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## Original Research Article

# Research on hoisting technology and its applications

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**Abstract:** This paper systematically studies hoisting technology, exploring its fundamental principles, application areas, key technologies, and future development trends. Through comparative analysis of different hoisting equipment, it emphasizes the importance of safety, efficiency, and economy in hoisting operations. Additionally, by examining practical cases, it analyzes common problems in the hoisting process and their solutions, providing a reference for industry practices. The research indicates that with continuous technological advancement, the development of hoisting technology in terms of intelligence and automation will bring higher safety and efficiency to future engineering construction.

**Keywords:** Hoisting technology; Safety; Equipment comparison; Case analysis; Future development

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## 1. Introduction

Hoisting technology is an indispensable part of modern engineering construction, widely applied in various fields such as building, bridges, ports, oil, and mining. The quality and efficiency of hoisting operations directly affect the progress and cost of the entire project. As engineering scales continue to expand, the demands on hoisting technology have also increased. Achieving efficient and safe hoisting operations has become a pressing issue in the engineering industry. This paper aims to conduct an in-depth analysis of hoisting technology, exploring its significance and development directions in practical applications. We will analyze the basic concepts of hoisting technology, equipment, processes, safety management, and future development trends, along with practical case studies, to provide valuable references for engineering practices.

## 2. Overview of hoisting technology

### 2.1. Classification of Hoisting

Based on application needs, hoisting can be classified into static and dynamic hoisting. Static hoisting is primarily used for the transport of fixed objects, such as the installation of building components, while dynamic hoisting involves lifting objects during movement, often applied in transportation and logistics. Dynamic hoisting requires operators to possess higher technical skills to respond to various unforeseen circumstances that may arise during movement.

### 2.2. Characteristics of hoisting operations

The high-risk and complex nature of hoisting operations necessitates strict management in multiple aspects. First, the training of operators is crucial. They need to not only master basic equipment operation skills but also possess rich on-site experience to make quick judgments and effective responses in emergencies. Training through simulations and practical exercises enhances their adaptability, thereby reducing the likelihood of accidents.

Furthermore, hoisting operations are influenced by various factors such as weather, terrain, and site conditions.

### **3. Lifting equipment**

#### **3.1. Cranes**

Cranes are the most commonly used lifting equipment, known for their high flexibility and ease of operation. Types of cranes include wheeled cranes, crawler cranes, and tower cranes. Wheeled cranes are suitable for urban construction and small-scale projects, favored for their mobility; crawler cranes are used in large-scale projects and provide greater stability; tower cranes are widely used in high-rise construction, allowing for high-altitude and long-span lifting tasks. Different types of cranes are suitable for different working environments and conditions. Choosing the right crane is essential for improving lifting efficiency.

#### **3.2. Hoists**

Hoists are another common type of lifting equipment, primarily used in large-scale projects for achieving higher lifting efficiency. Various types of hoists exist, such as tower hoists, truck-mounted hoists, and electric hoists. Tower hoists are ideal for construction sites, as they can handle large-scale lifting tasks in confined spaces. Truck-mounted hoists are used on job sites with high mobility requirements, while electric hoists are commonly found in factories and warehouses, suitable for repetitive lifting operations.

#### **3.3. Other equipment**

In addition to cranes and hoists, auxiliary equipment such as chains, slings, and hooks are also indispensable in the lifting process. The selection and configuration of these auxiliary devices affect the safety and efficiency of the lifting operations. For example, slings should be chosen based on the weight and shape of the lifted object to ensure their load-bearing capacity and stability. Additionally, the quality and design of hooks directly impact the safety of lifting operations. Therefore, a thorough inspection of all equipment before starting a lifting task is essential to ensure that everything is in good working condition.

### **4. Lifting operation procedure**

#### **4.1. Site preparation**

The first step in a lifting operation is a site inspection, which is crucial to ensure the ground is level, free of obstructions, and properly marked for safety. During the inspection, operators must carefully observe the terrain to identify potential hazards that may affect the lifting operation, such as uneven ground or overhead power lines and other obstacles. Additionally, it is important to verify the integrity of the lifting equipment and accessories, ensuring that hooks, wire ropes, and other attachments meet safety standards and that all equipment is positioned correctly as per the lifting plan to maximize safety and efficiency.

Brief training for the operators should also be conducted during site preparation to ensure they understand the specific procedures of the lifting operation, safety precautions, and their respective responsibilities. Such training not only improves team coordination but also reduces the risk of operational errors during critical moments. Furthermore, operators should be familiar with the signaling system to ensure quick responses and

coordination during the operation.

Weather conditions are another crucial factor that cannot be overlooked during preparation. Meteorological conditions can directly impact the safety of lifting operations. For example, strong winds, rain, or lightning can significantly increase the risk of the operation. As such, the team should closely monitor weather forecasts and, if necessary, adjust the work schedule to ensure that the lifting task is carried out under safe conditions. Thorough preparation not only enhances the safety of the lifting operation but also ensures that the project proceeds smoothly.

#### **4.2. Lifting plan development**

Before carrying out a lifting operation, developing a detailed lifting plan is a key step in ensuring safety and successfully completing the task. The plan should cover several aspects, including the selection of lifting equipment, personnel assignments, and safety measures. First, selecting the appropriate lifting equipment is the core of the plan. Based on the weight, shape, and lifting height of the object, the type of crane required (such as tower cranes, crawler cranes, or wheeled cranes) should be evaluated, along with other auxiliary equipment like slings, hooks, and pulleys. Equipment selection must adhere to relevant standards to ensure load-bearing capacity and undergo regular inspections to ensure optimal performance.

In terms of personnel assignments, the plan should clearly define each member's responsibilities to ensure everyone performs their roles effectively. Typically, lifting operations require a coordinator, crane operator, signalman, and ground support personnel. The coordinator is responsible for overall coordination and command, the crane operator controls the equipment, the signalman communicates instructions with the crane operator, and the ground support personnel ensure the site is safe and provide necessary assistance. Clear division of responsibilities enhances work efficiency and reduces the risk of misunderstandings and mistakes.

Safety measures are an essential part of the lifting plan. A series of safety regulations should be outlined in the plan, including the use of personal protective equipment (such as helmets, safety harnesses, and goggles), setting up safety zones and signs, and ensuring that operators are familiar with safety procedures.

#### **4.3. Lifting implementation**

When performing the actual lifting according to the planned procedure, operators must cooperate closely to ensure both safety and efficiency. The entire lifting process requires not only technical proficiency but also excellent teamwork. During the lifting operation, operators must continuously monitor the condition of the lifted object, ensuring its stability and preventing accidents. Each step requires precise control, especially when lifting, moving, and positioning the object. Operators must closely observe the tilt and sway of the lifted object and make adjustments to maintain balance.

### **5. Conclusion**

This article systematically analyzes various aspects of lifting technology, from basic definitions to specific applications, providing a comprehensive perspective. In the future, with continuous technological advancements, lifting technology is bound to encounter new development opportunities. All parties should actively adapt to the

application of new technologies to enhance the safety and efficiency of lifting operations.

## **References**

- [1] Li Ming. Lifting Technology and Safety Management. Engineering Technology Press, 2020.
- [2] Zhang Wei. "Risk Analysis and Countermeasures for Lifting Operations." *Journal of Building Science*, 2021, 35(2): 45-50.
- [3] Chen Hua. "Development Trends in Modern Lifting Technology." *Mechanical Engineering*, 2022, 28(4): 30-35.
- [4] National Administration of Production Safety Supervision and Administration. *Safety Regulations for Lifting Operations*. 2019.
- [5] Wang Fang. "Manual for the Use of Lifting Equipment." *Equipment Management*, 2023, 17(1): 15-20.