Research on Problems and Countermeasures of Railway Emergency Management System

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Abstract. With the development of economy and transportation process, China's comprehensive transportation system has gradually become large-scale. High-efficiency integrated transportation will become an inevitable change in the development of transportation productivity to a certain stage. Safe transport industry is therefore in an extremely important position. Taking the sub-module railway transportation of the integrated transportation hub as an example, this paper analyzes the current emergency response factors based on the current situation of railway emergency treatment, and improves the release quality, dispatching command capability and construction of the railway emergency dispatch command. The railway emergency command system solves the current problems in these three aspects, and proposes a new mode of "Database + emergency" fault handling to ensure safe and efficient railway emergency disposal.

Introduction

With the development of high-speed railways across the era, modern large-scale integrated transportation hubs combine multiple modes of transportation to achieve “zero transfer or short distance” for various modes of transportation such as aviation, high-speed rail, general railway, rail transit, public transport and maglev trains. "Transfer", the development of railway transportation has entered a new period [1]. In all links of railway transport work, railway transport dispatching is the command center of daily railway transport organization, which bears the dual responsibilities of transportation safety and production task realization [2]. Railway transportation is a dynamic and changing process. Equipment failures, natural disasters, and driving accidents all affect driving. In case of emergency, through the overall command of traffic dispatching, timely scientific, reasonable and flexible scheduling of traffic organization can minimize the impact of emergency on operation and ensure smooth traffic flow. Therefore, improving the emergency handling capacity of traffic dispatching is the key to deal with emergencies.

The state and railway departments have profoundly recognized the importance of emergency dispatch. The General Office of the State Council clearly stated in the "13th Five-Year Plan for Safe Production" issued on February 3, 2017. It made clear that the 13th five-year plan period to resolutely curb major railway traffic accidents. It also stipulates the promotion of railway line safety protection zone delineation, management work and emergency rescue capacity construction project to improve the effectiveness of emergency rescue and disposal. But a year later, there are still many problems in emergency dispatching and handling of railway.

The Problems Existing in Emergency Traffic Dispatching

Dispatcher Problem

After an abnormal situation occurs on the railway, the railway bureau group company and the
station emergency command center should immediately grasp the on-site fault situation accurately and make reasonable emergency treatment decisions in a timely manner. Therefore, the responsibility of the dispatcher is very important [4]. There are many problems in the existing railway dispatching team in China. First, in recent years, railways have attracted talents through campus recruitment and social recruitment. The railway dispatching team has greatly improved the overall level of academic qualifications and business literacy, but the quality of personnel is uneven. In addition, due to lack of experience, the newly hired dispatcher lacks timely and effective emergency treatment means, so cannot issue orders to driving vehicles in a timely and accurate manner. Secondly, because railway dispatching personnel have been overloaded with work time for a long time, it is easy to lead to ideological paralysis of dispatching personnel and lack of sensitivity to information judgment, so they cannot timely capture information that affects railway transportation safety.

**Scheduling Management Issues**

During the driving process, the railway dispatcher coordinates the behavior of the relevant departments and personnel according to the actual situation that occurs in the railway transportation. Whether the dispatching command can be accurately executed is directly related to the safe operation of the railway transportation. The problems currently existing in the issuance management of railway transportation dispatching orders are as follows: First, the dispatching emergency command lacks unified command, coordination and organizational capabilities. After the occurrence of an emergency, the duties of the dispatcher and the on-duty director among the various types of work are not clearly defined. This will lead to poor handling of emergency procedures, inaccurate order issuance, and busy processing on site. Second, the scheduling order lacks rigorousness. There are often cases of omission, error and multiple dispatching, which lead to the failure of driving departments to perform operations accurately in accordance with the contents of the orders. It is easy to miss the best remedy for emergency dispatch, resulting in double waste of human and financial resources, unrecoverable damage.

**Emergency Dispatching Command Organization System Problem**

At present, the operation procedure of the railway emergency dispatching command system is that after various emergencies occur, the dispatcher mainly grasps the on-site situation by means of the Centralized Traffic Control System display and the driver's brief report. But it is difficult to accurately and clearly grasp the specific situation of the site by this information alone. The dispatchers, experts and emergency commanders of the railway bureau group also inquired about the situation by the driver and the vehicle mechanic at the same time, which not only seriously interfered with the driver and the vehicle mechanic, but also could not realize information sharing because the telephone was busy. In addition, when the driver is carrying out emergency treatment, the railway bureau group company, station and section emergency experts guide the on-site personnel to deal with the situation by telephone, which is prone to errors in judgment and consequences of disposal errors. Therefore, the technical support for such emergency response process relies mainly on the individual ability of the emergency duty officer. It is difficult to ensure that each duty officer has good fault judgment and on-site command capability, resulting in the emergency command center unable to effectively command the site disposal. At the same time, it is impossible to provide an accurate decision-making basis for the emergency leadership team. After the failure of the railway equipment, the emergency commander must immediately grasp the information such as “train conditions, ramp curves, bridges and tunnels, and three passengers” [5]. These materials are published by the company, the driver reports, and other types of work. Personnel provide and other channels to obtain, because there is no automatic extraction of information platform, manual collection, summary, and combing, resulting in delay in the emergency information, affecting the disposal time.
Measures and Suggestions Should be Taken

Improve the Quality of Scheduling Commands

First, improve the clarity and completeness of the content of the scheduling command. It is necessary to make scheduling orders according to the guidance of professionals on the premise of fully understanding the on-site situation. It need to ensure that the order is complete, accurate and clear, and then issue it, and adhere to the principle of “one thing, one order”. Secondly, it is necessary to strengthen the training of order. By carrying out daily training, the dispatcher is familiar with common scheduling commands, so as to improve his or her scheduling and application ability. The dispatcher’s emergency handling and random response ability is improved by means of competition, and the common situations of multiple, omission and error are effectively changed. Third, carry out emergency simulation and training of high-speed railway [6]. The railway group should incorporate the professions of vehicles, engineering, electricity, passenger transportation into the simulation training implementation process. Station attendants, contact network operation vehicle drivers and rescue train drivers are required to conduct drill training through the emergency simulation system to improve the emergency. That can fight for emergency time and reduce personnel and financial losses. Fourth, strengthen supervision and inspection of dispatch orders. The dispatching department is required to strengthen the establishment of relevant systems, verify the daily dispatching orders, and implement certain reward and punishment incentives to improve employee participation enthusiasm and strict dispatching orders.

Improve the Dispatching and Command Ability of Railway

The railway bureau should reasonably set up relevant posts for railway dispatching, and combine the inherent requirements of railway operations for all aspects of dispatching and commanding. Taking into account the length of the dispatching section, train density, operation difficulty, number of stations and other factors, optimize the internal operation process of dispatching command and constantly release the productivity of dispatching post. In order to ensure the standardization of train operation process management. It is necessary to further strengthen and enhance the operational management level, and regulate the safety, technology, personnel and on-site operation management of high-speed railway intermediate stations. Its content must cover the safety professional management system, standardize the management of railway rules and regulations, strengthen on-site operation and control, standardize the management of ledgers, strengthen the emergency disposal of high-speed railways, build a railway talent team, and promote the standardization of railway driving rooms. The standard strongly promotes the construction of railway command capability [7].

Construction of Railway Transportation Emergency Command System

Railway transportation emergency dispatching and command system is an emergency treatment platform to improve the emergency handling efficiency by improving the emergency dispatching and command level through information means. The construction of railway emergency dispatching command system is a new fault-handling mode of "Database + emergency " that integrates emergency command platform, emergency command center, dispatching station, data storage platform, accident scene and experts [8]. The system workflow is shown in Figure 1.
The working principle is as follows: after the fault or accident occurs, the real-time data is stored in the data storage platform through the big data road network view and the audio interworking platform. The data of the big data road network view and the audio intercommunication are obtained by the “smart glasses” worn by drivers, car mechanics, and all the video and voice information in the visual range are stored. Then the fault data is immediately transmitted to the dispatching station. The dispatching station staff informs the accident to the scheduling director, and the duty officer immediately starts the emergency command platform. The emergency command platform will automatically extract the data of the data storage platform, accurately map the fault site information, and realize the real-time sharing of information. The experts and emergency command center members can view the live video in real time through the office computer or mobile APP access platform. After the expert group researched and determined the emergency treatment plan, the instruction information was directly transmitted back to the emergency command platform by means of video, voice and text. The platform is immediately transmitted to the dispatching station, and the dispatching station immediately performs the driving command work.

The implementation of the system can successfully solve many problems of the current emergency dispatch. First, when an abnormal situation occurs, the location of the train or the location of the fault can be located, and the scene miniature scene can be accurately mapped to accurately describe the correspondence between the train and the equipment. Therefore, the dispatcher can grasp the situation at the first time, quickly determine the optimal rescue plan, and improve the efficiency of emergency work. The system can also automatically generate fault diagnosis suggestions and provide technical support for emergency instructors to guide on-site operations. Secondly, emergency experts and field operators can conduct “face-to-face” communication through the system, which truly realizes expert judgment failure, expert guidance on-site and expert monitoring operations. And the dispatching emergency command platform enables the dispatching station and emergency command center of the railway bureau group, emergency experts at all levels, and field personnel to carry out emergency treatment on the same platform through “visualization” and “consultation” command mode. In this way, real-time sharing of various information is beneficial to coordinate the simultaneous action of various departments, scientific decision-making, and efficient disposal.
Summary

Railway transportation is an important part of the integrated transportation hub. Railway transportation dispatching should be done to improve the overall efficiency and service level of transportation. Railway transportation, safety first, the safety of railway transportation is greatly affected by the quality of railway dispatching work. Therefore, it is necessary to try to minimize the losses after the occurrence of emergencies, and constantly improve the railway transportation emergency handling system and treatment. Measures to summarize the deficiencies in the emergency management work, improve the quality of railway employees, optimize the operation methods, and ensure the safe and smooth flow of railway transportation.

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