Engineering Cost Analysis of Automatic Handling System

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Abstract. With the progress of the times and the continuous development of society and economy, many new and high technologies have been applied in our daily work and life. Automatic handling system technology is an important part of high-tech. From its name, we can know that it is a comprehensive technology integrating mechatronics, electronic technology, computer technology, and control and management technology. In the 21st century, with the proposal of made in China 2025, China's manufacturing industry will enter a new era, a new industrial revolution will begin, and enterprises that can grasp the times and market trends will win this competition. In order to help Chinese enterprises develop better in the new era, this paper puts forward the engineering cost analysis method of automatic handling system, analyzes the cost of different automatic handling systems in the process of factory manufacturing industry control, and designs an improved automatic handling system in the process of factory manufacturing by optimizing the cost calculation, Improve the engineering benefit. Through the analysis, we can see that the research method proposed in this paper provides a new development idea for the research of the project cost analysis of the automatic transportation system.

Keywords: High Tech, Computer Technology, Automatic Handling, Project Cost

1. Introduction

Automatic transportation technology [1-3] is an important component of advanced manufacturing process. From the generalized connotation analysis, we can see that it has developed from simple material processing in the past to a comprehensive technology, which integrates mechanical design, computer science, management and automatic control technology. At the end of the 1990s, manufacturers and distributors around the world were still faced with various pressures, including: more refined and frequent product orders; ever-changing and more customized product demand; and higher service value. Operators must adjust the operation of the factory to adapt to the mixing of orders, reduce the time spent in order production, and improve the production speed and capacity of the enterprise. In this new era, in order to help China's manufacturing enterprises to enhance their core competitiveness, it is necessary to improve the intensive ability of enterprise management inventory, operation and sales and production links. Only after the corresponding capacity improvement, can enterprises really develop rapidly in the new era. In the process of product transportation, there are many tedious processes that are unnecessary. After these useless processes and processes are reduced and merged, it will help enterprises to improve production and transportation efficiency. Facing the
requirements of the new era for China's manufacturing enterprises, modern logistics [4-6] and automatic handling technology need to be further developed.

With the development of large-scale and complex handling system in factory manufacturing industry, cost management technology of different automatic handling systems in factory manufacturing has become an important development direction. Its management scope has been detailed to all aspects. It mainly focuses on process control and management, maintenance and production, operation and management of different automatic processing systems, and the maintenance of automatic processing system. The whole cost control model of automatic loading and unloading system is an integrated system model. Through the management and control of automatic handling system in factory manufacturing, the project cost can be reduced and the production efficiency and profit of the project can be improved. In the traditional project management, cost control management mainly focuses on the factors affecting the cost, forecasting, controlling, summarizing and so on. It is a method to estimate the cost of transportation projects and record the corresponding implementation control. This method has very large errors. In the actual construction, it will lead to slow progress of the project and increase the transportation cost [7-8].

This paper mainly studies the engineering cost analysis of automatic handling system [9-10]. In the new era, the development of all walks of life needs the help of high and new technology, so as to enhance its core competitiveness. In order to help Chinese enterprises to better develop in the new era, this paper puts forward the engineering cost analysis method of automatic handling system. Firstly, the automation of manufacturing enterprises in China is analyzed In this paper, the author makes an in-depth study on the current motion control technology and PLC control technology on the market, analyzes its advantages and disadvantages and suitable manufacturing enterprises, so as to make reasonable arrangement for the automatic handling system of manufacturing enterprises in China. After that, it analyzes the engineering cost of the automatic transportation system, designs a set of design scheme that can better help enterprises save costs by optimizing the cost calculation, so as to enhance the core competitiveness of China's manufacturing enterprises in the new era and escort its development.

2. Research Method of Engineering Cost Analysis of Automatic Transportation System

2.1. Automatic Handling Technology
Handling system is mainly used in logistics system, but also in industrial production and other fields. Stereoscopic warehouse is the most typical transportation system in logistics system. It is mainly composed of overhead warehouse and other conveying systems. Stereoscopic warehouse has been widely used in foreign countries, formed a special topic, and constantly developed and improved; domestic research on stereoscopic warehouse started late, but also got rapid development. At present, there are hundreds of automated stereoscopic warehouses in China, but all of them belong to large and medium-sized systems. Small automatic handling system or stereoscopic warehouse with relatively perfect function, simple structure, high reliability and low cost is still rare.

2.2. Construction of Mathematical Model
It is assumed that different automatic processing systems in factory manufacturing are a series of interconnected and relatively independent subsystems. The iterative forms of mutual information parameters of different automatic processing system costs are as follows:

\[
x_{i}^{k+1} = \frac{1}{a_{i}} \left[ b_{i} - \sum_{j=1}^{a_{i}} a_{x_j} x_{i}^{k+1} - \sum_{j=1}^{a_{i}} a_{y_j} x_{j}^{k+1} \right] \tag{1}
\]

By using the adaptive weighting method, the cost and efficiency of the automatic loading and unloading system are obtained:
\[
    x_i^{(k+1)} = (1 - \omega)x_i^{(k)} + \frac{\omega}{a_{ii}} \left[ b_i - \sum_{j=1}^{i-1} a_{ij}x_j^{(k+1)} - \sum_{j=i+1}^{n} a_{ij}x_j^{(k)} \right]
\]  

The \( i \) relaxation solution for each participant of different automated handling systems in factory manufacturing is obtained:

\[
    f(x_1, x_2) = r_i x_1 \left( 1 - \frac{x_1}{N_1} - \sigma_1 \frac{x_2}{N_2} \right)
\]

At this time, the iterative equation of cost prediction function of different automatic processing systems tends to converge. On this basis, feature extraction is carried out to realize cost prediction and control.

3. Experimental Correlation Analysis

3.1. Experimental Background
With the development of science and technology, the space shuttle technology has gradually changed from artificial and mechanized to information-based and intelligent. As one of the key technologies of factory automatic loading and unloading system, shuttle car has been paid more and more attention by the society. In the 21st century, product production is developing from large-scale industrial manufacturing to small-scale flexible production. The product batch is small, the total category is many, the specification is different. In this context, the space shuttle and other handling equipment also put forward the requirements of keeping pace with the times.

3.2. Experimental Design
Motion control card is a kind of high-performance stepping / servo motor motion control technology based on PC bus. It uses high-performance microprocessor (such as DSP) and large-scale programmable equipment to realize multi axis coordinated control of multiple servo motors. The essence of PLC is a special computer for industrial control. It hardware structure is basically the same as that of microcomputer. PLC control technology plays an important role in automatic control system. The advantages and disadvantages of the two control technologies are investigated and studied. The specific results are shown in Table 1:

| Control method                  | advantage                                                                 | shortcoming                                      |
|--------------------------------|---------------------------------------------------------------------------|--------------------------------------------------|
| Motion control                 | It can form an open control system and add or decrease functions at will. It has mature motion control, detection and wireless communication module. | At present, it is relatively less used. The society has little understanding of this advanced control method. |
| PLC motion control technology  | It is widely used and there are many papers. The society is familiar with this kind of control mode, and basically can master it. Easy to use and easy to understand. | In order to expand the function, we need to purchase some other function modules, and the purchase cycle is long. |

4. Discussion

4.1. Analysis on the Current Research Situation of Engineering Cost of Automatic Transportation System
With the penetration and combination of computer network technology, wireless technology and intelligent sensor technology, the new concept of network intelligent sensor is proposed by wireless
technology. This kind of intelligent network sensor, based on wireless technology, can directly transmit, release and share industrial information through wireless network, which is based on wireless technology. Wireless communication technology can provide high bandwidth wireless data link and flexible network topology for the communication between various intelligent field devices, mobile robots and various automation devices in the factory environment. It can effectively make up for the shortage of wired network in some special environment, and further improve the communication performance of industrial control network. The proportion of wireless communication technology application in the field of industrial automation in China is investigated. The survey results are shown in Figure 1:

![Figure 1. Comparison of wireless communication technology](image)

As can be seen from Figure 1, radio wave technology accounts for the highest proportion of wireless communication technology in the field of industrial automation, accounting for 55%, followed by wireless network technology and infrared technology, accounting for 35% and 10% respectively. At present, radio wave technology has the highest proportion in the field of industrial automation in our country. The main reason is that it has no direction, remote control distance is relatively long, the price is low, the technology is reliable and widely used, but it is easy to be interfered by radio waves. As the emerging wireless communication technology, radio technology and infrared technology have a relatively small scope of use, the technology is not very mature, and the price is not low enough, so it is not widely used as radio wave technology.

In order to achieve effective cost control effect, it is necessary to use cost control means scientifically and reasonably in the design stage of automatic transportation system, such as life cycle cost analysis, value engineering analysis, quota design, design scheme optimization, etc. The research of project cost is often large and complex, which needs a design team composed of many professional designers. Each professional designer should not only be responsible for their own design tasks, but also take into account the coordination and communication between various disciplines. It can be imagined that the research process of project cost is a heavy mental work process. If the design cycle is over compressed, it is likely to produce problematic design works. Owners should be aware that in order to promote the development of the project, thus sacrificing the quality of design, they will put themselves in a situation of uncontrolled investment. Therefore, the owner should take the initiative to request the design quality to ensure the scientific and reasonable design cycle. This paper investigates the proportion of research methods of engineering cost of automatic handling system in China. The survey results are shown in Figure 2, where I represent overall scheme design, II represents process design, III represents equipment control system design, and IV represents equipment actuator design.
Figure 2. Proportion of research methods of engineering cost of automatic transportation system in China

It can be seen from Figure 2 that the overall scheme design accounts for 45% of the project cost research of the automatic handling system, 30% of the process design, 15% of the equipment control system design and 10% of the equipment actuator design. The design of the overall scheme is the most important. According to the detection process of transformer products, the pattern of system equipment should be studied and the control scheme should be designed, so as to achieve the control of engineering cost and cost. Today's industrial development highly relies on automatic control, and the manual or semi-automatic production mode will be gradually eliminated. Therefore, in the project cost research of automatic transportation system, we should design the overall scheme, so as to better control the project cost.

4.2. Development Prospect of Engineering Cost Analysis of Automatic Handling System

Improve work efficiency, reduce labor intensity, and improve the safety and reliability of operation. This topic mainly studies how to use the operation of the handling system to complete the transfer and installation of the work piece between the machine tool and the machine tool, between the machine tool and the measuring platform. The project has practicability, reliability, economy and generality. One is practical, which can complete the transfer of parts required by enterprise processing. Second, reliability, compared with manual operation, it is safe and reliable. The automatic handling system is not affected by the physical condition, mental state and emotion of workers. Third, economy, the completion of the whole project can reduce costs and improve productivity. The fourth is to promote communication. This processing system is widely used. Most of the equipment and parts in the factory can be adjusted after certain improvements.

This paper analyzes the current cost control methods in the design stage, mainly studies the cost analysis of life cycle, the quota design of value engineering, and the establishment of competition mechanism and standard design, and advocates the use of these methods to design the automatic transportation system in the project cost analysis and design scheme. By comparing and analyzing the advantages and disadvantages of the cost control methods such as value engineering and quota design are found. In view of the domestic analysis of value engineering and quota design, it is found that most of them are still in the theoretical stage, and there is a lack of application examples and automatic transportation system engineering cost analysis, so its feasibility is poor. In this paper, combined with the characteristics, contents and cost influencing factors of the engineering cost analysis of the
automatic handling system, the technical and economic analysis and comparison of the design schemes are carried out, so as to obtain the optimal design scheme and achieve the goal of reducing the cost and controlling the project investment.

With the continuous progress of automatic production technology, the traditional production equipment in various fields of our country will be gradually replaced by advanced and efficient automatic unmanned system. In the future, the automatic handling system equipment will develop towards the direction of more intensive system structure and larger detection scale.

5. Conclusions
This paper mainly introduces the engineering cost analysis of automatic handling system. With the continuous development of our society and economy, enterprises are facing great challenges brought by the development of the times. In today's new era, with the development of China's manufacturing industry put on the agenda, the reform of some manufacturing enterprises has become urgent. In order to help Chinese manufacturing enterprises develop the engineering cost analysis technology of automatic handling system, this paper puts forward the engineering cost analysis method of automatic handling system, and analyzes the cost of different automatic handling systems in the process of factory manufacturing industry control. This paper analyzes two different control technologies, motion control technology and PLC control technology. By optimizing cost calculation, an improved automatic handling system in factory manufacturing process is designed to reduce cost and improve engineering benefits. Through the analysis, we can see that the research method proposed in this paper provides a new development idea for the research of the project cost analysis of the automatic transportation system.

References
[1] Couce L C, Couce J C C, Formoso J A F. Operation and Handling in Escort Tugboat Manoeuvres with the aid of Automatic Towing Winch Systems. Journal of Navigation, 2015, 68(1):71-88.
[2] Sun Y, Ahmad I. A robust and adaptive rate control algorithm for object-based video coding. IEEE Transactions on Circuits & Systems for Video Technology, 2015, 14(10):1167-1182.
[3] Hermansson A . Openability of retail packages. Packaging Technology and ence, 2015, 12(5):219-223.
[4] Holota J, Gers E. How to increase the efficiency of beet logistics using modern technologies. Zuckerindustrie. Sugar industry, 2015, 140(7):443-445.
[5] Rawlinson T . THE IMPORTANCE OF SUBMARINE TENDERS TO A MODERN NAVAL WAR: NAVAL COMBAT LOGISTICS AND SEA BASING. The Submarine Review, 2017(sep.):42-57.
[6] Komelina O, Komelina A, Galinska T, et al. Modern (Financial and Innovative) Formation Determinants of Enterprise Logistics Management Under the Influence of Global Challenges. International Journal of Engineering & Technology, 2018, 7(4):467-471.
[7] Rade C. New and Common Perioperative Pain Management Techniques in Total Knee Arthroplasty. J Knee Surg, 2015, 29(02):169-178.
[8] Muns R , Manteca X , Gasa J . Effect of different management techniques to enhance colostrum intake on piglets' growth and mortality. Animal Welfare, 2015, 24(2):185-192.
[9] Sun J. 124.Construction of Dynamic Management System of Engineering Cost Based on Exponential Model. Revista de la Facultad de Ingenieria, 2017, 32(11):830-835.
[10] Wang B, Dai J. Discussion on the prediction of engineering cost based on improved BP neural network algorithm. Journal of Intelligent and Fuzzy Systems, 2019(7):1-8.