жылдамдықты магистралды құруға және пайдалануға мамандanған Қытайдың, Жапонияның және Еуропа елдерінің жетекші әлемдік ұйымдарының тәжірибесіне мұқият талдау ең тиімді жүйелік-техникалық шешім инфрақұрылым мен жылжымалы құрамның мазмұнын жобалаудың, салудың және басқарудың жоғары дәлдікті координаттық әдістерін пайдалануға көшу болып табылатындығын көрсетеді.

Түйінді сөздер: жоғары жылдамдықты темір жол, тасымалдаушылар, 30 дамыған ел, экономика, трансконтиненталдық транзит, желі.

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ENSURING TRAIN SAFETY ON HIGH-SPEED RAIL-HIGHWAY

Bitigova Dayana master's student, Academy of Logistics and Transport, Almaty, Kazakhstan, Dayana1uak@mail.ru

Bekzhanov Dinar candidat of technical science, general manager Temir Tulpar LLP, Almaty, Kazakhstan, d.bekzhanov@internet.ru

Bekzhanova Saule doctor of technical science, Academy of Logistics and Transport, Almaty, Kazakhstan, s.bekzhanova@bk.ru

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D.Bitigova, D.Bekzhanov, S.Bekzhanova
Academy of Logistics and Transport, Almaty, Kazakhstan

ENSURING TRAIN SAFETY ON HIGH-SPEED RAIL-HIGHWAY

Abstract: Modern high-speed trains in normal operation develop speeds of up to 350-400 km / h, and in tests they can even accelerate to 560-580 km/h. Due to the speed of service and high speed of movement, they seriously compete with other modes of transport, while maintaining such a property of all trains as low cost of transportation with a large volume of passenger traffic. For the first time the regular movement of high-speed trains began in 1964 in Japan under the Shinkansen project. In 1981, VSNT trains began to run in France, and soon most of Western Europe, including even the island of Great Britain, became connected by a single high-speed rail network. At the beginning of the XXI century, China became the world leader in the development of a network of high-speed lines, as well as the operator of the first regular high-speed maglev.

In Russia, the regular operation of high-speed trains "Sapsan", on common tracks with conventional trains, began at the end of 2009. Since 2013, the idea of building the first specialized high-speed railway Moscow-Kazan (cargo-passenger) for the national high-speed traffic system has been discussed.

Most of the high-speed trains carry passengers, but there are varieties designed for the transport of goods. For example, the French service La Poste has used special TGV electric trains for 30 years, which served to transport mail and parcels (their operation was completed in June 2015 due to the decrease in the volume of mailings in recent years).

Keywords: high-speed rail-highway, carriers, 30 developed countries, economy, transcontinental transit, network

Introduction. In recent years, all over the world, the issues of ensuring transport security have become especially acute. This is primarily due to an increase in the number of acts of unlawful interference in the activities of transport enterprises, including terrorist acts, an increase in the scale of their consequences (the number of victims and injured, the amount of material damage, etc.) and the expansion of the range of methods using which such illegal actions are committed.

Taking into account the transport specifics, it should be noted that one of the key points in the design and subsequent construction of a high-speed highway is transport safety. The safety system must guarantee the travel of passengers on a high-speed highway with an acceptable level of risk, a predetermined level of safety for service personnel, environmental protection and the normal functioning of the technical means of the highway. Thus, security issues are considered comprehensively - these are transport, technical, industrial, anti-terrorist, environmental, anti-crime and other types of security.

A safety system is understood as a complex of technical means of a high-speed highway, organizational and technical measures and regulatory documents governing the design, construction and operation of a highway with a given level of safety. Safety is ensured by creating the necessary margin of safety, laid down in the design in the design of permanent devices, structures and rolling stock, and maintaining this margin during operation; certification of the track, rolling stock and its pre-trip control; professional selection and training of personnel associated with the movement of trains pre-trip (pre-shift) health check of personnel; automatic registration in normal and emergency modes of parameters (states) of objects and technical means, actions of operators and traffic agents; admission of an inspection train without passengers at a speed of 160 km / h daily before the opening of train traffic according to the schedule. The infrastructure facilities of high-speed railway transport and products in terms of strength, stability and technical condition must ensure the safe movement of high-speed railway rolling stock at the highest speeds within the permissible values.

How to control traffic on the high-speed rail.

The HSR train traffic control system is based on the principles of multilevel management. The train traffic safety system covers the whole range of technological processes: train traffic control, track and energy facilities, telecommunication and communication systems, repair and restoration work, etc. It provides for redundancy of control functions and information transmission channels, ensures the work of a traffic dispatcher along the entire route for which it uses onboard systems with satellite navigation GLONASS.

In general, the automation system as a lower level of information and control systems should be considered in the form of three inextricably linked levels of control. At the top level, the formation of control commands is provided to optimize train schedules, taking into account the resolution of possible conflict situations.

The second level ensures the use of these technological solutions for the formation of routes at stations, transmission of information to locomotives about changes in the traffic schedule and receipt of information from all mobile units about the parameters of their movement and coordinates. At the present stage, this level should also include the infrastructure diagnostics tools installed on the rolling stock. The third, most critical level is security systems that provide a mode of interval regulation of train traffic and control of switches and signals at stations. All three levels are hardware and software computing systems.

Since in the area of large cities, the intervals of high-speed trains can be up to two minutes. Accordingly, the management system should be built differently. It should be noted that industry scientists have jointly created and developed the technology of multilevel control systems. And this is today recognized in international practice as one of our main achievements.

The operation of the station complex on the high-speed railways is also undergoing significant changes. Here it is necessary to provide for the possibility of flexible redundancy of systems functionally, and not at the elementary level, as before. This will reduce costs and increase the reliability factor.

You also need to remember that in solving strategic tasks there are certain problems and risks, including those associated with the cyber security of control systems. It is necessary to take into account their ability to withstand various threats. In this regard, the transition to digital models of infrastructure becomes a basic requirement. Today it is impossible to do without it in transport. Moreover, this allows us to fully harmonize with European systems.

Satellite technologies and digital communications make it possible to integrate various elements of the high-speed rail infrastructure, as well as create new approaches within the framework of a new diagnostic technology. And, importantly, we can now evaluate the results of all these developments economically.

Keeping in control

The system of monitoring and diagnostics of technical means reveals their condition, which threatens traffic safety. Information about the absence of danger is constantly, at a given frequency, supplied to stationary devices.

When the flow of information is stopped, the technological process is transferred to a protective position and the movement stops.

Stationary structures and devices, especially traffic control centers, are provided with burglar alarms and a staff of security personnel who prevent unauthorized access by strangers. At the points of intersection of the high-speed railroad track with pipelines through which fire and explosive, as well as chemically active substances are transported, it is planned to install control systems.

Fencing of road overpasses, other railway lines and pedestrian crossings placed above the high-speed lines, are equipped with devices for monitoring their integrity. In alarm systems, in addition to technological radio communication through portable radio stations, it is envisaged to install along the track, as a rule, on the supports of the contact network, push-button signaling devices for an emergency stop of the train.

A train approach alarm system is set up along the line for track work personnel; the same systems are installed at all intermediate stations. At the stations, television equipment is installed to monitor the situation on passenger platforms, as well as for a constant overview of places of increased danger: overpasses, the most important turnouts, etc.

To monitor the state of the subgrade, artificial structures, track superstructure and other devices, a monitoring system is provided based on the use of displacement and deformation detection sensors in individual elements of technical equipment. In dangerous places (river floodplains, reservoirs), flooding and erosion alarms are installed.

Special sensors will also be used to signal the formation of snow drifts on certain sections of the route. It is provided for the placement along the line of automatic wind speed meters - anemometers warning about hurricane winds, and rain gauges designed to alert about showers, the intensity of which exceeds 60 mm / h. Along the track at a given interval, as well as in front of large artificial structures, devices are installed to check the size of the rolling stock and control emergency-protruding and dragging parts and parts.

All the component parts of the railway track (subgrade, superstructure, etc.) and elements of the component parts of the railway track (rails, turnouts, rail fasteners, sleepers, ballast, etc.) in terms of strength, bearing capacity and stability should ensure the safe movement of high-speed railway rolling stock with the highest speeds within the permissible values. All the above features will be taken into account by a transport security expert already at the stage of route design.

Onboard technical devices.

The complex of on-board technical devices of the train includes the following traffic safety devices: devices for monitoring

the integrity of the train, fire alarms, checks of the driver's vigilance, anti-gas and anti-slip devices. For timely detection of the deviation of rail lines from the standard tolerances, high-speed rolling stock is equipped with a special system.

Conclusion. High-speed connections provide today a higher level of passenger safety compared to other modes of transport. Special designs of the track, rolling stock, contact network, blocking devices, signaling ensure high reliability of the entire high-speed traffic system.

Currently, high-speed trains are equipped with improved and efficient disc brakes, electrodynamic braking systems, electromagnetic rail brakes, as well as aerodynamic braking systems and eddy current brakes.

To reduce the resistance to movement, great attention is paid to the aerodynamic shape of high-speed trains, while any gaps between the cars are not allowed. An automated traffic control system ("motorist") also serves to ensure safety, since at speeds above 150 km / h, the perception of track objects, signals is visually difficult, therefore the movement of trains is carried out automatically, the control process itself is controlled by an additional on-board computer connected to the computer in control center. The selection of drivers for high-speed trains is carried out according to individual requirements. In addition to high engineering qualifications, special psychological training and increased health requirements are required.

The construction of high-speed highways with environmentally friendly rolling stock will significantly reduce the severity of man-made environmental problems.

Note that on the conventional railway network, the overwhelming number of passenger train crashes occurs when they collide with freight trains or freight cars, which is practically impossible for a high-speed line.

All intersections with highways are made at different levels, which means that such a massive type of accidents on conventional railways, such as a collision of trains with vehicles, is excluded on high-speed lines. The entire line of the high-speed highway is protected by special fences that prevent the entry of animals and unauthorized persons on the way. It is envisaged to use technological solutions that enable people, animals and vehicles to cross the high-speed line at different levels.

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ОБЕСПЕЧЕНИЕ БЕЗОПАСНОСТИ ДВИЖЕНИЯ ПОЕЗДОВ ПО ВЫСОКОСКОРОСТНОЙ МАГИСТРАЛИ

Битигова Даяна, магистрант Академии логистики и транспорта, Алматы, Казахстан, Dayana1uak@mail.ru

Бекжанов Динар, кандидат технических наук, генеральный директор ТОО «Темір Тулпар», Алматы, Казахстан, d.bekzhanov@internet.ru

Бекжанова Сауле, доктор технических наук, Академия логистики и транспорта, Алматы, Казахстан, s.bekzhanova@bk.ru

Аннотация: Современные высокоскоростные поезда в штатной эксплуатации развивают скорости до 350—400 км/ч, а в испытаниях и вовсе могут разгоняться до 560—580 км/ч. Благодаря быстроте обслуживания и высокой скорости движения они составляют серьёзную конкуренцию другим видам транспорта, сохраняя при этом такое свойство всех поездов, как низкая себестоимость перевозок при большом объёме пассажиропотока. Впервые регулярное движение высокоскоростных поездов началось в 1964 году в Японии по проекту «Синкансэн». В 1981 году поезда ВСНТ стали курсировать и во Франции, а вскоре большая часть западной Европы, включая даже островную Великобританию, стала связана единой высокоскоростной железнодорожной сетью. В начале XXI века мировым лидером по развитию сети высокоскоростных линий, а также эксплуатантом первого регулярного высокоскоростного маглева стал Китай.

В основном высокоскоростные поезда перевозят пассажиров, однако существуют разновидности, предназначенные и для перевозки грузов. Так, французская служба La Poste на протяжении 30 лет использовала специальные электропоезда TGV, служившие для перевозки почты и посылок (их эксплуатация завершена в июне 2015 года из-за сократившегося в последние годы объёма почтовых отправлений).

Ключевые слова: высокоскоростная железная дорога, перевозчики, 30 развитых стран, экономика, трансконтинентальный транзит, сеть

ЖОҒАРЫ ЖЫЛДАМДЫҚТЫ ТЕМІР ЖОЛЫНДА ПОЙЫЗДАРДЫҢ ҚАУІПСІЗДІГІН ҚАМТАМАСЫЗ ЕТУ

Битигова Даяна, магистрант, Логистика және көлік академиясы, г. Алматы, Қазақстан, Dayana1uak@mail.ru

Бекжанов Динар, техника ғылымдарының кандидаты, бас директор Темір Тұлпар ЖШС, г. Алматы, Қазақстан d.bekzhanov@internet.ru

Бекжанова Сауле, техника ғылымдарының докторы, Логистика және көлік академиясы, г. Алматы, Қазақстан, s.bekzhanova@bk.ru

Аңдатпа: Заманауи жүрдек пойыздар қалыпты жағдайда 350-400 км/сағ дейін жылдамдықты дамытады, ал сынақтар кезінде олар тіпті 560-580 км/сағ дейін жылдамдата алады. Қызмет көрсету жылдамдығы мен қозғалыстың жоғары жылдамдығына байланысты олар басқа көлік түрлерімен байыпты бәсекелеседі, сонымен қатар барлық пойыздардың қасиетін сақтай отырып, жолаушылар ағынының үлкен көлемімен тасымалдаудың төмен құны. Алғаш рет жүрдек пойыздардың тұрақты қозғалысы 1964 жылы Жапонияда Шинкансен жобасы бойынша басталды. 1981 жылы Францияда VSNT пойыздары жүре бастады, көп ұзамай Батыс Еуропаның көп бөлігі, тіпті Ұлыбритания аралын да бірыңғай жүрдек теміржол желісі байланыстырды. XXI ғасырдың басында Қытай жылдамдығы жоғары желілер желісін дамытуда әлемдік көшбасшыға айналды, сонымен қатар алғашқы тұрақты жүрдек маглевтің операторы болды.

Түйінді сөздер: жоғары жылдамдықты темір жол, тасымалдаушылар, 30 дамыған ел, экономика, трансконтиненталдық транзит, желі