Research and Application of ERP Management System in Factory Overhaul

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Abstract. With the rapid development of power systems, the reliability requirements for power supply are constantly increasing. How to quickly replace the spare parts of electrical equipment in the event of a power grid failure can be restored in the shortest possible time. It is a problem that needs to be solved urgently. The inherent contradiction between the existing overhaul management mode and the long-term operation and development of the enterprise has become increasingly prominent. The demand for the maintenance mode change has become increasingly pressing for the power supply enterprises. The factory-based overhaul mode has emerged as the time comes, and the ERP efficient management method has been used to strictly control the factory maintenance management system. A series of specific issues such as organizational structure, process control, and resource allocation during the construction process to ensure the quality of power products and the safety and reliability of equipment operations are aspects that power companies need to explore.

1. Introduction
The mode of factory maintenance refers to replacing the equipment to be repaired in a rotating manner and sending the equipment as a whole to the workshop that is specialized in equipment overhaul in the local area. Through a complete overhaul or modification of the equipment, a kind of overhaul that restores or improves the performance of the equipment. Mode. Because there are many differences in process flow and production management between factory inspections and on-site inspections, the inspection and maintenance environment requires stricter requirements and higher process standards. At the same time, personnel management and training also need to reach a higher level. Therefore, in order to ensure the effectiveness of factory-based overhaul work, power supply companies need to construct a set of management systems that are compatible with them, optimize maintenance procedures and management methods, and integrate existing resources to meet the needs of factory-based maintenance work [1]. Management is at the leading domestic level. The construction of the factory-based overhaul management system is closely linked with the current factory-based overhaul mode and conforms to the actual development trend of the power supply company, which is highly targeted and necessary. With the improvement of modern management mode, it is particularly important to adopt advanced ERP management mode to control the process of industrialized overhaul in the whole process. ERP system integrates information technology and advanced management ideas.
in one and becomes the operating mode of modern enterprises. Reflecting the requirements of the times for enterprises to rationally allocate resources and maximize the creation of social wealth has become the cornerstone of the survival and development of enterprises in the information age [2].

2. Establish advanced factory-level overhaul workshop

2.1. Need to have an industrial workshop

The industrialized overhaul platform mainly includes: essential pneumatic and electric dis assembly tools and equipment, as well as special tools, overhaul procedures, related organizations and management departments. During the "factory" inspection process, the general process of factory-based overhaul of dis connectors, circuit breakers, current transformers, voltage transformers, etc., has achieved the expected goals of work, management, and technical standardization, including factory inspections. The base should adopt a centralized management model. The inspection workshop should be equipped with a factory maintenance team to improve the existing management system for factory-based overhaul and achieve institutional control. Generally, dis assembly and overhaul work requires high technical content and quality standards. Therefore, some standards must be established for maintenance. The process is strictly controlled to lay the foundation for the subsequent management and innovation of factory-based overhaul [3].

2.2. Establishing an industrial workshop

According to the development plan of the power company's base, a base was established. The base is located on the edge of the city. Near the railway station, the traffic is convenient, the plot is complete, and the living facilities and electrical equipment are complete. Among them, the original simple warehouse and material pile site block on the east side of the basement occupy a large area and are distributed in an area. Clear, complete land plots, and unrestricted buildings and structures around the site, in line with the conditions for the construction of a "factory overhaul" base. Through the introduction of efficiency monitoring work, based on the actual needs of the primary equipment maintenance business of substations, combined with the lean production methods and the design ideas of the relevant manufacturing plants, the optimized design scheme will connect the internal channels of the base with the outdoor roads to achieve ring production [4]. Channel; In the layout of the plant, the optimized design plan is designed according to the process flow pushing method to realize the station-line production mode of substation equipment, significantly improving the production efficiency of the maintenance base, and avoiding the waste of resources caused by the reversing work of the maintenance workers. At the same time save plant land. The original site within the equipment yard and equipment storage land resources from the integration transformation, the layout of the base is divided into indoor and outdoor two outdoor venues set up outdoor test sites, equipment, turnaround sites and educational training venues. While satisfying the functions of various overhaul services, it has saved construction land to the greatest extent and saved investment costs. The base is fully equipped with professional settings, including power grid equipment maintenance test halls, maintenance and purification halls, smart equipment debugging rooms, insulating oil testing rooms, sulfur fluoride gas concentration treatment rooms, insulating oil testing laboratories, metalworking workshops, and battery rotation maintenance rooms. Electronic education training room, spare parts warehouses and other equipment [5].

2.3. Improve the Process of Factory Overhaul Workshop

(1) Create a business process model for a factory inspection workshop

The six major core businesses under this model are sorted out for the use of factory-based overhaul mode for the power grid equipment to repair the part of the application process. They are to formulate equipment maintenance and power outage plans, on-site inspection and maintenance equipment, to formulate maintenance and consumption plans, and to purchase spare parts, Demolition of field equipment and equipment factory overhaul. In order to ensure the smooth development of all aspects
of factory-based maintenance, it is also necessary to take the core business as a starting point, draw a standard workflow diagram, and explain the key nodes of the process, thus ensuring the implementation of the business process control, and ultimately achieving industrialization the effective operation of the overhaul mode.

(2) Achieve factory control workshop process control

In order to reduce the ineffective time of non-increment in the work process as much as possible to shorten the entire process time and reduce the waste of time, in the above research, the standard work flow was established for each core business, and the key node description table of the work flow was given to clarify the process. Nodes perform personnel needs, work content and requirements clear and clear, so that the work process has a basis, is conducive to the smooth progress of maintenance work, which can improve the efficiency of maintenance work. Realize system control. In order to manage factory-wide overhaul work in an all-round manner, this study supplements the corresponding management methods, and then combines the original institutional norms of the factory-based maintenance base to realize the management of relevant work and achieve standard control. To perfect the maintenance of power grid equipment within the factory-based maintenance base, certain standards must be established to strictly control the inspection process. The inspection and follow-up work guidelines are strictly enforced. Site identification cards are provided for each station on the site, and maintenance workers are required to provide training work instructions. The content and the corresponding operating procedures also have strict requirements on the qualifications of maintenance personnel.

(3) Establish a scientific maintenance plan management

Maintenance Plan Management Maintenance plan is the main line and basis for the equipment maintenance work. It mainly includes annual plans, monthly plans and weekly plans. The system equipment maintenance plan management module mainly implements the function of new plan, change and inquiry of the maintenance plan, and also has the function of adding the temporary plan. Through the combination of maintenance plan and business process processing, work order and maintenance work ticket, etc., we fully implemented the information management of the element data involved in the management, thereby achieving the entire process of maintenance planning and control, and enhancing the maintenance work. Trace ability.

Overhaul Resource Management Overhaul resource management is to achieve efficient allocation and efficient use of resources, management of consumption replacement parts, standard equipment, social resources and human resources, and additions, requisitions, and quantities of spare parts. There is a warning function. The adoption of factory-based overhaul resource management methods can effectively solve the problem that the equipment assets have a long life cycle to manage the large number of power grid equipment manufacturers and their models are complex. At the same time, the use of workshop-type, team-managed human resources management has improved the overall level of maintenance personnel’s business. The help will help establish a good team image. Associate maintenance resource management with ERP systems to achieve intensive management of the entire process of repair materials.

Figure 1. Factory inspection workshop pattern
Maintenance process management the core module of the factory-based maintenance system is process control management. Through the processes of equipment entering the plant, preparation, maintenance, testing, and shipping at the factory, the standard process management of the equipment is realized. According to the maintenance plan, each maintenance phase is related to each phase in the troubleshooting process flow chart, and a corresponding relationship is established with the operation guidance. Determining the management and maintenance system of the factory-based overhaul process this part constructs the process framework from the business perspective and determines the relationship between the business process models. It then uses the business model as the orientation, processes such as value stream mapping, and draws a workflow diagram. It also emphasizes The key control points realize the process control; then, according to the lean management method, the maintenance management system is not suitable for the main problems of the "factory overhaul" management, the existing management system for the overhaul of the factory is perfected, and the system is controlled; since the overhaul is the overhaul The technical content and quality standards are all very demanding. Therefore, some standards must be established to strictly control the inspection process. In accordance with the original standards and requirements of the industrialization inspection bases, the relevant standards should be supplemented and standardized according to standardized management methods to achieve standard management and control; The establishment of the basis for the management and system implementation of chemical maintenance.

2.4. Establishing an Integrated Management System for Factory Maintenance Equipment Management in ERP

According to equipment management integration analysis, equipment management integration mainly includes data exchange with planning management, project management, material management, and financial management.

![Figure 2. Maintenance base ERP management system](image)

(1) Establish equipment inventory after completion of project acceptance

After project completion and acceptance, according to the requirements of project management, it is necessary to establish a complete inventory of asset-level equipment acceptance, and be able to share the value of asset-level equipment, so as to ensure that the asset card of the equipment can be
automatically created based on the assessed price to achieve the asset value and Uniform equipment. If there is professional system management, the equipment acceptance list is passed to the professional system first. The equipment management personnel completes the equipment information in the professional system and transfers it to the ERP system to create the equipment ledger and asset card. The value of the asset card is based on the project that has established the mapping relationship. The equipment acceptance checklist is obtained. For equipment that does not have professional system management, the equipment ledger and asset card can be directly established in the ERP system based on the acceptance checklist to realize the automatic management of full-calibre equipment.

(2) Improve planning department to report and issue project

The equipment management department shall report the demand for the equipment that needs maintenance or technical renovation to the planning department according to the equipment operation and operation, and form the information of the reserve project. The planning department will examine and approve the technical renovation project according to the planning requirements and form a repair and technical transformation project. According to the project management requirements, the company needs to include different types of projects into a unified platform management to achieve a unified business process such as project approval, review, and release, while taking into account the relevant equipment data in the professional system, so the project management that forms the equipment management will issue an integration relationship. It can not only achieve full-caliber equipment management, but also ensure the integrity of the asset life-cycle workflow.

(3) Achieving cost collection in the process of establishing equipment maintenance

Whether it is an ERP system or a professional system, the carriers for maintenance cost collection are maintenance work orders. The professional system that has achieved maintenance management is synchronized to the ERP system after establishing the work order associated with the project and equipment. When the work order of the professional system is executed, the materials and outsourced services that are consumed by the ERP system are recorded. When the settlement of the work order is completed, the work order cost information can be calculated. Equipment maintenance without professional system management can be directly implemented using the maintenance module in the ERP system to ensure full-caliber management of equipment maintenance.

(4) Change of assets in the course of completing equipment change

Equipment changes mainly include equipment allocation, transfer, decommissioning, and scrapping. When equipment status changes, it is necessary to promptly inform the financial department of the adjustment of equipment asset cards. Devices that have professional system management first change the device status in the device maintenance function. These status changes trigger predefined work flows, change the device status in the ERP system synchronously, and initiate account processing for asset changes. Equipment without a professional management system performs state adjustment directly in the ERP system, updates asset cards, and realizes real-time linkage of account cards.

2.5. Establishing Efforts in ERP for Factory Maintenance Human Resource Data Management

The factory-based maintenance base adopts a centralized management mode, and the maintenance workshop sets up the factory maintenance team. It is necessary to set factory maintenance class positions in the ERP, including: squad leader, deputy squad leader, technical person in charge, administrator, quality inspector, safety officer, and maintenance personnel. Special equipment operators, packers jobs. Among them, the positions of the maintenance personnel are divided into the following categories according to the specific work: the cleaning and dismantling area maintenance personnel, the component maintenance area maintenance personnel, and the overall debugging area maintenance personnel positions. At the same time as setting up the position, the post qualifications and responsibilities are clearly defined. The advancement and development of science and technology are improving the human resources management system and at the same time changing the basic functions of human resources. Human resources management personnel and ordinary employees are all accepting the challenges brought about by the human resources management system. As the importance of human resource management system is continuously recognized by companies, its
application prospects will be more and broader. Of course, the human resource management system applied in traditional enterprises still needs to be constantly improved in practice, and further improve the scientific nature, so that the work of human resource managers is handier, more accurate and more reasonable.

3. Factory Maintenance Management Expected Results

3.1. Improve the quality of inspection
The power supply company has established an on-site management system for quality, environment, safety, and lean management of the factory-based maintenance base and an information management platform to form a work quality standard and management process that conforms to the "factory-oriented" overhaul, so that the equipment being repaired can achieve the same Type maintenance standards are consistent with maintenance procedures, bench test quality standards are consistent, and factory acceptance standards are the same. Machines of the same type can be interchanged.

3.2. Reduced device inspection time
Due to the timely supply of spare parts, the delay caused by insufficient spare parts preparation was avoided, and production preparation time was greatly reduced. Through strict observance of maintenance standards and maintenance procedures, strict implementation of quality and acceptance standards, effectively ensuring the quality of inspections, equipment reliability indicators have been greatly improved. Achieved the repair center to complete the batch work, personnel, appliances have been effectively used, on-site workload has been greatly reduced, the number of maintenance personnel and maintenance costs are effectively controlled. While reducing the safety risk of on-site maintenance, it also improves equipment maintenance efficiency.

3.3. achieved the sharing of resources
Since the main overhaul work is done in the factory-repair workshop, simple work such as disassembly and assembly is required at the production site to effectively protect the clean and tidy environment of the inspection site, and the working environment of the maintenance personnel is effectively improved. The equipment, tools, and professionals in the service center can be properly deployed and used to achieve the sharing of all resources in the factory's maintenance workshop. A well-equipped, highly skilled and highly skilled maintenance team has been established. Through continuous refinement of inspection and maintenance procedures and technical standards, the Company has realized the upgrade of its main business and greatly improved the production efficiency of its power supply companies.

4. Conclusion
By improving the management of factory-level overhaul workshops, it is possible to improve equipment maintenance and repair levels and extend the life cycle of equipment. The use of factory-based maintenance bases to train specialized skilled personnel. With the factory-based overhaul workshop as a platform, a professional maintenance team was set up to coordinate the power grid overhaul resources and related services in the region, and to promote the operation and maintenance system of the equipment. It can maximize the scale effect of factory maintenance and obtain more economic and social benefits.

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References

[1] Yu Kai, et al. Application research of lean production in power supply enterprises [D]. Tianjin: Tianjin University, Vol. 6 (2009) No. 23, p.213-217.

[2] Zhang Jian, Wu Jianzhou, et al. The change of equipment on-site maintenance concept [N]. National Grid News, Vol. 6 (2010) No. 23, p.356-362.

[3] Fan Ruibo, Zhang Huichen, et al. Diagnosis of ERP Human Resource Management System [J]. Human Resources Development and Management, Vol. 6 (2008) No. 23, p.124-129.

[4] Sun Fuan, et al. Exploration of ERP Application and Enterprise Human Resource Information [J]. Science and Technology Information, Vol. 6 (2008) No. 23, p.221-228.

[5] Yu Kai, et al. Application research of lean production in power supply enterprises [D]. Tianjin: Tianjin University, Vol. 6 (2009) No. 23, p.156-161.