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A Study on Optimization Strategies of Enterprises Storage Management

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Abstract

Today, when market competition becomes increasingly fierce, improving the efficiency of storage services becomes a key for chemical companies to win the trade war. Focusing on the improvement of internal storage efficiency of enterprises, aiming at the characteristics that production enterprises for primary chemicals rely on economies of scale to make profit, according to industry conditions and forecasts of demand for market of chemical products based on logistic curve, and analyzing the difference between the storage scales of different enterprises, this paper proposes that general-scale emerging chemical enterprises should make full use of outsourcing resources to achieve economies of scale of storage; while in respect of mature super large enterprises, through using AHP method, object programming with priority and other methods, this paper proposes that enterprises' own storage systems should be constructed and improved so as to achieve significant improvement of storage efficiency.

Keywords: *Optimization Model, Storage Efficiency, Economies of Scale, Outsourcing Resources*

1. Introduction

Today, the researches for the storage of chemical production enterprises have been mainly focused on the fuel chemical industry with petrochemical enterprises as represents, and the perspective of the researches can be broadly divided into two major categories: the ones based on business administration and those on management science and engineering. The former focuses on analyzing and solving storage problems in chemical production in the positions of business managers and directors. Externally, they mainly focus on the improvement of supply chain relationships, reinforcement of information communication, while internally, they mainly study the perfection of storage performance system, control of inventory cost, balance of material supply and demand, restructuring of organizations and other problems. While the latter is to analyze and solve problems with optimization models established through the combination of quantitative and qualitative researches from the perspective of scholars or engineering and technical personnel.

Through literature reading and analyzing, we find that there are few studies for the storage problems of chemical production enterprises in the Northwest. As a chemical production base after the founding of the PRC, the northwest region has many upstream enterprises in the chemical industry chain. Different from the fine chemicals of southern coastal developed areas, Northwestern chemical production enterprises are mainly engaged in the production of basic inorganic chemical products, basic organic synthetic products and fuel chemical products. Its storage management has distinct characteristics: the variety and structure of

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materials in inventory are relatively simple with fewer hierarchies; the system of production material flow is huge, and the differences in physical and chemical properties of materials are very large and they are mostly dangerous chemicals; the specificities of storage devices are strong and they are expensive with high daily maintenance costs; the production has rigid demand for raw materials; the enterprises are mainly large and medium-sized state-owned enterprises, most of which use highly centralized linear unity form organizational structure. Their management is rigid, simplistic and bureaucratic, and at the same time, they are much influenced by the planned economy. There are problems like not paying attention to the market and production costs and others. Storage efficiency is an important factor affecting the competitiveness of chemical enterprises. How to improve the storage efficiency of the Northwest chemical enterprises is a real problem worthy of further study.

In this paper, with the Northwest chemical companies as the object of study, we first screened the main factors affecting the storage efficiency of northwest chemical enterprises based on the SAD model, then dividing the object of study into two categories by size and industry environment, according to the demand forecasts of chemical market by logistic curve, distinguishing general and ultra-large-scale chemical enterprises, we put forward specific measures with respect to improvement of the efficiency of storage management.

2. An Analysis for the Factors Affecting the Storage Efficiency of the Northwest Chemical Enterprises

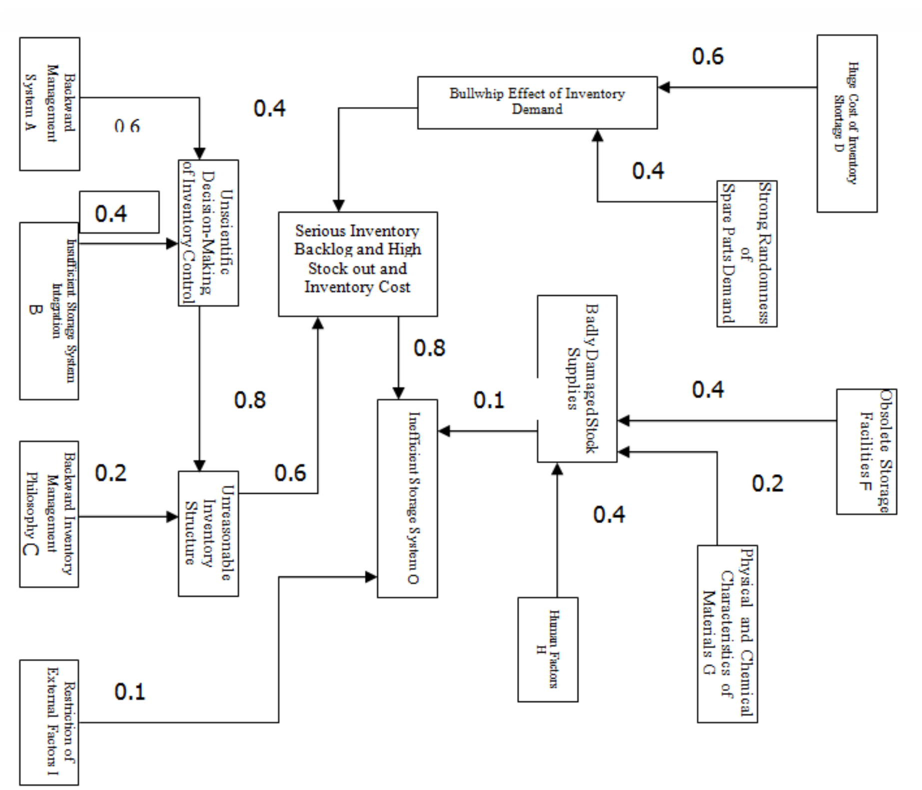

Figure 2-1. SAD Model of Storage Problems of Northwest Chemical Production Enterprises

Through research and analysis, we believe that the factors that cause the inefficient storage of northwest chemical enterprises mainly include: (A) backward storage management system, (B) insufficient storage system integration, (C) backward inventory management philosophy, (D) huge cost of inventory shortage, (E) strong randomness of spare parts demand, (F) obsolete storage facilities, (G) physical and chemical characteristics of materials, (H) human factors and (I) external factors. The following SAD modeling analysis is adopted to peel off the key ones among the problem clusters as shown in Figure 2-1.

Based on the causal relationship of the above-mentioned problems, Mr. Wang Anjun[②], person in charge of Xi'an Chemical Plant, got the results with the weights:

$$\delta_{OA}=0.2304,\ \delta_{OB}=0.1536,\ \delta_{OC}=0.096$$

$$\delta_{OD}=0.192,\ \delta_{OE}=0.128,\ \delta_{OF}=0.004$$

$$\delta_{OG}=0.04,\ \delta_{OH}=0.02,\ \delta_{OI}=0.1$$

Where except that I is an uncontrollable factor, all the other factors can be improved. When the four problems of A, B, D and E are solved, the problem of O can be improved by 70.4%. Therefore, the countermeasures should be focused on problems A, B, D and E.

3. Determination of Storage Scale of Enterprises based on Logistic Curve Forecast

In the development of storage strategy of chemical production enterprises, we also need to take full account of the present production, market demand, market saturation and other factors of the enterprises and those in the coming period to develop targeted management strategies according to different scales of production.

Aiming at the problems existed in northwest chemical companies at the present stage like being big but not strong, overcapacity, irrational structure and others, China has developed appropriate adjustment policies of industrial structure, and the major industry reshuffle will be inevitable. Future Northwest chemical companies will be divided into two categories: the first is the chemical enterprises in the growth period. Such enterprises are mostly concentrated in the new energy, new materials and other departments. Their potential of market demand is huge and their market competition is sufficient. The expansions of storage and production scales are required to be highly coordinated to support enterprise development. The second is the chemical enterprises in the stable and fluctuation periods. Due to overcapacity, requirements for the development of resource-saving heavy chemical industry and other reasons, such enterprises are in the phase of deep adjustment. Industry resources will further focus on the above-scale enterprises, and merger and reorganization will make a group of ultra-large-scale oligopoly enterprises emerge in the industry. The purpose of using logistic curve to predict the industry environment in which the enterprise lies is to provide the scientific basis for the development of better storage strategies.

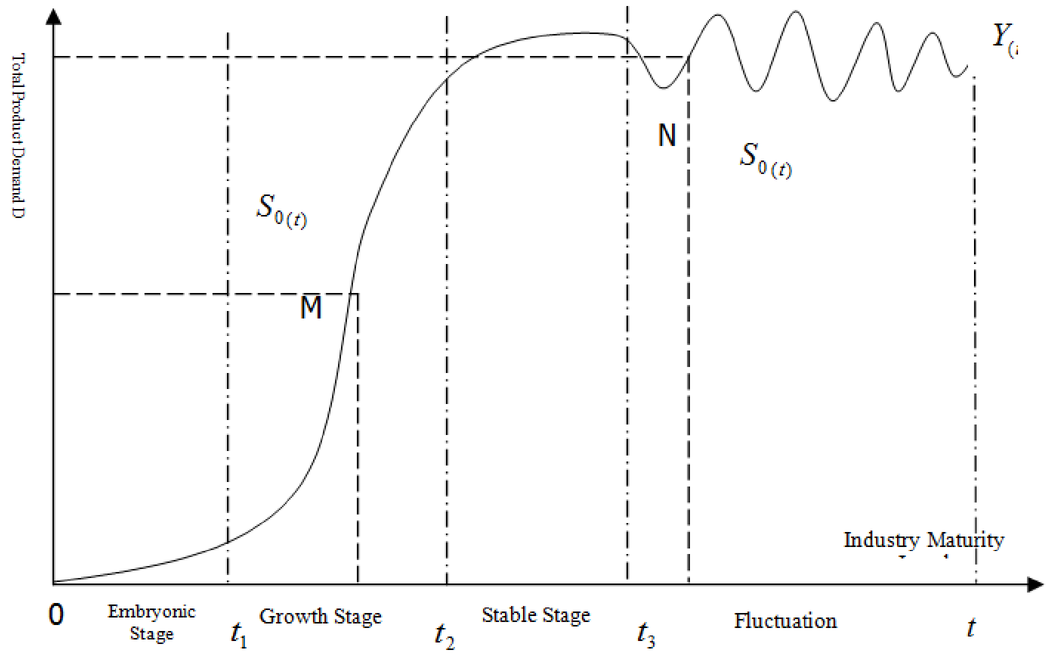

Figure 3-1. Demand Curve of Chemical Products in their Life Circle

First, with the help of authoritative market research agencies and statistical agencies, we calculate the targeted growth rate of product demand: $R_t = \frac{D_t - D_{t-1}}{D_t}$ and the expected quantity of demand growth within a certain period:

$$Y_{(t)} = \begin{cases} A \cdot e^{(R_t)^t} & 0 \le t \le t_3 \\ Y_{(t_3)} + V_t \cdot \cos(w_t \cdot t) & t > t_3 \end{cases}$$

Then we obtain the logistic curve: $L_{(t)} = R_{(t)} \cdot Y_{(t)} \cdot \left[\frac{K - Y_{(t)}}{K}\right]$,where A is a non-negative parameter; V_t is the amplitude function with regard to time t, w_t is the angular frequency conversion function with regard to time t, K is the full capacity of the market for a chemical product, and D_t is the quantity demanded in time t, and the values are assigned by the above agencies (the results should be timely maintained and updated based on changes in the market).

In the next place, we make statistics for the total output of the product at the present stage and for some time in the future ($S_{0(t)}$). $S_{0(t)} = \sum_{i=1}^{n} S_{it}$; S_{it} is the output of various manufacturers within a specific period segment. When $S_{0(t)}$ and $Y_{(t)}$ intersect at point M where $\frac{K - Y_{(t)}}{K} \to 1$, it belongs to the first category; when they intersect at point N where $\frac{K - Y_{(t)}}{K} \to 0$, it belongs to the second category.

4. Countermeasure Analysis---General Scale Chemical Enterprises

A big tree affords good shade---implementing the “two-step strategy” of settling in chemical industry park to achieve economies of scale in inventory and activating inventory with the help of financial institutions so as to achieve decrease of storage management and operation cost and inventory cost.

4.1. Taking Advantage of Economies of Scale to Reduce Storage Management and Operation Cost

Chemical industry is a process manufacturing which gives priority to continuous process. It has a large scale of system, a complex process and it is difficult to be controlled. Usually the production is organized in the mode of large quantities, high strength, and fewer varieties. The enterprises in the growth stage have larger inventories and slower turnovers; the production type is gradually transferred from build-to-order to make-to-stock. In the case of stock-oriented production, the implement of zero inventories is clearly unrealistic.

Because there also exist characteristics of economies of scale in storage activities (according to the research results of Cohen M. A, we will give an extreme example for illustration: if you want to make the airline which only has one aircraft achieve economies of scale, you will have to need spare parts that can assemble 26 same model aircraft.), while the previous VMI, JMI[④] and other inventory management models based on supply chain can only enable various chemical companies in the chain to make inventory adjustment in the longitudinal direction on the basis of the supply and demand planning of upstream and downstream businesses in order to hold down the inventory. This obviously can not adapt to the requirement for push production during the growth stage of the businesses. And each link of the chain is generally one chemical company, which can not form the economies of scale of storage.

For third-party hazardous chemical storage industry, if they want to satisfy the storage outsourcing services of chemical manufacturers in northwest, they shall have a solid strength. Because the pre-construction phase requires a lot of investment in fixed assets; when completed, in order to maintain normal operations, a very high volume of business is also needed to be maintained. Economies of scale can be achieved only when the storage facilities are at full load condition. Even when 3PL storage enterprises of dangerous chemicals have had enough clients to maintain their normal operation, because they are only engaged in the single storage business, the profit margin expansion will also be limited.

If the chemical production enterprises at point M have all settled in the chemical industry park, then at the appointed time, the storage demand for dangerous chemicals in the park will be considerable enough to attract a large specialized 3PL storage enterprise of dangerous chemicals to settle in. Because manufacturers and storage companies are in the same chemical industry park, the raw chemical materials purchased and the finished products produced can be sent directly to the 3PL storage companies. This is equivalent to that the storage systems of various production enterprises in the park is outsourced in a unified way to a 3PL for intensive construction and management. Because the marginal cost of outsourcing storage is less than that of the independent storage of a single enterprise, manufacturing companies can purchase the inventory that meets the economies of storage scale of their own businesses within the allowable range. Because there are professional 3PLs to care for storage operations, according to the principle of “use and disuse theory” in genetics, manufacturing enterprises can get rid from the problem plagued by storage; both the supply and demand parties of storage will reach economies of scale.

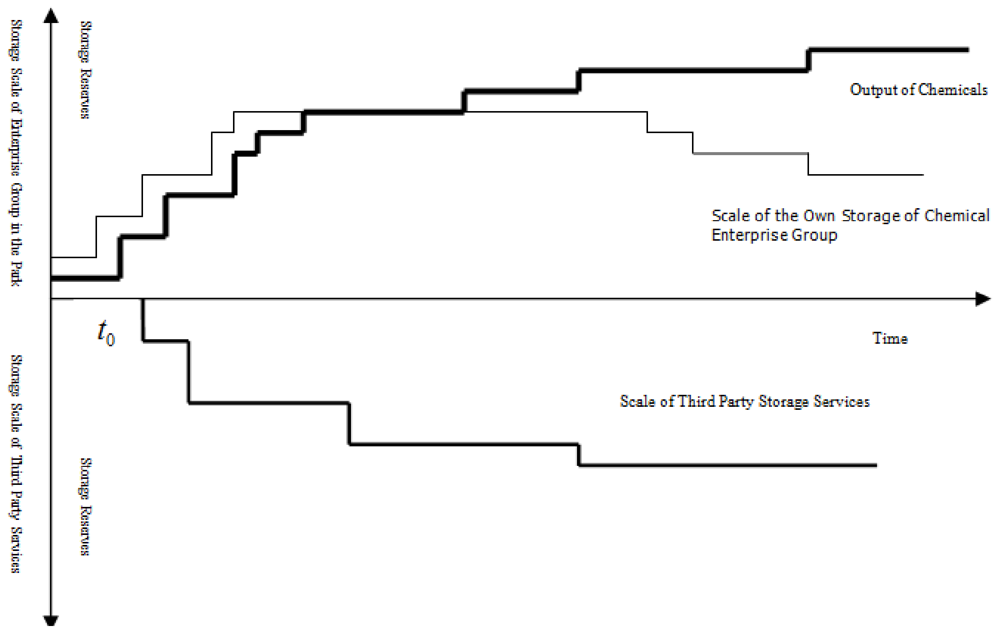

Figure 4-1. A Schematic Diagram for "use and disuse theory" of Storage Scale Adopted by Enterprises in the Chemical Industry Park

According to Figure 4-1, it is known that the earlier the time t_0 when the third-party storage service providers enter the chemical industry park, the more obvious the inhibition for the chemical manufacturer's own storage scale will be; the more a game relation of symbiotic cooperative interdependence will be able to be formed.

Due to achievement of stable contractual relationships and economies of scale, the manufacturer group and 3PL storage businesses in the park may also form a horizontal strategic partnership similar to the one between supply chain enterprises. Given the importance of raw materials and spare parts for chemical production (a huge cost of stock out), each manufacturer may become a shareholder of 3PL storage enterprises with its original storage and transportation equipment in the form of investment in kind to form communities of interest (such as self-provided truck cabins, tankers, cargo vans and other utilities), and may dock the information systems and exchange liaison officers and others. Through the above measures, the production enterprises can effectively monitor the service quality of the 3PL storage businesses. And because of the support of the manufacturers, the 3PL storage enterprises will become professional chemical storage and transportation companies with the two functions of "common storage and common distribution". The operating costs of both sides are significantly reduced, which helps reduce the charging standards of 3PL, and the chemical production enterprises at point M will be the biggest beneficiaries.

4.2. Revitalizing Inventory of Materials and Reducing Inventory Costs

Because of the role of benefit reduction of the inventory, enterprises used to go along the idea of minimizing the total inventory to optimize structure of payables, speed up capital turnover rate and reduce inventory costs and others. The status quo of huge amount of total inventory of supplies cannot be completely reversed within a short time. If goods in stock are used as collateral to raise capital from financial institutions, the inventory of materials will be efficiently used in the warehouse. Because it is not necessary to wait for the realization until the end of finished goods trade, the cash flow rate of the enterprises will be increased and the risk of capital chain rupture will be reduced, thereby greatly protecting the enterprises' steady production. The feasibility analysis of this approach is as follows:

First, relative to other SMEs, the chemical companies at point M are mostly private units above designated size. Their strength is relatively strong, and their production, sales, earnings and other situations are more stable. Their strong solvency and high degree of credibility make them the object of lending of financial institutions. If the enterprises reach an agreement on this business of financial services with financial institutions, the financial institutions will have another new profit growth point. More important is that the business will greatly ease the pressure on operators caused due to overstock. So for both sides of the financing, the business has a win-win situation.

Second, new energy and new materials are widely used. When the supply is less than the demand in the market, sales growth is guaranteed, and the price fluctuation is smaller; the prices of equipment and spare parts are generally fixed. And because when they are not installed to the production line, they can also be considered inventory of movable property, so the same as chemical raw materials and finished products, they are equally in the normal trade flow state and in line with the credit conditions of mortgage finance for mortgage marks. In the specific operation, we may use a third party as guarantee (for example, when Northwest chemical companies use the loan to buy large-scale production lines, they all invite a high-credit-level third-party company as a credit guarantee to apply for loans from banks). In every business transaction, financial institutions may provide financing to businesses according to the percentage of recent or long-term futures prices of chemical raw materials, fair market prices of equipment and spare parts and others for the reference.

5. Countermeasure Analysis---very Large Scale Chemical Groups

The ultra-large-scale chemical groups are oligopolistic firms (such as Sinopec, etc.) formed through forward and backward integration. Self-contained production, sales, storage and other systems of a single economic entity can achieve economies of scale. At this time, the marginal cost of outsourced storage is greater than that of a single enterprise's own storage. Due to many reasons, this paper does not involve structural reform and other sensitive issues.

5.1. Improving Inventory Management Efficiency by using Modern Information Technology based on Simulated Decentralization Structure

Structural units whose organization is divided according to the production stage (process) benefit to giving full play to the capacity of equipment and the professional expertise of technical personnel. They facilitate maintenance of equipment and supply of raw materials, and are in line with the actual needs of enterprises of continuous flow production.

Compared with other organizational structures, the biggest advantage of simulated decentralization structure lies in its ability to adapt to the growing production scale of northwest chemical companies. It can induce executives to divide powers to managerial personnel at the level of production phase, thus avoiding the blind intervention by the top leaders who are not familiar with daily storage operations toward inventory management activities. The supervisor responsible for storage department, because of having a certain decision-making power, can greatly improve his sensibility of response in dealing with the problems in inventory control and decision-making process.

To determine whether an organizational structure is in line with the characteristics of chemical manufacturing industry, it will need comparison with the three-level flow control structure to see if the structure meets its flow characteristics. The simulated decentralization structure is an organizational structure that corresponds with three-level flow control structure.

Problems with regard to organizational structures of northwest chemical production enterprises cannot be completely eradicated only by simulated decentralization structure, because each organizational structure has its flaws. Overcoming of birth defects of simulated decentralization structure requires the help of modern information technology.

Through application of advanced information technology, according to internal and external environment with real-time changes and temporary short-board links occurring randomly in work, the tasks of each storage staff in a certain period of time may be determined and adjusted timely. This dynamic management and operation pattern is conducive to the achievement of the "ant effect" of storage operations so as to achieve the target where human resources are fully utilized and equipment is operating at full capacity.

With the help of information technology platform, real-time upload and summary of material demand information and other information at all stages of production will be achieved. Through information sharing, procurement, production, sales and storage departments can form a consistent picture of the enterprise, so that the various departments of the enterprise can maintain a state of linkage. Operating personnel at all levels of the storage system of the chemical manufacturer can also achieve effective communication with their service objects based on the information platform, arranging inventory production and adjusting storage program. Enhancement of adaptability of storage systems can effectively prevent the occurrence of disconnection of supply and demand.

In addition, through information technology, corporate executives can effectively monitor the work performance of storage department, and they will be capable of correcting the existing problems in a timely manner. This will effectively prevent the negative effects caused by the selfish departmentalism brought about due to decentralization on the production and operation, so that the storage department will fully serve the overall objectives and interests of the enterprise.

When screening information systems, we have to choose the system that complies with industry characteristics and actual production needs of the enterprise. Process control technology is the most critical factor for chemical production enterprises to win the competition. Aiming at the characteristics of the Northwest chemical production enterprises, we should not choose generic ERP or MRP Ⅱ (traditional ERP or MRP Ⅱ are developed based on the prototype of discrete enterprises, and they don't have the characteristics of process industry; this causes difficulties in modeling of accurate mechanism, insufficient amount of data and calculation, makes it difficult to handle the information of complex processes, makes it unable to cope with a large number of uncertain factors and others, while CIPS can satisfactorily solve the problem.). Therefore, the first choice of northwest chemical production enterprises should be CIPS system. The longitudinal ladder operation structure of

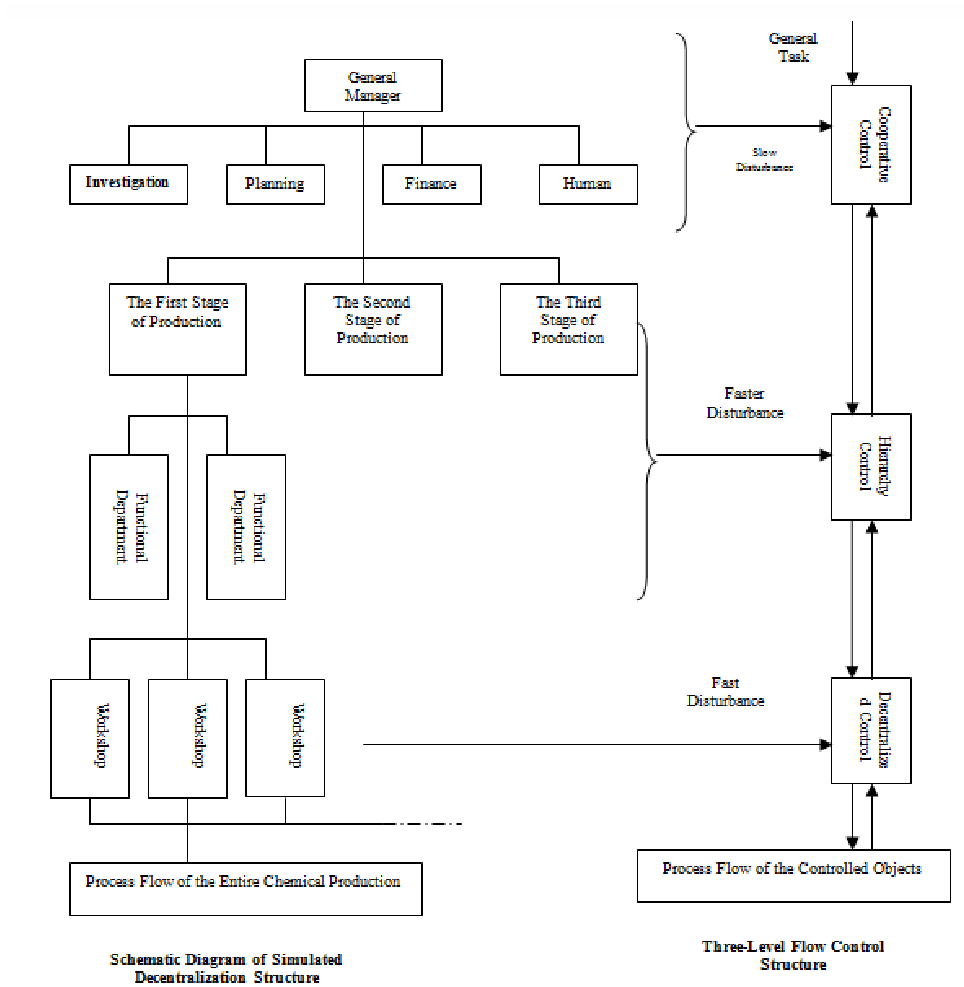

Figure 5-1. A Reciprocal Figure between Simulated Decentralization Structure and Three-level Flow Control Structure S

CIPS (basic control level, optimization level, scheduling level, management level, operation and decision-making level, etc.) just fits the hierarchical governance structure of northwest chemical production enterprises.

5.2. Establishing Storage Scheduling Department and Integrating Logistics Resources within Enterprises

If the storage scheduling department serves as the logistics control center within the enterprise, various logistics costs of the enterprise can be calculated and analyzed clearly and comprehensively after being summarized in the storage scheduling. Through unified billing, the actual cost of logistics of the enterprise can be correctly grasped from the inside. It can help avoid incapability of conducting comparative analysis with regard to logistics costs between enterprises and avoid incapability of really measuring the relative logistics performance of various enterprises. And the internal storage, transportation and other subsystems of logistics will also be effectively integrated to improve the adaptability of the internal logistics system of the enterprise.

But it should be noted that the resulting broken reporting relationship between storage department and production department will bring a non-cooperative game, because the production department expects that the larger the inventory is, the better it will be, while storage department hopes that the smaller the inventory is, the better it will be.

5.3. Improving the Multi-cycle Management Model of Depot Spare Parts

Because chemical equipment is usually purchased by complete set, the equipment suppliers are also spare parts suppliers. According to the system of regular maintenance of equipment, the spare parts divided by the production lines are all purchased in bulks in order to save costs. Minimum inventory of spare parts is usually determined in this approach: $Q_{\min} = h \cdot Q_p$ (where $Q_{\min}$ is the minimum inventory, h is the insurance coefficient, and Q_p is the single entry economic quantity). The bottom line of any spare parts inventory is its reorder point, as a result, we believe that the determination of minimum inventory should be based on reorder point. With this as a theoretical basis of modeling, we make improvement for the multi-cycle management model of depot spare parts.

5.3.1. Using AHP Method to Determine the Priority: Based on the difference in property values of spare parts, we need to conduct treatment of standardization, for this purpose, we established the index system of spare parts as shown in Table 5-1.

Table 5-1. The Index System of Spare Parts

Symbols	Property Name	Standardization Treatment
f_1	Shortage Cost	$r_{i1} = \frac{a_{i1} - \min_i(a_{i1})}{\max_i(a_{i1}) - \min_i(a_{i1})}$
f_2	Production Line Penetration	$r_{i2} = \frac{a_{i2}}{\max_i(a_{i2})}$
f_3	Average Useful Life	$r_{i3} = \frac{\max(a_{i3}) - a_{i3}}{\max_i(a_{i3}) - \min_i(a_{i3})}$
f_4	Procurement Cycle	$r_{i4} = \frac{a_{i4}}{\max_i(a_{i4})}$
f_5	Inventory Cost	$r_{i5} = \frac{a_{i5}}{\max_i(a_{i5})}$
f_6	Procurement Cost	$r_{i6} = \frac{a_{i6}}{\max_i(a_{i6})}$
f_7	Maintenance Cost	$r_{i7} = \frac{a_{i7} - \min_i(a_{i7})}{\max_i(a_{i7}) - \min_i(a_{i7})}$

The standardized property values of equipment are aggregated to obtain matrix A of property values.

$$\mathrm{A} = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{17} \\ r_{21} & r_{22} & \cdots & r_{27} \\ \vdots & \vdots & \cdots & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{n7} \end{bmatrix}$$

In accordance with the relative property importance of spare parts, the warehouse keeper looks up the scale table of judgment and determines the judgment matrix B:

$$B=\begin{bmatrix} 1 & 3 & 3 & 5 & 7 & 6 & 9 \\ 1/3 & 1 & 1 & 3 & 4 & 3 & 3 \\ 1/3 & 1 & 1 & 2 & 5 & 2 & 3 \\ 1/5 & 1/3 & 1/2 & 1 & 5 & 3 & 5 \\ 1/7 & 1/4 & 1/5 & 1/5 & 1 & 1/5 & 5 \\ 1/6 & 1/3 & 1/2 & 1/3 & 5 & 1 & 5 \\ 1/9 & 1/3 & 1/3 & 1/5 & 1/5 & 1/5 & 1 \end{bmatrix}$$

Process the judgment matrix with root method:

$$M_i=\prod_{j=1}^{n} b_{ij}\,,\ \overline{M_i}=\sqrt[n]{M_i}\,,\ w_i=\frac{\overline{M_i}}{\sum_{j=1}^{n}\overline{M_j}}\,,\ i.j=1,2,\cdots,n;\ n=7$$

Obtain the relative weight vector of the properties:

$$W=(w_1,w_2,...,w_7)^T \quad i.j=1,2,\cdots,n$$

After approximate calculation of maximum eigenvalue and consistency test, we get:

$$\lambda_{\max}=\frac{1}{n}\sum_{i=1}^{n}\frac{(AW)_i}{w_i}$$

$$C.R.=\frac{C.I.}{R.I.}=(\frac{\lambda_{\max}-n}{n-1})/R.I$$

If $C.R.\le 0.1$, then the test results are consistent, we will use this judgment matrix [8].

The ranking results reflect the importance of spare parts, and they are also the basis for the development of safety stock structure and tolerable risk level of stockout. We conduct the ranking calculation of properties according to Table 5-2.

Table 5-2. Property Ranking Table

Property f / Equipment S	f_1 f_2 …… f_7	Ranking Result
	w_1 w_2 …… w_7	$\sum w_j \cdot r_{ij}$
S_1	r_{11} r_{12} …… r_{17}	
S_2	r_{21} r_{22} …… r_{27}	
⋮	⋮ ⋮ ⋮	
S_n	r_{n1} r_{n2} …… r_{n7}	

5.3.2. Establishing Goal Programming Model: Suppose the inventory cost of the i type of equipment is b_i, the stock out cost is c_i, the inventory area used is v_i, the order point is ROP_i, the existing inventory is x_i, the total area of inventory is V_0, the maximum amount of inventory is K_0.

N kinds of equipment are designated as m layers, and to the jth layer there contains an accumulative total of $J_{(j)}$ objectives. Assign priority P_j $(j = 1,2,\cdots,m)$ according to the importance and the results of the size of the sorted results.

Suppose $P_1 \succ P_2 \succ \cdots \succ P_m$;

We obtain the objective function:

$$\min Z = \sum_{j=1}^{m} P_j \sum_{i=J_{(j-1)+1}}^{J_{(j)}} (k_i \cdot d_i^+ + c_i \cdot d_i^-)$$

$$s.t \begin{cases} x_i = ROP_i + d_i^+ - d_i^- \\ \sum_{i=1}^{n} v_i \cdot x_i \le V_0 \\ \sum_{i=1}^{n} k_i \cdot x_i \le K_0 & i = 1,2,\ldots,n \\ d_i^+ \cdot d_i^- = 0 \\ x_i, d_i^+, d_i^- \ge 0 \qquad x_i, d_i^+, d_i^- \in Z^+ \end{cases}$$

Equipment failure obeys poisson’s distribution; here it is replaced with the normal distribution:

$$ROP_i = \overline{R} \cdot \overline{L}_t + Z \cdot \sqrt{\overline{L}_t \cdot \sigma^2{}_R + \overline{R} \cdot \sigma_{L_t}{}^2} \quad [9]$$

Where $\overline{R}$ represents the average daily / weekly demand, σ_R represents the standard deviation of average daily / weekly demand, L_t represents lead time, $\overline{L_t}$ represents the average of lead time, σ_{L_t} represents the standard deviation of lead time, Z represents the standard normal distribution under the conditions of short supply, in which each parameter of ROP is decided by the ranking results and the actual inventory control policies of the chemical production enterprises.

When the software like lingo8.0 and others are used for calculation, if there are several globally optimal solutions in the results, we can reasonably select experimental conditions according to the actual situation of the chemical enterprises and use the orthogonal experiment method for optimization again; if there appears partial or no optimal solution, the constraints will need to be re-adjusted.

The inventory control of raw materials is also a problem that very large chemical companies should pay attention to in the storage. But on this point, we believe that Li Xuerong and Zhang Jie’s Improved Model on Dynamic Bulk Inventory Control [10] has solved the problem, so we will not describe it here.

6. Conclusions

According to the industry characteristics of chemical production, this paper summarizes the existing problems demanding prompt solution in the storage management of northwest chemical companies; through SAD modeling analysis, the key entities in the problem clusters are peeled off; then the object of study is divided into two categaries according to size and industry environment. According to the forecast of demand of chemical product market by logistic curve, the viewpoints are proposed that units at point M should make full use of the outsourcing resources to achieve economies of scale of storage and effectively support enterprise development; ultra-large units should have a foothold with respect to their own storage building, so that the storage system within the enterprise can step close toward optimization. Among all, the paper mainly discusses the pathways by which enterprises achieve economies of scale of storage under the background of the construction of chemical industry park; it demonstrates the feasibility of organizational restructuring by very large chemical companies via simulated decentralization structure. Improved multi-cycle inventory management model is proposed aiming at irrational spare parts structure of chemical inventory. Deficiencies in this paper include: the research scope is confined within the enterprises, and the storage operations in the whole industry chain are not considered; chemical storage planning, equipment selection and other issues are not covered; specific operation procedures of chemical storage are not deeply analyzed.

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