

# Study on the Path Improvement of Materials and Equipment Basic Management Level of Power Grid Company

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## Abstract

Basic management is the basic skill of companies in the production and operation activities, which is directly related to the level of the company management and the survival and development of the enterprise. In this paper, the Key Success Factor method and Fishbone Diagram are used to diagnose the basic management problems of power equipment materials, analyze the root causes of the problems, and put forward the key path to solve the problem, promotes the improvement of the overall basic management level of the power grid company, which is of great significance to the high-quality development of the company and the power grid.

## Keywords

Power Equipment and Materials; Basic Management; Key Success Factor; Fishbone Diagram.

## 1. Introduction

As an important part of the comprehensive management system of enterprises, basic management plays a more and more important role in building socialist modernization and promoting the high-quality development of enterprises in the 14th Five-Year Plan. In terms of national strategy is concerned, with the continuous advancement of China's reform and opening up and the in-depth economic development in the world, China's electric power industry is also facing the need to be in line with the world economic globalization and integrate into the trend of internationalization. According to data released by the National Energy Administration, China's electricity consumption is increasing year by year, and the huge electricity consumption cannot be separated from the support of power supplies. As far as the development of the power industry is concerned, the management of equipment and materials is the foundation of the construction and operation of power grid companies, the lifeblood of ensuring national energy security and national economy, and undertakes the mission of providing users with safe, reliable and stable electric power[1]. And a wide variety of huge demand plays a vital role in national life. As far as company management is concerned, equipment and material management, as an important part, undertakes the responsibilities of material supply, cost control, asset management and so on, which has an important impact on the work efficiency and economic income of enterprises. Therefore, in order to adapt to the new international trend and situation, promote the sustainable development of the national economy, and improve the core competitiveness of the company, it is necessary to carry out research on the basic management of equipment and materials, and improve the basic management level of the company.

## 2. Identification and Cause Analysis of Power Materials and Equipment

### (1) Identification of influencing factors

This paper summarizes 20 main factors affecting the basic management level from materials, equipment, personnel and environment, as shown in Table 1.

**Table 1.** Main factors affecting the basic management level

Classification	Influence factors
Equipment management	Equipment management cost is high
	Production tasks and personnel are insufficient, and the production bearing capacity is overloaded
	There are many hidden dangers of EHV equipment
	High-quality and lean maintenance needs to be strengthened
	Equipment quality control needs to be comprehensively strengthened
	On-site operation risk control needs to be strengthened
	The essential safety level of the equipment is not high, the first set of equipment of the main network is widely applied, and the failure probability is high
Material management	Fire-fighting capacity needs to be improved
	Optimize the business environment under great pressure to withdraw payment for goods
	There are hidden dangers in the equipment manufacturing quality
	There are still certain difficulties in implementing the procurement standards, and the bill of material needs to be optimized
	The construction and application of modern smart supply chain needs to be promoted, and the supply chain operation capacity needs to be further improved
	The quality control capacity needs to be strengthened
	The consumption and utilization rate of inventory materials needs to be improved
Personnel management	There is a risk to the contract settlement
	The team structure is unreasonable, and the basic organization and personnel work needs to be further strengthened
	Personnel assessment and evaluation system needs to be improved
Environment	The comprehensive quality of employees and their ability to perform their duties need to be improved
	Meteorological changes are complex and natural disasters occur frequent
	The business forms are complex and changeable

### (2) Identification of key factors and cause analysis

In terms of personnel management, the comprehensive quality of employees and the low ability to perform their duties are the bottleneck restricting the improvement of basic management level. Employees are the executors of the system, the operator of the business process, and insufficient employee competence will affect all aspects of basic management. In terms of equipment management, there are hidden dangers in the equipment, which will increase the workload of maintenance and even pose safety risks; equipment maintenance and inspection are the guarantee of their normal work; site operation risk control should not only promote the project progress, but also take safety precautions to prevent safety accidents, the importance is obvious. In terms of material management, procurement is the first link. A series of links such as the formulation of the procurement plan, the implementation of the standards and the determination of the list of materials will have an impact on the follow-up work. Quality is the

primary condition, Therefore, the hidden danger of equipment manufacturing quality and quality control ability as one of the key influencing factors. In addition, the construction of the smart supply chain and the supply chain operation ability are the overall grasp. The problems in the smart supply chain operation ability and information application will greatly reduce the work efficiency of material basic management. In conclusion, Fishbone Diagram is used to detail the key factors causing low basal management, as shown in Figure 1.

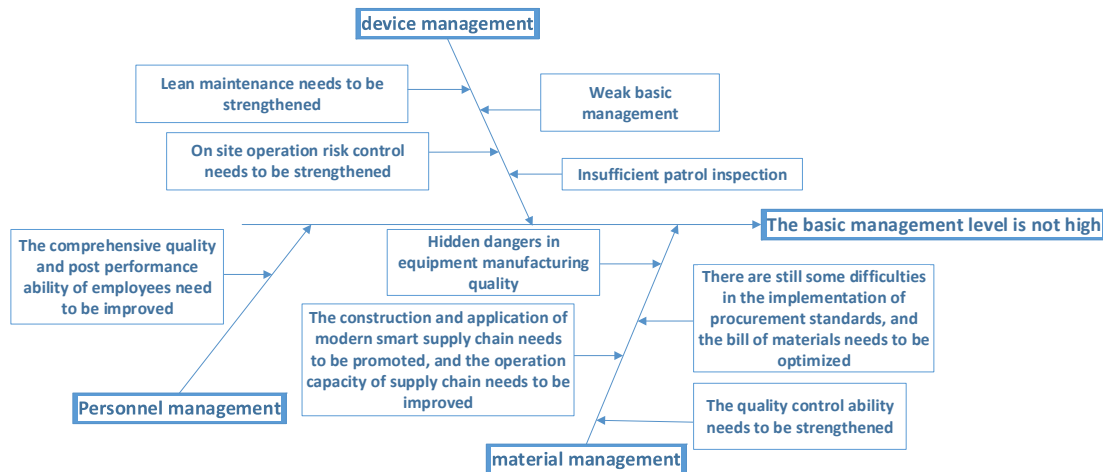


Figure 1. Identification of the key influencing factors

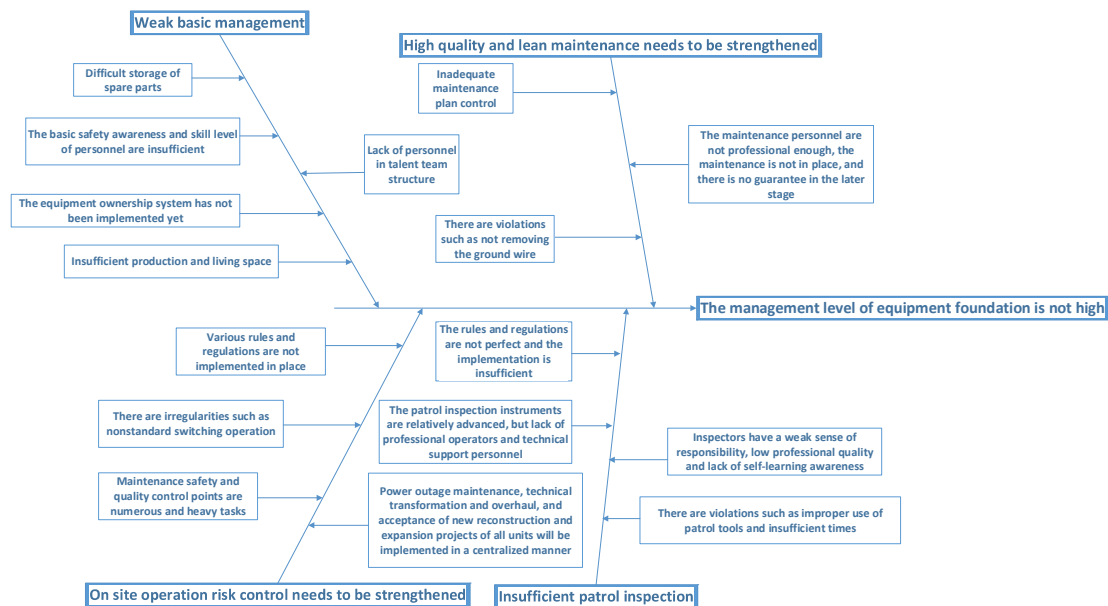
The key influencing factors of the basic management level of equipment are weak basic management, high quality, lean maintenance need to be strengthened, insufficient inspection strength and on-site operation risk control need to be strengthened. Figure 2 details the reasons for the various key influencing factors.

1) Grassroots basic management is weak. The basic safety awareness and skill level of personnel are insufficient, there is still a big gap in organization, infrastructure, instruments and equipment, system and process, talent team, etc, especially the equipment master system has not been implemented in place, production and living housing, spare parts storage difficulties, personnel team structure, to some extent restrict the development of professional basic management.

2) High-quality, lean maintenance needs to be strengthened. The power grid company has much equipment investment and heavy maintenance tasks, and there is still a certain gap with the high quality and lean maintenance level. Mainly because the ① maintenance plan control is not in place. There are non-planned operation and temporary approval, irregular technical operation and safety measures, resulting to major accidents; ② violations such as wire disassembly, sign hanging, unlocked box door, temporary fence, leakage recovery wiring, dismantling test line (ground line) and inadequate recovery of isolation measures.③ maintenance personnel of insufficient professionalism, maintenance is not in place, later is not guaranteed.

3) Patrol inspection intensity is not enough. Due to the large number of power equipment, the inspection and inspection work has increased a certain difficulty, and various problems are also highlighted, including the more prominent should be personnel, technology and management problems.① Inspectors have no strong sense of responsibility, low professional quality, and a lack of self-learning consciousness.② The inspection instrument is relatively advanced, but it lacks professional operators and technical support personnel.③ Rules and regulations are not sound, the implementation is insufficient, there are improper use of inspection tools and insufficient number of violations.

4) The onsite operation risk control needs to be strengthened. The low level of risk control on the operation site is mainly due to the irregularities such as irregular gate operation, the large quantities and heavy tasks of maintenance safety and quality control points, and the inadequate implementation of various rules and regulations.



**Figure 2.** Fish bone map analysis of the key influencing factors of equipment basic management

The key influencing factors of the low basic level of material management areas follows. 1) the procurement standard has certain difficulties, the material list needs to be optimized; 2) hidden dangers in equipment manufacturing quality; 3) the quality control ability needs to be strengthened; 4) the construction and application of smart supply chain need to be promoted, and the supply chain operation capacity needs to be further improved. Figure 3 details the causes of the key influencing factors.

1) Procurement standards are difficult to implement, and the bill of material needs to be optimized

The causes mainly involve two aspects. First, materials involving environmental conditions (such as low temperature, wind area) and open current 63kA are not included in the scope of preferred materials, and the other is, the inventory categories in some distribution network agreement are complex and some materials are not streamlined enough.

2) Equipment manufacturing quality has hidden dangers

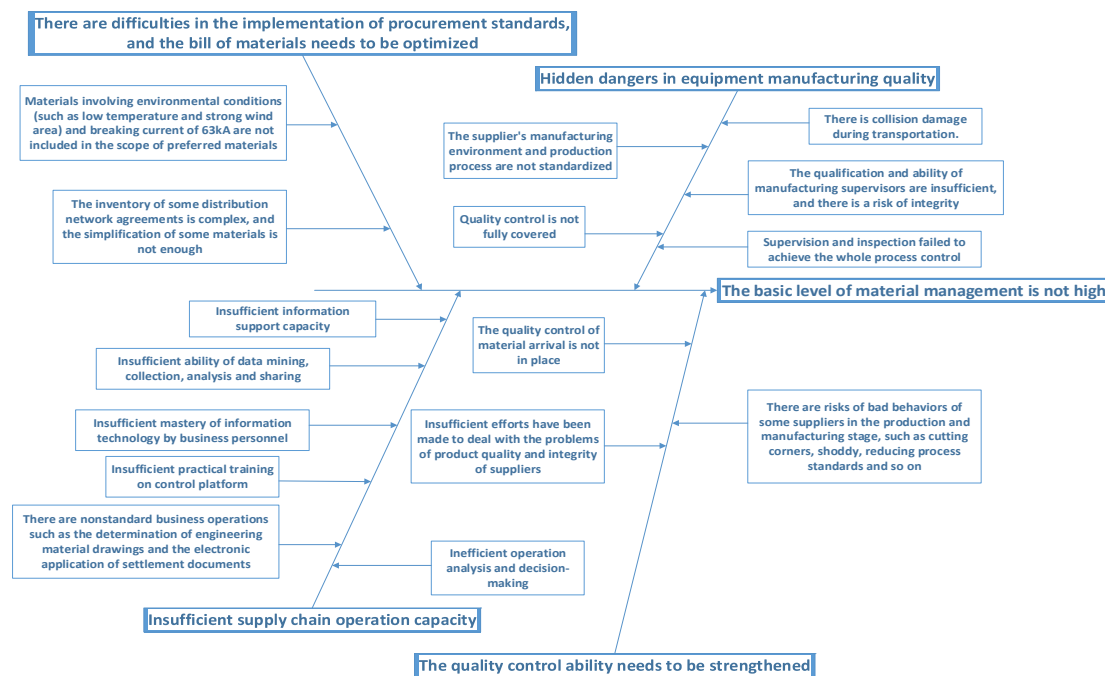
The defect rate of purchased equipment is high, especially the manufacturing quality problems in the main equipment such as reactor, combined electrical and circuit breakers, which brings safety risks to the construction progress and production and operation of the company. The causes focus in production, transportation and quality inspection, irregular supplier production environment, quality control is not fully covered; there is collision and damage during transportation; the supervision and inspection do not achieve the whole process control, insufficient supervision personnel qualification, and the risk of integrity.

3) The quality control capacity needs to be strengthened

① Due to the large price increase of non-ferrous metals such as copper and aluminum, which use more power materials, there may be some suppliers' bad behavior risks such as corners, shoddy and reducing process standards in the production stage, which increases the difficulty

of quality control in the manufacturing stage. ② material arrival quality control is not in place. Sampling inspection and special inspection after arrival are not comprehensive, and some materials have quality defects. ③ The supplier relationship management is not strict enough, there is a lack of a sound supplier qualification verification and assessment mechanism, and insufficient efforts are made to deal with the problems of supplier product quality and integrity. 4) The construction and application of smart supply chain needs to be promoted, and the supply chain operation capacity needs to be further improved

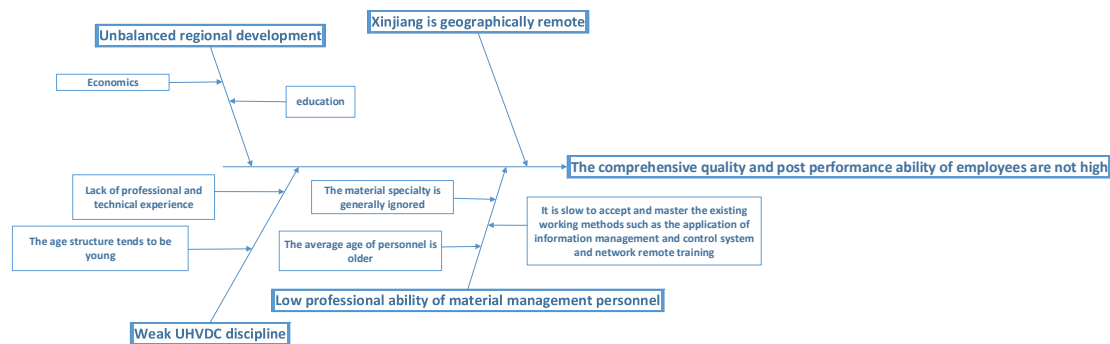
It is mainly due to the insufficient enterprise information support ability and the insufficient data mining, collection, analysis and sharing ability, resulting in the efficiency of operation analysis and decision-making is not high. Secondly, there are non-standard business operations such as the determination of engineering materials drawings and the electronic application of settlement documents, as well as insufficient practical training of the control platform, and the degree of information technology mastery of business personnel is insufficient.



**Figure 3.** Analysis of key influencing factors with low material basic material management level

In personnel management, the comprehensive quality of employees and the ability to perform their duties are the most critical factors. Figure 4 shows the key factors and cause analysis of the low personnel basic management level. The problem is mainly caused external environmental and internal management factors. From the perspective of external environment, the education level and education level in the northwest inland region is not high, causing a certain gap between the comprehensive quality and ability of local personnel and that of the mainland. Moreover, due to the remote geographical location and unbalanced regional development, few graduates are willing to go to the northwest inland region of the northwest inland region. From the perspective of internal management, one is insufficient business skills training, safety operation education; second, in performance assessment, salary lack of incentive, difficult to stimulate the employees of self-learning awareness; third, the daily supervision is not enough, can not fully find employee violations, timely standard. In addition, the insufficient staff ability and quality are also reflected in various departments, Take the equipment department and the material department: ① The UHV DC specialty is weak due to

the younger age structure and lack of professional technical experience. ② The business ability and comprehensive quality of material practitioners need to be strengthened, due to regional factors, and the existing working methods of information control system application and network remote training.



**Figure 4.** Analysis of key factors for low comprehensive quality and low ability to perform duties

### 3. Basic Management Level Improvement Strategy of Electric Power Materials and Equipment

In view of the problems and causes existing in the basic management of equipment and materials mentioned above, the solution strategy can be roughly listed as the following parts.

#### (1) Innovate the management concept

Management concept is the core of enterprise management, is the redefine of management. The first link to improve the basic management level of equipment and materials is the innovation of management concept. We should strengthen the green development concept of power supply chain, the management concept of developing virtual logistics, enhance the management concept of lean six Sigma, promote the concept of reverse logistics management, and enhance the management concept of collaborative cooperation.

#### (2) Actively adopt the lean management mode

Lean management is the use of "lean thinking" by enterprises to provide customers with satisfactory products and services, while reduce the investment of enterprises and minimize waste[2]. The lean transformation of power grid enterprise management is to reduce the waste generated in the procurement, distribution, storage and operation of power materials while providing customers with safe, reliable and stable power guarantee. Specifically manifested in improving the power grid management information system, the establishment of lean distribution system and standardizing the storage facilities and equipment.

#### (3) Strengthen the application of PDCA cycle method in the basic management of power grid equipment and materials

In the planning link, we should first determine the management objectives of optimizing the purchase material list and the material inventory turnover rate, and improve the management level of the power material plan[3]. By implementing plan demand management, formulate scientific and reasonable material management plan, and improve management efficiency. Use the information management system to vigorously promote the information construction of material plan management information. Finally, we should pay attention to strengthening the comprehensive quality of material planning management personnel.

The execution link is conducted according to the plan formulated in the P link and collects the information available for improvement. First, strengthen the management of procurement links. For the key complete set of equipment, if there are design requirements and customized characteristics, the material price database shall be established. Analyze the market trend

changes of such materials by recording information including historical purchase price, purchase time, key design parameters, performance indicators, applicable environment, type selection basis and other information. Second, to optimize the storage and inspection system. Equipment material quality inspection cycle is not fixed, quality inspection time uncertainty, quality inspection transportation cause secondary handling problems, not only cause waste of resources, and delay the construction date of power project, can be power materials warehouse and quality inspection institutions together, form a centralized storage, centralized inspection intensive, lean management mode. Third, timely disposal of waste electric power materials. A single centralized bidding disposal method is bound to increase the disposal cost or cause certain environmental protection risks. Therefore, it requires a detailed analysis and design of the classification and disposal methods of waste materials.

The inspection link is to regularly check the work effect of the D link, evaluate the results of the actual work implementation, and provide help for the decision-making to improve the inventory turnover rate. The inspection link in the basic management of electric power equipment and materials refers to the supervision, inspection and management of material quality and personnel. The introduction of Internet of Things technology in the quality supervision sampling system, the use of two-dimensional code identification technology, global positioning technology, etc., and the establishment of sampling traceability system can greatly improve the material quality supervision and management ability of power grid companies[4]. Modify and improve the management and implementation rules of supplier relationship, strict review of supplier qualification, quality and reputation assessment and on-site inspection should also be strict, multiple inspections, can effectively improve the quality of material supply. But also to implement the accountability mechanism, strengthen the sense of work responsibility of employees.

The action link also becomes a feedback link, the aim to solve the problems found in the C link and output the results to the next P link. The company can establish a mechanism for reverse investigation of quality problems and collect feedback information after the use of materials, so as to reasonably improve the strategy and further strengthen the quality management of equipment and materials.

#### (4) Strengthen the construction of talent team and ability and quality training

First of all, we will deepen the mechanism for selecting and appointing young people, strengthen the introduction of high-quality composite young talents, increase the proportion of composite talents, and constantly deliver fresh "blood" to the talent team. Secondly, establish a talent incentive mechanism, encourage supply chain management talents to carry out technological innovation and management innovation, and stimulate the vitality and power of young talent innovation and efficiency. Finally, we will promote the rotation of professionals in each link of the supply chain, strengthen the communication with related professional departments, and introduce outstanding talents across majors. And continue to strengthen the training of personnel team to promote the professional ability and comprehensive quality of personnel team.

## 4. Conclusion

To sum up, it is important and necessary to optimize the management process of equipment and materials and improve the basic management level. It is an effective measure for power grid companies to improve market profit and enhance competitiveness, as well as a due way to promote the strategic development of the company. Combined with the Key Success Factor and Fishbone Diagram, it finds out the problems in the basic management of equipment and materials, analyzes the causes, and puts forward the solution strategies from the management

concept, management strategy and management methods, which has certain reference value for the management of power grid companies.

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