UDC 330

Yang Xu
School of Business of BSU, Minsk, Belarus, 517918051@qq.com

APPLICATION OF ERP DIGITAL SYSTEM IN POWER ENGINEERING LOGISTICS INFORMATIZATION

Starting from ERP, this article aims to achieve the scientific and efficient layout of logistics information in power companies. It conducts functional analysis of the logistics mechanism and steadily improves the level of ERP-based power logistics informatization. Furthermore, it establishes effective connections between logistics, capital flow, and information flow within the power enterprise, thus constructing a modern power logistics mechanism. The article comprehensively analyzes the role and application of ERP in power logistics informatization from multiple dimensions, with the goal of leveraging the technical advantages of ERP to promote the realization of power logistics informatization.

***Keywords**: ERP, digital technology, logistics informatization, power enterprise, application methods*

Ян Сю
Институт бизнеса БГУ, Минск, Беларусь, 517918051@qq.com

ПРИМЕНЕНИЕ ЦИФРОВОЙ СИСТЕМЫ ERP В ИНФОРМАТИЗАЦИИ ЛОГИСТИКИ В ЭНЕРГЕТИКЕ

Начиная с ERP, эта статья направлена на достижение научного и эффективного размещения логистической информации в энергетических компаниях. В ней проводится функциональный анализ логистического механизма и неуклонно повышается уровень информатизации логистики электроэнергетики на базе ERP. Кроме того, она устанавливает эффективные связи между логистикой, движением капитала и информационными потоками на энергетическом предприятии, тем самым создавая современный механизм логистики в энергетике. В статье всесторонне анализируется роль и применение ERP в информатизации энергетической логистики с разных сторон, с целью использования технических преимуществ ERP для содействия реализации информатизации энергетической логистики.

***Ключевые слова:** ERP, цифровые технологии, информатизация логистики, энергетическое предприятие, методы применения*

Analysis of ERP Working Principles

A comprehensive analysis of ERP working principles is helpful for management personnel in power enterprises to develop a scientific understanding at the conceptual level. It clarifies the operational characteristics and functional mechanisms of ERP and highlights the necessity of ERP application, thereby creating conditions for the subsequent application of ERP in the phase of power logistics informatization.

ERP, as a modern integrated management system, incorporates various production and operational activities of an enterprise into a single management mechanism, achieving the informatization of management activities and fully meeting the objective requirements of enterprise development in a market economic system. ERP views the various business functions of an enterprise as interrelated supply chains and internally divides them into interconnected and mutually supportive operational modules. Common functional systems such as logistics, procurement, raw material supply, and human resources modules are implemented to achieve a high level of integration of various enterprise

resources and streamline operational processes. Unlike other management systems, ERP exhibits a clear hierarchical structure. Therefore, during its operation, it functions differently from routine office systems, organically integrating the company's back-end operations with front-end tasks, and supporting each other between front-end and back-end business operations. This allows the release of internal vitality within the enterprise and further enhances its market competitiveness.

The application of ERP systems in logistics greatly enhances the efficiency of logistics processes and enables scientific control over procurement orders and inventory levels within enterprises. Specifically, the application of ERP systems enables scientific management and control over planning orders and purchase orders in power enterprises, making the procurement process more standardized and gradually institutionalizing power resource procurement. In China, a two-tier bidding system is currently implemented, where different levels of power enterprises undertake different bidding tasks. Considering the multiple intermediate steps, longer material supply times, and higher turnover costs involved in power procurement bidding processes, Chinese power enterprises have introduced ERP systems to rationalize the division of bidding authority and tasks, reduce intermediate steps in procurement by different levels of power companies, shorten the material supply cycle, reduce cost expenditures, control logistics costs, and ensure the profitability of power enterprises. At the same time, leveraging the powerful technical capabilities of ERP systems, power enterprises can conduct supplier audits and revoke supply qualifications for non-compliant suppliers, ensuring the quality of material procurement. The application of ERP systems in power inventory control significantly enhances the quality of incoming materials and improves the efficiency of fund utilization. Inventory management, as a fundamental component of material management systems, plays a crucial role in the implementation of various production and operational management activities. Based on past experiences, the use of ERP systems optimizes inventory structure, reduces inventory levels as a proportion of funds, ensures the flow of funds while meeting the production needs of power enterprises, reduces inventory management costs, and ensures profitability.

During its operation, ERP systems integrate various business departments of power enterprises into a unified computer management mechanism, centrally manage various data and information, and facilitate high-level information sharing. With ERP systems as the starting point, management personnel from various departments of power enterprises utilize information platforms to achieve information sharing, maximize the utilization of various data, and promote the informatization of power resource production and management. By using technology as the framework, power enterprises standardize their production and operational activities, minimizing the negative impact of human factors on power logistics activities[1]. Additionally, ERP systems integrate various internal funds of power enterprises, providing necessary information and data support for managerial decision-making, enhancing the scientific and effective nature of decision-making, and establishing a pre-estimation, in-process control, and post-feedback mechanism, thereby constructing an efficient operating mechanism for power enterprises.

The Current Status of Power Enterprise Logistics Informatization

Power enterprises, with electric power as their main product, have certain differences in constructing their logistics systems compared to other products. Specifically, the logistics supply chain of power enterprises can be divided into several stages, including power generation, transmission, distribution, and power sales. As a necessity that affects national economy and people's livelihood, power resources play a crucial role in various aspects of economic production and social life. Since power resources cannot be stored, any excess production of power resources beyond consumption will inevitably lead to waste and have adverse effects on our energy security[2]. Considering the different characteristics of power resource utilization in different regions, there are certain differences

in the logistics supply chain of power enterprises. In order to achieve continuous and stable supply of regional power resources and achieve supply-demand balance, power enterprises engage in specialized information transmission and supply chain control, centralized management of power resources, and rational scheduling of power resources to realize the informatization construction of power logistics system.

Due to their unique characteristics, power enterprises mainly cover the procurement and supply logistics stages in their logistics systems. The main purpose of logistics activities is to transport various power production principles and components, and to allocate power resource inventory to achieve continuous production. In practice, the investment in production equipment of large-scale thermal power plants accounts for about 70 % of the total infrastructure investment, and the cost of generating fuel and equipment maintenance accounts for about 60 % of the generation cost, indicating a high expenditure ratio. In order to adapt to the requirements of market economy operation and reduce costs for power enterprises, it is necessary to optimize the logistics system and strengthen the construction of power enterprise logistics informatization, consolidate technological advantages, and leverage the positive role of information technology in power enterprise logistics systems. However, in the current stage, power enterprise logistics informatization is relatively new and lacks experience, resulting in a lack of necessary supervision mechanisms in the information management process. The transparency of logistics procurement and supplier management is low, and the disclosure of various information is not comprehensive, leading to weak regulatory capabilities of power enterprises. In the procurement stage, there is a problem of weak information sharing [3]. Currently, power enterprise suppliers face issues such as information silos, making it difficult for employees in various departments of the power logistics system to leverage their strengths and work together to promote orderly logistics procurement.

Considering the importance of power logistics informatization, power enterprises should focus on the practical aspects and, based on analyzing the characteristics and current status of power logistics informatization, identify the problems in the logistics process. By establishing correct understanding and clarifying the development needs of power enterprise logistics informatization, any barriers to the application of ERP systems in power enterprise logistics informatization can be overcome.

Analysis of ERP Requirements for Logistics Informationization in Power Enterprises

In the process of logistics informationization in power enterprises, it is necessary for management personnel to analyze the requirements of ERP systems to ensure effective utilization of ERP and enhance the level of logistics informationization, addressing any existing shortcomings. To meet the demands of logistics informationization in power enterprises, it is important to establish appropriate settings for ERP functional modules, taking into account the specific circumstances.

The overall objectives of logistics informationization in power enterprises include establishing a comprehensive supplier declaration and approval process and forming a mechanism for logistics management and maintenance. In this process, it is essential to scientifically consolidate various types of information about suppliers in power enterprises to achieve unified management of material suppliers. Additionally, it is important to establish efficient information sharing mechanisms among different departments within the power enterprise to achieve comprehensive coverage of logistics informationization and enable the digitalization of procurement processes. In terms of inventory management, logistics informationization should focus on core aspects such as material issuance, returns, and storage management, enabling remote management of inventory materials in power enterprises and creating conditions for the realization of logistics informationization (Table).

Table

ERP Digital System Features Summary Table

Abbreviation	Chinese	English	Description
MRPII	制造资源计划	Manufacturing Resource Planning	An integrated method for effective planning of all resources of a manufacturing company.
MRP	物料需求计划	Material Requirements Planning	A system for calculating the materials and components needed to manufacture a product.
MPS	主生产计划	Master Production Schedules	A plan for individual commodities to be produced in each time period.
MTO	订货生产	Make-to-Order	A manufacturing process strategy where the production of an item begins only after a confirmed customer order is received.
BOM	物料清单或产品结构表	Bill of Material	A list of the parts or components that are required to build a product.
BPR	企业业务流程重组	Business Process Reengineering	A business management strategy focusing on the analysis and design of workflows and processes within an organization.
IM	库存管理	Inventory Management	The supervision of non-capitalized assets (inventory) and stock items.
PAC	生产作业控制	Production Activity Control	A method to manage, schedule, and control the manufacturing process.
PP	生产计划大纲	Production Planning	The planning of production and manufacturing modules in a company or industry.
POQ	周期订货法	Period Order Quantity	An inventory system that orders the same quantity at each reorder point.
HR	人力资源计划	Human Resources	The division of a business that is charged with finding, screening, recruiting, and training job applicants.

The functional settings of ERP systems in the logistics modules should include the design of procurement and inventory management modules. These settings aim to establish an informationization mechanism, leveraging technological advantages, and ensuring the effective application of ERP systems in logistics informationization. To determine the specific functional settings, it is necessary to consider the actual circumstances and tailor the settings accordingly. This involves streamlining processes such as material demand, allocation, procurement requests, allocation planning, and arrival plans, integrating them into the ERP system to create a comprehensive and systematic material procurement functional module. This module should fully meet the current objective requirements of power enterprises in material procurement, ensuring a continuous, stable, and high-quality supply of equipment and components for power enterprises and creating conditions for subsequent power resource production activities[4].

Implementation Plan of ERP in Logistics Informationization for Power Enterprises

The implementation of ERP in logistics informationization for power enterprises requires a systematic and comprehensive approach. Power enterprise management personnel need to have a clear understanding of the technical principles of ERP systems and analyze the current state of logistics informationization and the requirements for ERP system usage. Based on these factors, a targeted

technical approach and application strategy should be adopted to actively promote the application of ERP in the logistics informationization process.

The design of the power enterprise logistics ERP system should cover three levels: logistics information integration, process information integration, and inter-enterprise information integration. Through this design, an information sharing platform can be established within the enterprise, leveraging information technology advantages[5]. Specifically, in the logistics ERP system's information integration phase, the power enterprise's operational information, behavior, and available resources should be integrated and shared to achieve rational resource scheduling. In the process information integration phase, the power enterprise needs to reform the traditional information sharing management model, abandon the use of separate specialized systems by different departments, break information silos, and achieve information sharing in logistics. Regarding inter-enterprise logistics information integration, it is crucial to ensure smooth information exchange between enterprises, integrate various resources, and optimize logistics resource allocation.

Power Enterprises

The power enterprise's ERP logistics system should be supported by fiber-optic networks or other broadband networks to ensure smooth information exchange. The network bandwidth should be maintained at a minimum of 2 Mbps to meet the actual operational requirements and leverage the technical advantages of the ERP system. In terms of network architecture, a three-tier structure comprising presentation layer, application layer, and data layer can be adopted. In the presentation layer construction, the SOAP protocol can be used to connect the presentation layer with the application layer, forming an application program. The application layer can utilize the JDBC framework to connect with the database, enabling the three layers to be flexibly distributed across different computers to control the ERP system's operational load and avoid excessive system pressure that may hinder smooth operations.

From the aspects of requirement determination, procurement allocation, material issuance and retrieval, and payment, the ERP logistics system can effectively contribute to scientific and efficient material management[6].

To fully leverage the positive role of ERP in the logistics informationization of power enterprises and promote the implementation of logistics informationization, it is important to understand the technical principles of ERP systems and clarify the usage requirements of ERP in power enterprise logistics informationization. By summarizing and incorporating past experiences, an implementation plan for ERP systems in the logistics informationization of power enterprises can be devised within the existing technical framework. This ensures effective integration between ERP systems and power enterprise logistics informationization, injecting new vitality into the development of power enterprises.

References

1. *Liu, X.* Analysis of the Application of ERP in Power Logistics Informatization / X. Liu // Science and Informatization. – 2021. – № 11. – P. 112–113.
2. *Yue P.* On the Application of ERP in Power Logistics Informatization / P. Yue // Modern Industrial Economy and Informatization. – 2020. – № 23. – P. 36–37
3. *Wang, Y.* Application of ERP in Supply Chain Management of Logistics Enterprises / Y. Wang, Y. Xia // Jiangsu Science and Technology Information. – 2021. – № 34. – P. 55–56.
4. *Yu, L.* Application of Enterprise Supply Chain Management in ERP / L. Yu, D. Ma // China Business Review. – 2019 (22) . – P. 21–22.
5. *Wang, J.* Analysis of the Application of ERP in Logistics Informatization Management of Power Production / J. Wang // Manager. – 2020. - № 18. – P. 67–68.
6. *Fei, D.* Analysis of the Application of ERP in Power Logistics Informatization / D. Fei, J. Dai, Z. Yu, B. Wang // China Chemical Trade. – 2021. – № 12. – P. 56–57.