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PERSPECTIVE DIRECTION OF SECURITY OF PRODUCTION PROCESSES USING TRAINING SIMULATORS FOR HIGH-SPEED MOVEMENT

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Abstract: The article provides examples of functional trainers and the results of their comparative analysis. Moreover, modules for ensuring the safety of production processes based on a problem-situational approach are considered. For example, simulators that are focused on training a specialist with the further development of certain skills. As a result of which, it can be noted that a modern training system should include, in addition to the means of "visual simulation", also the means of "sensitive simulation", which mainly form the experience and ability to act in a certain environment.

Key words: Train simulators, training systems, production processes, complex, driver, multiplayer, simulation, interface, operator, specialist, model, simulator, external factors, internal factors.

The creation of the National High Speed Communication System in our country plays an important connecting and strategic role. According to the «Strategy for the Development of Russian Railways until 2030», by this time 1.5 thousand km of high-speed highways should appear in our country. The advent of the National High-Speed Traffic System will bring

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cities closer together and increase the mobility of Russians. To select the fundamental technical and technological solutions on the basis of which the Russian high-speed traffic will be created, the specialists of Russian Railways study in detail the world experience in the construction and operation of high-speed railways, get acquainted with the technology and system for organizing high-speed traffic on foreign railways [1]. The origin and development of high-speed movement in Russia required fundamentally new approaches to training personnel to work on «Sapsan» electric trains. In this regard, August 30, 2010. President of Russian Railways V.I. Yakunin and signed the order No. 145 «On the establishment of a Training Center for personnel for servicing high-speed trains - an educational structural unit of the High-Speed Traffic Directorate - a branch of Russian Railways» [1,2].

For the first time in the practice of the Russian railways with the technical training of locomotive brigades, the mandatory use of simulators is normatively prescribed. The display on the screen or monitor of the images of the path ahead and the readings of the signals creates a real situation with all its changes characteristic of the train in a particular section. As in a real control cabin, the instrument displays the readings of measuring instruments and signaling devices. So that the driver can take adequate measures to eliminate the "malfunction" that has occurred, the «Sapsan» simulator is equipped with all the necessary tools. A special role is played by the interior of the cabin, where the driver feels in his usual working environment. Equally important is the creation of a real acoustic environment. For this, the simulator is equipped with the means of reproducing all sounds and noises that are characteristic of the driver's cabin during the train. Here he sees and feels the slopes of the path, their steepness and descents. The simulator has a mobility system. That is, the dynamics module reproduces all the vibrations experienced by the engineer when driving a real train. The maximum synchronization of the nature of the loads experienced by a person is important with what he sees on the screen at this time, since the brain quickly responds to the slightest inconsistencies. The real pride of the Training Center is the «Sapsan» train simulator. To transmit the real dynamics of movement, a system is installed in it, projecting a piece of infrastructure onto a spherically curved screen. Simulation of the passage of

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turnouts, curves, acceleration and deceleration occurs with characteristic longitudinal and transverse dynamic reactions, depending on the given geometric parameters of the site and its geographical coordinate, where the electric train is currently located. The whole system of simulation of the «Sapsan» simulator consists of six actuators with electric screw transmission, three cylinders for pneumatic shock absorption of a load, a movable platform, gaskets and corresponding control units. For "holding" the mass and "damping" in the simulator, pneumatic cylinders are used with constant maintenance of the necessary atmospheric pressure in them, connected through articulated joints to the movable and supporting frames. The supply of compressed air comes from a stationary pneumatic system. The motion simulation system is controlled by a master computer, which with the help of special software generates the necessary impulses. Using this unique simulator is a direct way to significantly improve the quality of training of speed drivers who are entrusted with driving the «Sapsan» electric trains. However, there is a question that needs to be addressed. At the same time, only one person can be trained on the simulator who does not have interaction with other colleagues from related services. Therefore, in the foreseeable future, it is planned to introduce technologies into the educational process, where the simulators will be combined into a single network. It is this technology that has already been developed by Australian experts. There is also a new personnel training system that comprehensively simulates the situation on a specific section, the road as a whole, and, of course, in the driver's cab. Using virtual reality theaters, training sessions can be "lost" in the classroom, which helps to consolidate the knowledge gained. There is recording and reproducing equipment with which you can demonstrate a series of animated training films, which details the difference between the correct and erroneous actions of the locomotive team. Over time, this system will be widely used in technical studies and advanced training of all personnel of high-speed electric trains. During training, teachers, as a rule, draw the attention of students to the requirements of traffic safety. After all, «Peregrine Falcons» follow on special conditions. In their timeline, the "threads" are constant. Before such a fast-flying express train, whole lines should be free. Of course, colleagues from other depots and the population, accustomed to daily commuting from the suburbs by electric trains, have complaints about

speed drivers. Only one «Sapsan» during its movement «cancels» up to eight "simple" trains. That is why it is necessary to build separate specialized lines. And the solution to this problem is already being worked out by the management of Russian Railways, as well as many experts in the field of high-speed traffic [3,4,5,12].

The simulator of the EP1M electric locomotive driver is a new generation simulator created using modern methods of mathematical modeling. It is designed to train locomotive crews in rational ways of driving trains, driving connected, heavy and long trains, actions in emergency and emergency situations on real sections of the track served by a locomotive crew. The simulator simulates the operation of all the main systems of an electric locomotive in interaction with railway objects. infrastructure.

Locomotive cab, driver's console, controls and displays fully correspond to real conditions. The visualization system - 3D graphics - provides a high level of simulation of the traveling situation, the ability to select weather conditions and visibility ranges. The simulator has a high-quality system to simulate a sound environment.

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