

Paper 3

Research on Green and Efficient Operation Mode of Intelligent Warehouse Under Low-Carbon Background

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Abstract

Under the background of global low-carbon and green development, the logistics and warehousing industry, as an important part of social economic operation, is facing higher requirements for energy conservation, emission reduction and green operation. Traditional warehouse operation modes have problems such as high energy consumption, low resource utilization rate and unreasonable space allocation, which are not in line with the development trend of low-carbon economy. Intelligent warehouse relies on digital and intelligent management technology to realize refined management and efficient operation of warehousing business, which can effectively reduce energy consumption and resource waste, and realize the organic unity of operational efficiency and green environmental protection. This paper analyzes the green development demand of modern warehousing industry, discusses the energy consumption and management problems of traditional warehouses, explores the advantages of intelligent warehouse in green and efficient operation, and puts forward green operation optimization strategies from the aspects of intelligent equipment application, energy-saving transformation, inventory lean management and green management system construction. The research can provide practical reference for warehousing enterprises to realize low-carbon transformation and green upgrading.

Keywords

Low-Carbon Background; Intelligent Warehouse; Green Logistics; Efficient Operation; Lean Management

1 Introduction

With the continuous promotion of global carbon peak and carbon neutrality goals, all walks of life are accelerating green transformation and low-carbon upgrading. The logistics and warehousing industry is an important basic industry supporting social and economic operation, and its energy consumption and carbon emission level have an important impact on the realization of social green development goals. Traditional warehouse operation mostly adopts extensive management mode, with unreasonable

equipment operation, low space utilization rate, serious goods backlog and waste of human and material resources, resulting in high comprehensive energy consumption in the warehousing link.

In recent years, intelligent warehousing technology has been continuously mature and popularized. Through automatic equipment, big data scheduling and intelligent monitoring system, intelligent warehouse can realize precise control of warehousing operation, effectively reduce invalid energy consumption and resource waste, and provide an effective way for the green and low-carbon transformation of the warehousing industry. At present, many warehousing enterprises have begun to try green and intelligent operation modes, but there are still problems such as insufficient green awareness, imperfect energy-saving transformation and unformed green management system.

Therefore, studying the green and efficient operation mode of intelligent warehouse is of great significance for promoting the low-carbon development of the warehousing industry, reducing enterprise operation costs and improving the sustainable development ability of enterprises.

2 Green Development Demand and Traditional Warehouse Operation Defects

2.1 Green Development Demand of Modern Warehousing Industry

With the continuous improvement of national green environmental protection policies and industry standards, the logistics and warehousing industry is facing stricter carbon emission assessment and energy consumption supervision. Enterprises must change the traditional extensive operation mode, reduce energy consumption and carbon emission in the operation process, and realize the transformation from high-energy consumption operation to low-carbon and efficient operation. At the same time, with the improvement of social environmental protection awareness, customers' requirements for green logistics services are constantly improved, and green warehousing has become an important part of enterprise core competitiveness.

2.2 Operation Defects of Traditional Warehouses

First, high energy consumption of equipment operation. Traditional warehouses mostly use manual and semi-automatic equipment, with unreasonable operation scheduling, frequent start and stop of equipment, and serious invalid energy consumption. The lighting, ventilation and temperature control systems of warehouses lack intelligent regulation function, resulting in long-term high-load operation and serious energy waste.

Second, low space utilization rate. Traditional warehouse space allocation is unreasonable, goods stacking is disorderly, inventory backlog is serious, resulting in waste of warehouse space resources, increased management costs, and increased

carbon emission caused by repeated handling.

Third, extensive inventory management. The traditional inventory management mode is backward, unable to accurately predict demand, prone to overstocking and shortage of goods, resulting in waste of goods resources and increased logistics operation pressure.

3 Advantages of Intelligent Warehouse in Green and Efficient Operation

3.1 Intelligent Equipment Reduces Invalid Energy Consumption

Intelligent warehouses are equipped with automatic handling robots, intelligent sorting equipment and intelligent sensing systems, which can realize automatic and precise operation according to business needs, avoid repeated handling and wrong operation caused by manual errors, and reduce invalid energy consumption. At the same time, the intelligent energy-saving control system can realize automatic regulation of warehouse lighting, temperature and ventilation according to the actual operation situation, effectively reducing daily energy consumption.

3.2 Digital Scheduling Improves Resource Utilization Rate

The intelligent warehouse management system can analyze warehouse space data, inventory data and order data through big data technology, realize scientific planning of warehouse space and reasonable allocation of goods storage positions, maximize the utilization rate of warehouse space, and avoid space waste. The intelligent scheduling system can optimize the operation sequence and handling path, reduce the operation time and energy consumption of equipment, and improve the overall operation efficiency.

3.3 Lean Inventory Management Reduces Resource Waste

Relying on big data demand prediction technology, intelligent warehouse can accurately predict market demand changes, realize dynamic optimization of inventory, avoid goods overstocking and expiration waste, reduce inventory capital occupation and resource waste, and realize lean and green inventory management.

4 Green and Efficient Operation Optimization Strategies for Intelligent Warehouses

4.1 Promote the Application of Green Intelligent Equipment

Warehousing enterprises should actively promote energy-saving and environmental protection intelligent equipment, replace high energy consumption traditional mechanical equipment, and adopt low-power automatic handling equipment and

intelligent energy-saving control system. At the same time, optimize the equipment operation scheduling mechanism, formulate scientific equipment operation plans, avoid idle and repeated operation of equipment, and reduce unit energy consumption.

4.2 Carry out Energy-Saving and Green Transformation of Warehouse

Carry out green transformation of warehouse infrastructure, adopt energy-saving lighting, heat insulation and environmental protection materials, optimize warehouse ventilation and heat preservation system, and reduce the energy consumption of temperature and humidity regulation. Make full use of clean energy such as solar energy to provide auxiliary power for warehouse operation, reduce the use of traditional electric energy, and realize low-carbon operation of warehouse.

4.3 Implement Lean Inventory Management

Build a digital lean inventory management system, realize real-time monitoring, dynamic analysis and intelligent early warning of inventory data. According to market demand changes and goods turnover rules, optimize inventory structure, reduce slow-moving inventory and expired goods, improve inventory turnover efficiency, and reduce resource waste and carbon emission caused by inventory backlog.

4.4 Improve Green Warehouse Management System

Enterprises should establish and improve green warehouse operation management system, formulate standardized green operation specifications, clarify energy-saving and emission-reduction assessment indicators, and incorporate green operation effect into enterprise performance assessment. Strengthen the green environmental protection training of warehouse employees, improve employees' low-carbon operation awareness and professional ability, and form a long-term mechanism for green operation of intelligent warehouse.

5 Conclusion

Under the low-carbon development background, the green and intelligent transformation of warehousing industry is an inevitable trend. Intelligent warehouse has obvious advantages in energy conservation, emission reduction and efficient operation, which can effectively make up for the defects of traditional warehouse extensive management. Warehousing enterprises should take intelligent digital technology as the support, promote the application of green intelligent equipment, carry out energy-saving transformation, implement lean inventory management, and improve the green management system, so as to realize the organic unity of high-efficiency operation and low-carbon environmental protection of warehouses, and promote the sustainable green development of modern warehousing and logistics industry.

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