

# Research on Electric Traction Technology of Modern Rail Transit Vehicles

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**Abstract:** the application of electric traction technology in modern urban rail transit vehicles, electrical traction technology has strong controllability. In the actual work process, it can be effectively transformed into stable braking of vehicles, providing high safety and controllability for vehicles, so as to realize stable braking and deceleration of rail vehicles during operation, prevent the vehicle from bad accident and ensure the safety of passengers.

**Key words:** Modern, Rail transit vehicle, Electric traction technology

In modern rail transit, electrical traction technology is one of the most important technical links, which plays a very important role in the electrical traction system of rail transit. Not only that, there is another important function of electrical traction technology, which can provide more appropriate functions for rail transit. The application of electric traction technology can further improve the safety of rail transit vehicles in the process of operation, and have an effective control role in the realization of rail transit. At the same time, the application of electrical traction technology can effectively improve the automation and information level of modern rail transit industry.

## 1, Electric traction technology of rail transit vehicles

### (1) Control system

In the process of the operation of rail transit vehicles, the electrical traction technology mainly controls the whole elevator traction control system through computer software, and also realizes the real-time monitoring of the whole operation mode of the rail vehicles, and realizes the information control mode of the rail vehicle operation. The main advantage of the computer system is to achieve good self-control and self-test and other good working performance. Through the effective control of the computer system, the vehicle can be more stable and safe during the operation process, and in the process of the work of the rail vehicle, electrical traction technology plays a crucial role, mainly through multiple crisis systems to carry out synchronous control, in order to achieve a good traction level. Through the effective control of computer systems, the independent control of rail transit vehicles can be effectively realized. Under the working conditions of signal processor, the operation rate and operation mode of rail transit can be effectively controlled, and other auxiliary work items can be effectively controlled, such as communication system, driving system, etc., Through the synchronous control of several modules of electrical parts technology, the whole electrical traction work can realize network and information, and ensure that rail transit vehicles have higher integration function.

### (2) Main components in electric traction technology

The receiving electric is a very important component in electrical traction technology. The performance standard of the component is relatively high. In order to ensure the full play of the working advantages of electricity, it must be realized within the requirements of the third track sliding. In the process of increasing the speed of rail transit vehicles,

the pressure under electrical pressure needs to be guaranteed in a suitable range, so that the effectiveness and safety of the electrical traction system can be fully guaranteed, and the rail transit vehicles can be prevented from being damaged by external friction. The speed of electrical traction technology is directly related to the safety and stability of the electrical work. Only by fully ensuring the working performance and working stability of the electrical, can the traction force be safer and more stable. At present, the electric receiving with the ability of automatic control has been introduced into the electric traction technology of rail transit vehicles effectively, and the effective work connection between the technology of electrical transfer and the electric transfer technology is made to avoid the damage caused by the excessive pressure of the electrical.

## **2, The characteristics of electric traction technology of modern rail transit vehicles**

As an important force to promote the stage development of public transport in China, electrical traction technology has many remarkable characteristics. First, the application of electrical traction technology is realized by the combination and cooperation of multiple electrical systems. Each electrical system can cooperate with each other while being independent, and form an organic whole, and then play a greater role. More importantly, electrical traction technology has the characteristics of information and automation, and with the continuous development of electrical traction technology, its information level and automation level are also constantly improving. Secondly, compared with ordinary vehicles, after applying electric traction technology in modern rail transit vehicles, the exhaust gas and noise pollution in the process of rail transit vehicles operation will be greatly reduced, which is of great significance for the sustainable development of cities and the protection of the natural environment. Thirdly, compared with the traditional traction mode, the electric traction scheme has a very effective control effect on the operation cost of rail transit enterprises, and then improves the economic benefits of the enterprises. Finally, as a non-self-contained traction power, the power of electric traction rail transit vehicles is not supplied by fuel, but by traction as the operation power of rail transit vehicles. Under the action of electric traction, the weight of rail transit vehicles will be significantly reduced, the total power rate will be significantly improved, and the time required for the start of rail vehicles is relatively short and acceleration is very fast. The convenience of urban rail transit vehicles has been greatly improved.

## **3, Relevant parts of electrical traction technology application**

### **(1) Circuit breaker**

In the process of application of electrical traction technology in the operation of modern rail transit vehicles, the application of circuit breaker can realize the function of emergency blocking, especially with the automation and information of modern rail transit electrical traction technology becoming higher and higher, the role of circuit breaker plays a very important role. In the application of electric traction technology in modern rail transit vehicles, circuit breaker can further optimize the application effect of electrical traction technology, and make the operation of modern rail transit vehicles safer and more efficient. By the application of circuit breaker, the time of braking segment of rail transit vehicles can be greatly reduced during braking. The work of regulating the rail transit vehicle is completed quickly to avoid the problem of blocking the current rising. If there is an emergency in the operation of modern rail transit vehicles, it can also brake in time through the action of circuit breaker to prevent the occurrence of safety accidents.

### **(2) Interface appliance**

For the practical application of electrical traction technology in modern rail transit vehicles, interface electrical equipment plays a role in controlling the overall electrical traction system, and is an important bridge to connect the electrical traction system and rail transit vehicles. In the electric traction system, the application quality of interface

electrical appliances is directly related to the application nature and level of electrical traction technology, especially the matching relationship between modern rail transit vehicles and electrical traction technology will have a certain impact on the interface electrical appliances. Therefore, when selecting interface electrical appliances, the matching relationship between rail vehicles and electrical traction technology should be considered in particular, and scientific and reasonable selection should be made.

### **(3) Receiving device**

As one of the important components in electrical traction technology, receiving electric equipment plays a role in ensuring the sliding stability of the third rail in the process of modern rail transit vehicles. Because the operation requirements of modern rail transit vehicles are very high, the quality level and performance level of the corresponding receiving appliances must be guaranteed, so that the electric traction technology can play an ideal traction role in the operation of the rail vehicles. In order to make the traction force of modern rail vehicles in the safe and reasonable range during the application of electrical traction technology, the pressure in the process of electrical equipment work must be appropriate to prevent serious wear. The electric appliance directly determines the force in the practical application of electrical traction technology. Therefore, the performance and strength of the receiving device must be guaranteed to make the traction force in a relatively balanced state. With the development of electrical traction technology and the progress of related industries, there have been self-adjusting electrical appliances. Through the application of this type of receiving apparatus, the coordination between electric traction technology and receiving apparatus can be further improved, which has a more significant relief effect on the pressure of the receiving apparatus in the process of electrical traction.

## **4, Electrical control in modern rail transit traction**

In electrical traction technology, traction inverter is a very important work link in the system. In the actual work process, it is mainly through the sequence conduction of IGBT, which effectively converts the system voltage into adjustable frequency, and then directly transmits three alternating current with adjustable amplitude to the traction system for use. IGBT is a very important component of traction inverter system. With the development of science and technology, the system capacity and working performance of traction inverter are improved obviously, and it also directly promotes the rapid innovation and development of vehicle inverter system. However, to ensure the normal and stable operation of the rail transit vehicle system, the reasonable control of the motor must be improved. The corresponding system control method is developed by the drive control unit inside the motor. The asynchronous motor system is used to directly control the vehicle operation system. Meanwhile, it can control the AC asynchronous motor in the inverter in real time with the modular design software of AC drive, so as to ensure the safety and stability of the motor operation. At the same time, it can effectively avoid the bad fault problem in the operation of the motor. Through the effective application of the system, it has the following advantages: in the application process, it can save a lot of energy, and the external environment is less polluted. The direct control traction system with rotation distance has good dynamic response rate in the process of vehicle operation, and can realize digital, information and network control functions in the process of operation. The effective application of electric traction technology cannot be separated from the collaborative work and operation of all links of the system, but each engineering link is independent from each other. In the process of research and development of electric traction technology, it must be developed in the direction of automation and information control, laying a solid foundation for the transportation industry in China.

## **5, The main system of application of electric traction technology of rail transit vehicles**

### **(1) Electrical control system**

For the application of electric traction technology in the operation of modern rail transit vehicles, the electrical control system plays an indispensable role. Through the operation of the electrical control system, the motor plays an effective control role in the track vehicle operation, and implements the specific control measures related to each electrical traction. When the rail transit vehicle is started under the action of electric traction technology, the electric control system will transform electric energy and kinetic energy accordingly, so as to ensure the smooth start of the rail transit vehicle. In addition, for the power grid system connected with rail transit vehicles, the electrical control system can also be controlled to a certain extent, which makes the electric motor have a higher rationality in the operation process, and reduces the excessive waste of power in the operation process. As the main part of the electrical control system, traction inverter plays the role of on-off. The realization of this function is mainly realized by IGBT sequence, which can convert DC voltage into three-phase AC, with adjustable amplitude value and adjustable frequency. Finally, three-phase AC is transmitted to traction motor. The application of the L GBT inverter can realize the function of fault protection and self-diagnosis, and also can automatically eliminate the fault to a certain extent. Compared with traditional traction inverter, IGBT has the function of saving energy and reducing pollution. With the development of relevant technologies, its advantages such as information networking and digitization are becoming more and more obvious.

## **(2) Traction system**

Based on the characteristics of modern rail transit vehicles, it is required that the constant gravity of the electric traction system should not be greater than 43.3km/h, and the speed should be controlled between 43.33 and 65km / h. When setting the conditions of electric traction, the electric traction force shall be adjusted automatically based on the load condition of the track vehicle, and the traction force within the vehicle load range shall be reasonably determined so as to ensure that the standard state of rated traction can always be reached during the operation of the rail vehicle. In order to ensure the stability and efficiency of rail transit vehicles and make the speed of electric braking force in a relatively stable state, the coordination and adaptability between electric braking force and electric traction system should be adjusted.

## **Concluding remarks**

In a word, in the process of modern rail transit vehicles, it is necessary to apply electrical traction technology effectively, effectively ensure the operation safety and stability of rail transit vehicles, and also have important guarantee for people's daily travel safety.

## **References**

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