

# Discussion on Material Management Optimization of Large Power Generation Enterprises Based on Watershed Management

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**Abstract:** This paper analyses the management of power production materials in basin hydropower enterprises, discusses the current situation and existing problems of power production materials management in Yalong River Basin, and formulates corresponding measures for power production materials management, so as to provide important reference for power production materials in basin hydropower enterprises.

## 1. INTRODUCTION

The management of power production materials is an important component of the production management of power generation enterprises. It refers to an enterprise operation activity that organizes, plans, coordinates and controls various materials that need to be ordered, transported, stored and supplied in the normal operation of power enterprises. It is also an important part of the management of power enterprises [1][2][3].

The main business of Yalong River Basin Hydropower Development Co., Ltd. is hydropower and new energy power generation. According to the authorization of the National Development and Reform Commission, it is responsible for the development of hydropower resources in Yalong River Basin and the implementation of operation management in a new mode of 'basin, group and scientific'. At the same time, Yalong River Company actively promotes the construction of Yalong River Basin water scenery complementary green renewable energy demonstration base, and strives to build Yalong River clean energy brand. With the commissioning and power generation of Lianghekou and Yangfanggou hydropower stations in the middle reaches of the Yalong River, and the construction of green, clean and renewable energy demonstration base with water, wind and solar complementary in the Yalong River basin, the management of power production materials must also carry out related management work in the mode of 'basinization, collectivization and scientization', so as to provide guarantee for the power production of the Yalong River and contribute to the safe and stable operation of the Southwest Power Grid.

## 2. CLASSIFICATION OF ELECTRICAL PRODUCTION MATERIALS

Power production materials can be divided into supplies,  
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materials, low-value consumables three categories.

### 2.1. Supplies

The equipment mainly includes mechanical equipment, electrical equipment, protection and monitoring equipment, communication and network equipment, regulators, actuators, measurement and analysis instruments, optical instruments, calibration experimental instruments and devices, testing machines, testing instruments, electrical experimental instruments, laboratory equipment and other categories.

Supplies can be divided into single-source and competitive supplies according to procurement methods.

The characteristics of competitive spare parts are that spare parts have a wide range of applications, the sales model is dominated by intermediary agents, the market price is not particularly transparent and the unit value is relatively high, such as electric ball valves, submersible pumps, circuit breakers, current transformers, power transmitters, pressure transmitters and monitors.

The feature of single-source spare parts is that the access to spare parts is single, and spare parts can only be purchased directly from manufacturers or integrators due to quality control or functional matching.

### 2.2. Material

Materials by functional classification, agriculture, forestry, animal husbandry and fishery products, building materials, thermal insulation materials, fuel oil, sealing materials, fasteners, welding materials, hardware products, sealing materials, electronic components, electrical equipment and other categories; according to the material classification, chemical products, petroleum products, rubber and plastic products, black metal materials, non-ferrous metal materials and other categories.

Materials are characterized by large demand for

materials, high frequency of use, low unit value, and sufficient market competition and transparent price.

### **2.3. Low-Value Consumables**

Low-value consumables include labor protection supplies, cultural and educational and office supplies, office equipment, daily necessities, food, beverages, medical supplies, daily appliances, commonly used hand tools, electric, pneumatic tools, measuring, cutting tools, machine tools, pneumatic welding tools, weighing machinery, fire fighting equipment, transportation tools, lifting tools, packaging equipment and other categories.

Low value consumables have the same characteristics as materials.

## **3.ELECTRIC POWER PRODUCTION MATERIAL MANAGEMENT SYSTEM**

### **3.1. Requirements Plan**

The planned management of material procurement is implemented, and non-planned procurement is prohibited without approval. In addition to emergency disaster relief and emergency flood control projects, annual bidding or procurement plans are included for reaching the bidding scale. In the implementation of the plan, it is necessary to add, in accordance with the principle of 'one thing a batch' to the higher level units to declare adjustment [4][5].

### **3.2. Material Procurement**

Industrial e-commerce procurement materials, low-value consumables, sub-station sub-bid section catalogue list bidding or on-demand multi-batch sporadic procurement of competitive supplies, single source procurement of single source supplies. The procurement of single-source materials with major equipment manufacturers has not been carried out through the framework agreement.

### **3.3. Warehouse Management**

Each power plant independently carries out material storage, inventory, warehousing and other warehousing work according to the principle of territoriality, does not carry out warehousing sharing work such as the Fed of each power plant, does not formulate relevant systems for material warehousing management, standardize warehousing standards, especially dangerous chemicals.

### **3.4. Scrap and Disposal**

The centralized and unified management of waste materials follows the principles of resource conservation, environmental protection, priority repair and use or internal adjustment and utilization. Selling method is divided into listing transactions, through the property rights trading institutions open and according to its rules

to determine the dealer. Waste materials are sold by listing in principle. Disposal of hazardous chemicals by bidding to determine the entrusted disposal units to carry out scrap work.

### **3.5. Information Support**

Each power production unit through the power production management information system to carry out material demand planning management, material acceptance, warehousing management, scrap management, through directory procurement and e-commerce system procurement of materials has completed the production management system and supplier data docking. At present, the bidding of material management and the procurement of inquiry and comparison are carried out on the electronic procurement platform of the national investment. It is also necessary for the group to clarify the way of docking data, and its data and process basically form the informationization of material management covered by the whole business link. At the same time, Ertan power station has completed warehousing intelligent work, Lianghekou, Yangfanggou, Tongzilin power stations have been implementing warehousing intelligent construction work, Jinping, Guandi power plants have been carrying out related research work.

## **4.PROBLEMS AND SHORTCOMINGS**

At present, Yalong River electric power production materials do not implement fully intensive management, lack of overall material management, management efficiency has room for improvement, electric power production materials inventory overall presents the characteristics of 'high inventory, high storage age, weak liquidity.' The specific deficiencies and problems are as follows:

### **4.1. Intensive Management of Electricity Production Materials Has Not Yet been Achieved and the Role of Integrated Watershed Management Has Not been Fully Played**

(1) Each electric power production unit completes the demand plan declaration by departments and units, the demand in the factory is not in place, the control is not strict, the headquarters is not in-depth understanding of the site demand, the lack of professionalism of material procurement, and the lack of professionals, which is not conducive to the overall management of enterprise materials.

(2) The procurement cycle of single-source spare parts is long. Affected by market price fluctuations and technical barriers to spare parts, the unit price increase of some single-source purchases is large, which also leads to an increase in inventory.

(3) There is no shared reserve of general-purpose equipment in each power plant basin, and there is no joint reserve mechanism between the main equipment

manufacturers. From the perspective of watershed, there are problems such as repeated procurement, low utilization rate and insufficient utilization of resources.

(4) Each unit in the scrap and disposal process still needs to communicate with the exchange alone, which is not conducive to on-site burden reduction and corporate co-ordination; after power production materials are scrapped, the waiting time for evaluation and disposal is too long, and the storage pressure of production waste materials is large. The management of hazardous waste is managed by the power plants themselves, and the pressure of environmental protection is great.

(5) The material management time of each power plant accounts for a large proportion, squeezing the energy and time of equipment management, which is not conducive to on-site production.

#### **4.2. Weak Institutional System of Power Production Materials**

The related system requirements of each link of material management in electric power production are scattered, weak and missing. There is no operable system and standard for material management departments. At the same time, no corresponding assessment requirements are formulated, and the direction of material management is not clear [6].

#### **4.3. Insufficient Informationization of Material Management in Individual Business Scenarios and Inconsistent Warehousing Intelligent Standards**

At present, the material management bidding and inquiry price procurement are carried out on the electronic procurement platform of the national investment, and the group needs to clear the docking data mode to complete the informationization of the whole material management business link. At the same time, Ertan power station has completed the first phase of warehousing intelligent work, Lianghekou, Yangfanggou, Ertan power plant in the second phase of the implementation of warehousing intelligent construction work, Jinping, Guandi power plant has carried out related research work. The intelligent mode and standard of power station which has implemented intelligent storage are not unified, and the intelligent management standard of field storage is not unified.

### **5.MAIN IDEAS OF MATERIAL MANAGEMENT**

According to the material management principle of 'unified management, centralized procurement, warehouse sharing and territorial responsibility', the company carries out the optimization and upgrading of material management in electric power production, establishes the material management system of river basin coordination, coordinates the work of material demand, procurement, storage, allocation and scrapping,

forms the agreement reserve mechanism of river basin power plant federal reserve and manufacturer, optimizes the inventory structure and reduces the inventory amount.

### **6.MAIN MEASURES OF MATERIAL MANAGEMENT**

The specific material schemes are formulated in accordance with the principles of basinization, collectivization and scientization, so as to ensure the basinization, intensification and specialization of power production material management, promote the workshop management of power production, and reduce the pressure on field production. The specific measures are as follows.

#### **6.1. Deepening the Material Management System**

(1) Set annual assessment indicators of each unit

The company sets the inventory control index of power production materials, and decomposes the inventory task of power production materials to the production units in the Yalong River Basin, which is included in the annual performance appraisal of each production unit. Stimulate the enthusiasm of inventory management and control of production units, promote the purchase plan of declaration materials on demand, and actively digest and utilize the backlog of power production materials in each station of the basin.

(2) Construction of material management system

Combined with the material management requirements of the company, the material management system of the company's electric power production is prepared and released. The management requirements, processes and standards of the material budget, demand plan, procurement management, material acceptance, storage management, scrap and disposal are clarified. The cost control is further strengthened, the material management process is standardized, and the management orientation of the company is clarified, so that the material management of each production unit can be based on.

(3) Formulate the inventory of spare parts shared by the whole basin

The technical personnel of each power station are organized to sort out the spare parts based on years of equipment operation and management experience. Some equipment and systems of each power station are produced and supplied by the same manufacturer. The spare parts that can be mutually universal and have high value are identified, and the inventory sharing spare parts list of the whole Yalong River basin is determined. In the list, the number of shared purchases and reserve locations are defined to reduce the number of purchases and duplicate reserves through inventory sharing, so as to achieve inventory optimization.

(4) Establishment of a federal reserve sharing mechanism for power production materials within enterprises

The establishment of power production materials sharing warehouse, the implementation of regional warehouse joint reserve, the power station can be shared by the federal reserve, sharing materials are still belong to each power station. Other power plants have material transfer requirements, can be approved by the company in the material management system across units for shared warehouse inventory allocation. Through the inventory sharing mechanism, the production cost can be effectively controlled and the inventory can be reduced.

(5) Strong implementation of the framework agreement on single-source supplies

Vigorously promote the single source of spare parts framework agreement, in the form of signing the framework agreement to establish and consolidate the strategic cooperation relationship with the main single source of spare parts manufacturers, clear spare parts list, maintain the relative stability of the price, to ensure the scene emergency needs.

## 6.2. Strengthening Daily Management of Materials

(1) Unified material coding system and establish long-term maintenance mechanism of material coding

Combing and analyzing the business systems of enterprises, comprehensively coordinating the coding requirements of the system, considering the unified coding requirements in the industry, the unified coding classification and object are planned, and the unified coding standard system framework is designed. At the same time, it is necessary to strengthen the regular maintenance of material coding, organize the data cleaning of each unit's material coding in the flood season every year, clean up the problem coding in this year, and stop the coding with inventory of 0 and no longer used for more than two years, so as to ensure that the coding applied by each unit does not have problems such as coding recoding, error and expiration.

(2) Strengthen warehouse inventory

In order to avoid invalid and useless materials occupying storage resources, each electric power production unit is organized to carry out inventory material cleaning in the flood season every year, and the useless materials are identified and scrapped in time to effectively reduce the invalid inventory.

## 6.3. Carry Out Intelligent Material Management

(1) Research on watershed intelligent storage standards and application promotion

The company has completed the intelligent storage construction of Ertan power station, and the intelligent storage construction of Lianghekou, Yangfanggou and Tongzilin power stations is also actively promoted. The intelligent storage construction modes of each power station are different. The relevant model research is carried out to form the company's river basin intelligent storage standard and promote it in other power stations in the river basin, so as to improve the utilization rate of materials and the intelligent level of warehouse

management in the whole Yalong River basin. [4]

(2) Research on the application of big data in material management

Based on the big data of material management accumulated in intelligent storage system, the big data of material is deeply excavated by using big data technology and artificial intelligence technology. The laws of material procurement and use in time dimension are summarized and refined. The formulation of material procurement plan and inventory quota are guided and optimized to realize the planning, organization, coordination and control of the whole process of material procurement, warehousing, inventory, outbound, use and maintenance.

## 7. CONCLUSION

Based on the results and discussions presented above, the conclusions are obtained as below:

With the construction of water, wind and solar integration base in Yalong River Basin, the scope of power production materials will gradually change from hydropower and power production materials to hydropower, wind power and photovoltaic power production materials. The increase of power production stations will make the material management of watershed power production urgent. Establish the material management system of basin co-ordination, co-ordinate material demand, procurement, storage, allocation, scrap and other work, form the basin power plant federal reserve, manufacturer agreement reserve mechanism, optimize the inventory structure, reduce inventory.

## ACKNOWLEDGMENTS

The joint fund of National Natural Science Foundation of China (NSFC) & Yalong River Hydropower Development Company, Ltd. (Abbreviation: Yalong River Joint Fund; project approval No.: U1965106) is acknowledged.

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