub>2</sub> 4500	L <sub>3</sub> 2100	
0	Z <sub>2</sub> 35000	F <sub>3</sub> 6000	L <sub>4</sub> 2200	
0				

**Table 5**  
**Cost Optimization Model (Total Cost and the Normalized Results)**

	TC <sub>ij</sub> (Yuan)	TC <sub>ij</sub> ' (Normalized)
1	36000	0.0064
...	...	...
13	38000	0.0067
...	...	...
73	41000	0.0072
...	...	...
144	43200	0.0076

**Table 6**  
**Time Optimization Model (Total Time and the Normalization Results)**

	TT <sub>ij</sub> (Day)	TT <sub>ij</sub> '(Normalized)
1	95	0.0072
...	...	...
13	92	0.0070
...	...	...
73	90	0.0067
...	...	...
144	85	0.0064

Set the weight of the cost  $a=0.5$ ,and the weight of the time  $b=1-a=1-0.5=0.5$ ,the most optimal path comes from the time - cost normalization model .Calculate the minimum weight of the sum of the value from all paths,put them into the formula.

$$T_m = \min(aTC_{ij} + bTT_{ij}) \quad (7)$$

You can get  $T_m=0.0066$ .The most optimal path for the steel industry supply chain:  $G_1 \rightarrow Z_1 \rightarrow F_1 \rightarrow L_2$ .

## 4. IMPROVEMENT FOR THE IRON AND STEEL INDUSTRY INVENTORY UNDER THE SUPPLY CHAIN

Based on the comprehensive research and analysis on the method and model of inventory control in agile supply chain environment, it puts forward to the suggestion that we can achieve inventory optimization control from two aspects of internal and external, which can be used by steel production enterprises to combine with the inventory status for reference and selection.

### 4.1 Improving the External Environment of Inventory Management Under Supply Chain of Iron and Steel Industry

#### 4.1.1 Adjusting Iron and Steel Industry's Layout, Enhancing the Degree of Concentration of Iron and Steel Industry

Iron and steel industry should comprehensively considerate mineral resources, energy, water resource, transportation, environment capacity, market distribution and make full use of foreign resources and other conditions, based on growth in inland areas of strict control on the production, transferring productivity to coastal areas. Improving the industrial concentration should not be only by merger acquisition and reorganization and other ways to improve the scale of production of large iron and steel enterprise group, but also to pass the strict market access system. From the aspects of policy and financing it should support large-scale iron and steel enterprises with strong capital and technology and the small and medium-sized enterprises having the space for development. It must be strictly to shut down the backward production capacity with small scale, low efficiency, heavy pollution and never comprehensively using facilities, high unit energy consuming, having a serious threat to the peripheral ecological environment. Given the facts that Chinese steel industry is big but not strong, and in the process of industrial development, the phenomenon of inverse centralized is serious, it encourage advantage of iron and steel enterprises in China to merger and joint trans-regional, cross-ownership. Since 1996, it is common for large and small iron and steel enterprises to restructure. In recent years, the joint reorganization of iron and steel enterprises in China gradually accelerate the pace. For example, Wuhan steel group and Liugang steel group are presented the teamed up to form Guangxi iron and steel group, and Tangshan Steel group, Handan steel joint reorganization of Hebei iron and steel group. All of these are for the optimization of iron and steel industry supply chain to create a favorable external environment.

#### 4.1.2 Set up the Iron and Steel Enterprises of Agile Supply Chain Coordination Mechanism

Agile supply chain model find the optimal path for us. If you want to be the optimal scheme, it requires a lot

of factors. The first factor is the urgent need to establish a perfect supply chain collaboration mechanism among the raw material suppliers, steel processing enterprises, transport enterprises, iron and steel sales enterprises and customers. Each node enterprise in the supply chain has close relations, showing the situation of “one-wing all-wing, one loss”, but they are independent economic entities, so in such circumstances, the establishment of an effective cooperation mechanism is particularly important. The second is the supporting measures.

Trust is the foundation of building steel industry of agile supply chain, make the enterprise to achieve synchronization of supply chain decisions, cooperation makes the enterprise internal and external resources to be able to use integration and optimization, self-discipline performance gap between departments within the enterprise, and to motivate the optimal supply chain system for iron and steel enterprises and the best coordination.

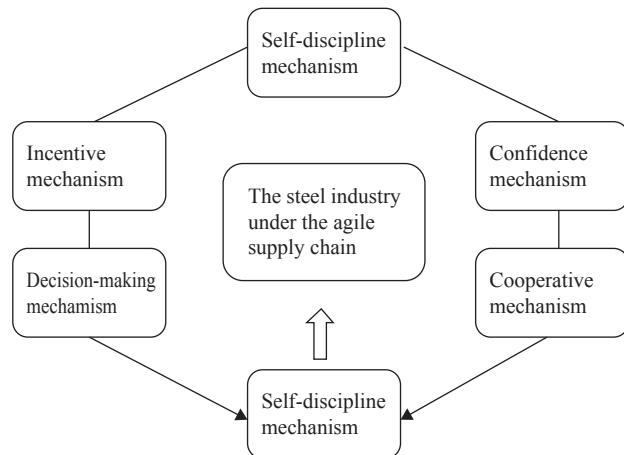


Figure 2  
Restriction Mechanism of Supply Chain

### 4.2 The implementation of Core Enterprise Inventory Control Suggestions in Agile Supply Chain Environment

#### 4.2.1 Improve Inventory Management, Set up a Reasonable Organization Structure

Strengthen learning, and change ideas. The steel industry enterprises should improve the understanding of inventory and inventory management through the theoretical training, cost accounting and other varieties of ways. Enlarge the inventory management knowledge, and based on a scientific and reasonable inventory management, reflect the deficiency of internal inventory management, so as to set up a correct and comprehensive concept of inventory. The relationship between structure setup and function of the iron and steel enterprises shall be each business unit managed by one department. Each department for own business implement the whole process management from start to finish, with institutions

not overlap and no repeat business. It is To realize more accurate, more timely and comprehensive information communication between the enterprise upper and grassroots, according to the reasonable information flow, to determine the organization setup, canceling middle-level organization which is blocking information flow, strengthening the functions of information collection and processing control layer and decision-making layer. For example, in the procurement process, the procurement plans of different products, purchasing departments agreed targets and relevant measures of JIT purchasing with supplier together, keeping information communication unobstructed. Through the information interaction platform, suppliers timely forecast demand, stocking up in advance, to shorten the supply cycle, In order to ensure the smooth implementation of JIT inventory management method in iron and steel enterprises.

#### 4.2.2 Strengthening Steel Sales Forecast and Strengthening the Inventory Control

For example, if you can reduce the variability of consumer demand observed by retailers, so even if the bullwhip effect appears, the variability of consumer demand observed by seller will decrease. A remedy to avoid repeated processing the data in the supply chain is to make the upstream enterprises to obtain its downstream demand information. So, upstream and downstream enterprises in supply chain can update their forecast according to the same original data. Partners in supply chain can use electronic data interchange system (EDI) to predict or bypass the downstream enterprises to obtain relevant information. Because of the different predicting methods and buying habits, when they order from upstream enterprises, it still can cause orders with some unnecessary fluctuations. Using EDI can make upstream enterprises understand the demand and stock information of the downstream enterprises, and then supply to the downstream enterprise. Accordingly, the downstream enterprises have become an active part of the supply chain. Shorten the extended lead time has a significant influence on demand variability in each stage of supply chain. Therefore, shortening lead time can significantly reduce the bullwhip effect of the whole supply chain. In view of the present inventory management situation of iron and steel enterprise, they can learn from the JIT inventory management method and combine with the method of inventory management. Each node enterprise in the supply chain which the steel enterprises belong to, manage their own inventory, lacking communication and exchanging between each other. In order to make the joint inventory management method to be applied to the iron and steel enterprises, the company should establish the supply chain coordination management, making the cooperation between each other more smoothly, defining their own goals and responsibilities, ensuring the effective implementation of joint stock management method.

#### 4.2.3 Promoting the Information Construction, Implementing Agile Supply Chain Reengineering

Accelerating the process of information in iron and steel enterprises can respond to changes in market demand in time, improving the market reaction speed, and enhancing the strain capacity and market competitiveness. One of the results of promoting information construction is the implementation of business process reengineering (BPR), first of all the process must construct enterprise resource planning system. What the enterprise resource planning reflects is not only a system, but a kind of management thought. In view of the inventory problems existing in the iron and steel enterprise mentioned above, implementing enterprise resource planning requires enterprises to introducing information technology talents, making business standardization in technology and product price reasonable, and the overall system design has the characteristics of flexibility and rapid implementation. It is strengthening storage terminal information input, using automatic recognition technology to automatically identify steel products in warehouse, installing the POS terminal, eliminating the past out of storage, inventory of paper, saving a lot of manpower, material resources, time, and reducing the error rate. The use of the EDI between upstream supply chain partners, the implementation of CRM, the methods of B2C direct sales to shorten the information lead time, effectively improve the level of inventory control, reducing inventory pressure. In view of iron and steel enterprises use the agile supply chain model, its advantage is that it can quickly reconstruct and adjust, according to the formation and dissolution of the dynamic alliance, to seize the market opportunities quickly. So for the supply chain, as the internal and external environment changes, timely implementation includes new opportunities for recognition, supply chain member selection, supply chain formation, operation process and the evaluation process of the supply chain, in order to realize the agile supply chain between the iron and steel enterprise restructuring. It is of great importance to multi-echelon inventory control.

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## SUMMARY AND PROSPECTS

Inventory control in iron and steel industry is such an important part of enterprise management, which has a very close relationship with benefits. The actual situation of China's steel industry, implement reasonable inventory control could greatly reduce the inventory of liquidity, shorten the circulation of capital cycle, and help enterprises to gain initiative in the market, win the market advantages, gradually move out of the woods. Increasingly along with the mature supply chain and production technology innovation, there are challenges and opportunities for inventory control of iron and steel enterprise development. Under the supply chain, the steel

industry should rely on internal training to improve related employees' understanding of inventory management; They should use information sharing, centralized inventory management, IT inventory management method, and the joint inventory optimization management for process and operational efficiency; Strengthen steel sales forecast, Make accurate plan for inventory; From the perspective of the supply chain, enterprise should advance the information process, to improve the market reaction speed, inventory flexibility and market competitiveness. Anyhow, iron and steel industry must be based on its own characteristics which are not only previous supply chain cost optimization requirements, but also rapid response time target for the market. This paper combines the view point of systems engineering with the engineering method, to analyzing supply chain core enterprise inventory control system, putting the cost optimization and time optimization as a modeling way, proposing time-cost model. According to the features of China's steel industry supply chain and actual inventory management, we put forward the suggestions for enterprises inventory control. Of course, the research of multistage inventory control under the agile supply chain environment is still in its infancy. It is still in theory without many successful cases. The author is trying to do the theory research and model building etc, to rise related ideas to improve inventory management with limited knowledge. There are still some problems failed to be solved. How to solve the inventory management problems existing in the iron and steel enterprise need to be further studied and discussed.

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