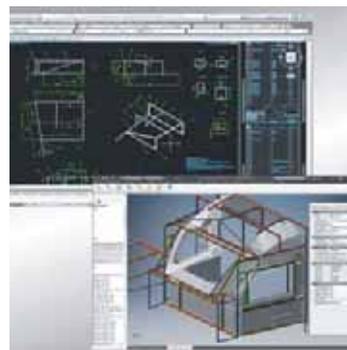
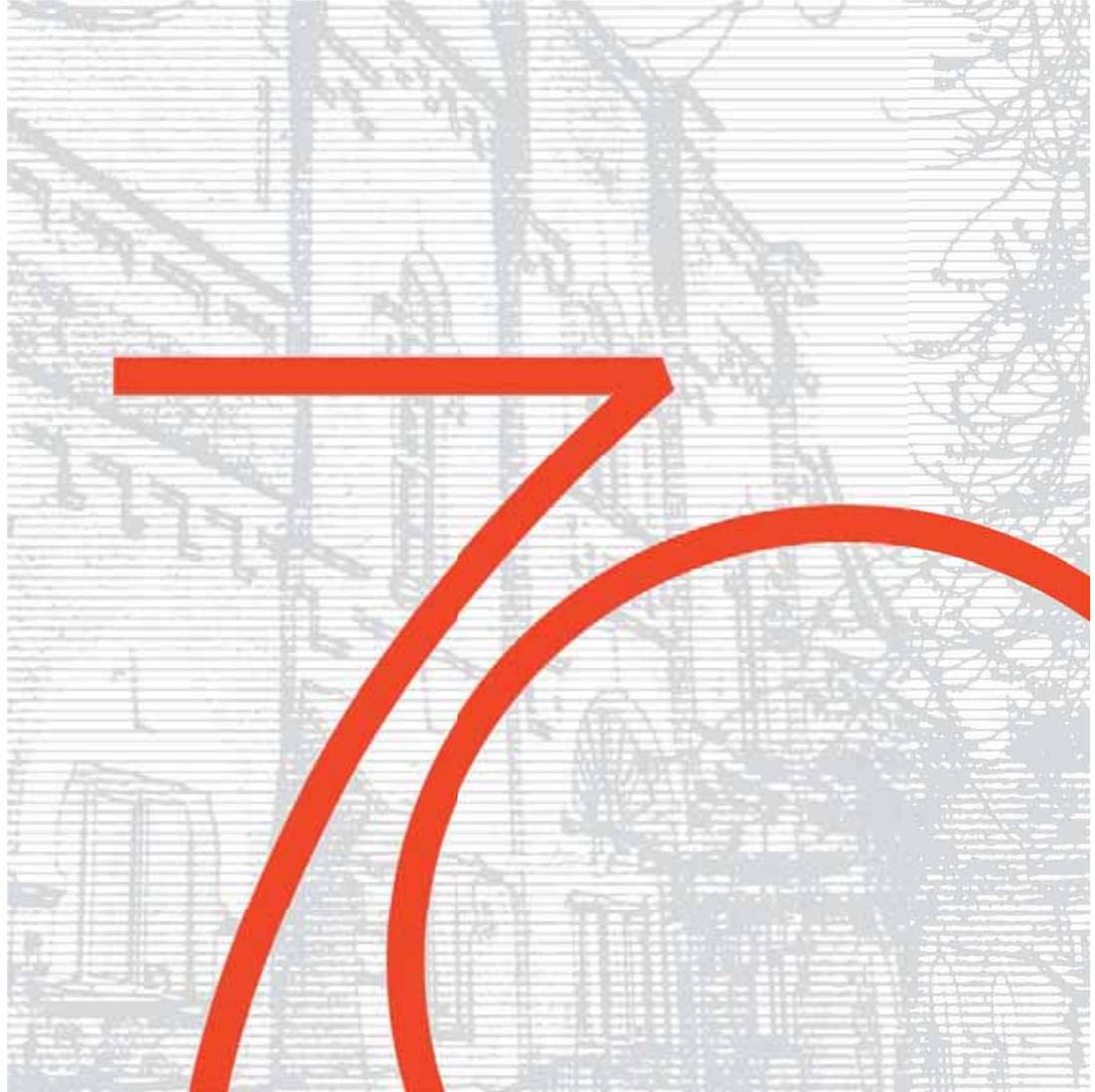
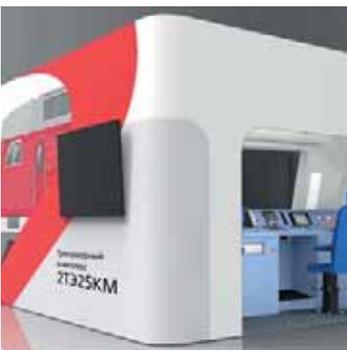




Design Bureau of Russian Railways



TRADITIONS, RELIABILITY, INNOVATION

The Locomotive Engineering Design Bureau, a branch of Russian Railways (hereinafter referred to as the Design Bureau), is an industry engineering, evaluation, and research center, providing the integrated support of the locomotive facilities and handling specific issues of the Russian Railways passenger and infrastructure business units, service providers, locomotive building and repair plants, as well as third-party organizations.



For more than 70 years, the Design Bureau experts have been offering the best engineering solutions for the development of new traction rolling stock, operation, maintenance, and repair of locomotives, improving traffic safety, heavy haul organization, introduction of advanced technology and process equipment, simulator complexes, personnel training, modernization of traction rolling stock, improving energy efficiency and reliability of locomotives and their units and assemblies

The Design Bureau's scope of work is determined by the requirements and objectives of Russian Railways and the complex of locomotive facilities in the rapidly changing conditions of the modern world.

We are willing to follow all innovative engineering trends to always be in demand in our industry



OUR AWARDS



The Design Bureau is included in the register of the most successful companies by the European Fund for Quality Management (EFQM) and has received an EFQM international certificate

The Bureau has been highly commended by the Russian Quality Program



Since 2010, the Design Bureau developments have won five prizes of the 100 Best Goods of Russia program



Since 2011, the Design Bureau developments have received five honored certificates, four gold and platinum medals of the International Exhibition of measuring tools, testing equipment, and metrological support



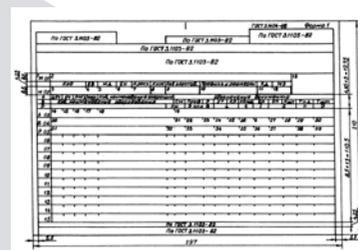
Engineering solutions developed by the Design Bureau are protected by 66 patents

EXPERTISE AND CUSTOMERS

Traction Directorate, branch of
Russian Railways

Directorate for Repair of Traction Rolling Stock, branch
of Russian Railways

Locomotive Engineering Design Bureau,



- Design documentation archive covering all the Soviet and Russian traction rolling stock

- Locomotive control systems software archive

- System support. Electronic Passport of locomotives and their equipment

- Providing necessary documentation for locomotive complex facilities

- Accredited test centre for threshold standard values of train masses

- Support services for cars of traction and power laboratories

- Accredited test center for service and verification of diagnostic devices for rolling stock brake equipment and train brake control systems

- Basic structural division of the Russian Railways Standards Office

- Basic structural division of the Russian Railways Metrological Service

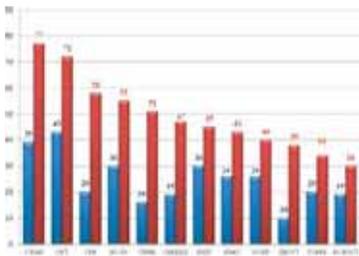
- Developing standard processes of locomotive maintenance and repair

- Developing the regulatory and methodological support documentation for locomotive facilities (maintenance and repair depots, locomotive building and repair plants, and other organizations)

Departments and other branches of Russian Railways



branch of Russian Railways



- Maintaining and calculating the balance of locomotive fleets and their repair needs
- Reference and analytical support of the locomotive complex facilities

- Expert evaluation of design and process documentation for manufacturers of locomotives, locomotive equipment, spare parts, and repairs
- Developing the regulatory documentation on occupational health and safety (standards, rules, instructions)

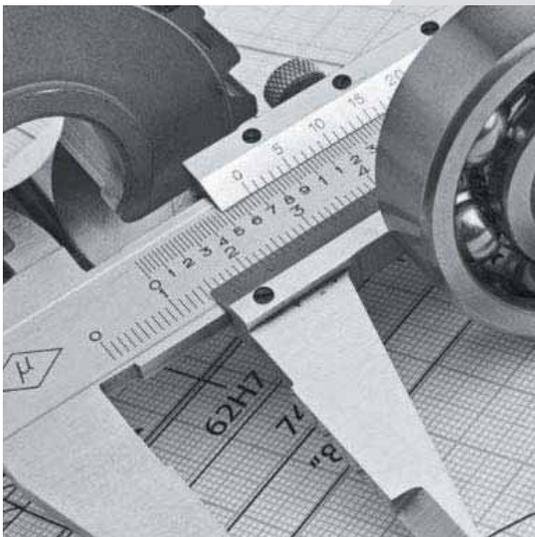
- Developing and manufacturing non-standardized process and test equipment for locomotive operation and repair on the basis of locomotive design documentation

- Developing and maintaining expertise evaluation and improvement systems for the personnel of the Traction Directorate, Directorate for Repair of Traction Rolling Stock, Central Directorate of Motor Rolling Stock
- Developing of training complexes and supporting personnel trainings using the same

OUR HISTORY

1949: ESTABLISHMENT OF THE DESIGN BUREAU

By the order of Iosif Stalin, Chairman of the Council of Ministers of the USSR, the Design Bureau for the unification and standardization of locomotive units and parts was established at the Head Directorate of Locomotive Facilities of the Ministry of Railways. Throughout its history, the Design Bureau managed an extensive network of branches and divisions in Torzhok, Almaty, Kharkiv, Rostov-on-Don, Novosibirsk, and Petropavlovsk. Nowadays, the Design Bureau has its divisions on 14 Railways of the Russian Federation



1981: BASE ARM FOR METROLOGY

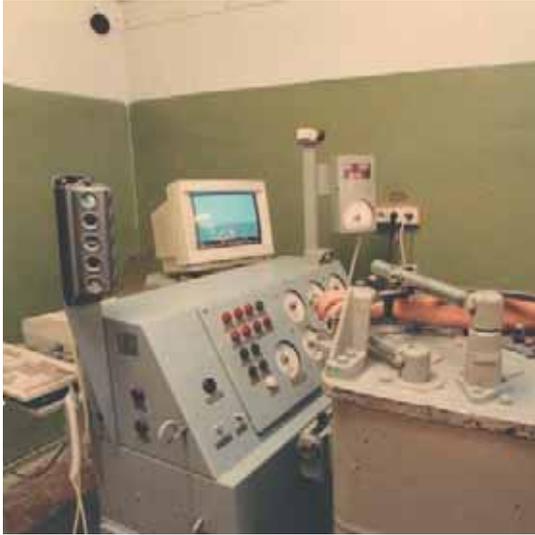
Since 1981, the Design Bureau has been the base arm for Metrology of the USSR locomotive facilities.

Over the past thirty-eight years, more than forty items of testing and verification equipment meeting up-to-date metrological requirements have been developed and put into production

1986: PARTICIPATING IN CHERNOBYL DISASTER MANAGEMENT

The Design Bureau personnel took an active part in the Chernobyl disaster management. A locomotive suitable for operation in high radiation settings was developed under the guidance of distinguished railway engineers





LATE 1980'S: DEVELOPMENT OF SIMULATOR SETS

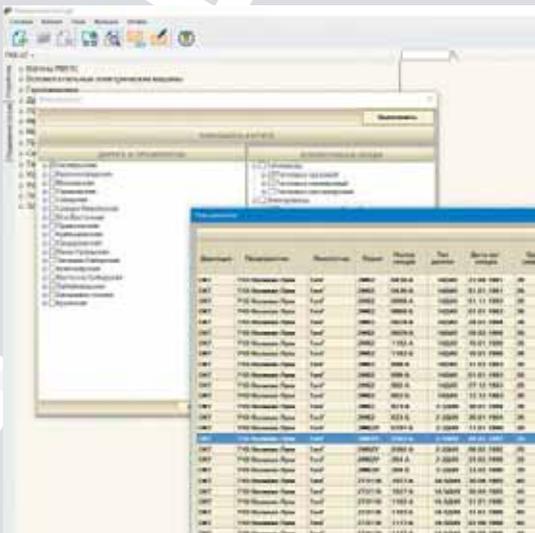
Upon establishing the Department for Microprocessor and Computer Technology, the Bureau began to develop and manufacture simulators of various locomotive series to train locomotive crews.

Today, the Design Bureau is the heart of domestic railway simulator production

1993: IMPORT SUBSTITUTION PROGRAM

Since 1993, as instructed by the Ministry of Railways of the Russian Federation, the Design Bureau participates in the import substitution program.

Within the framework of the above, the Bureau experts have developed the technical documentation to substitute imported traction rolling stock equipment with domestic analogues in order to organize the repair and spare part production at locomotive repair plants



2002: DEVELOPMENT OF THE ELECTRONIC PASSPORT AUTOMATED SYSTEM (EP AS)

As per the Resolution No. 2 of February 06, 2002 of the Ministry of Railways of the Russian Federation, experts of the Design Bureau began to develop the ePass AS to ensure that the technical condition of the traction rolling stock and its equipment is properly controlled. By 2011, the system had been implemented across all the locomotive depots, as well as locomotive repair and building plants. Today, the EP AS contains data both on locomotives and their equipment, and also on the Russian Railways motor car rolling stock

2006: REVIVAL OF DOMESTIC LOCOMOTIVE ENGINEERING

Since the Department of New Locomotives and Operational Testing was established in 2006, the work has been underway on supporting the development, testing and production of new locomotives and component equipment supplied to Russian Railways.

The Bureau experts continuously monitor the technical condition of the traction rolling stock under operation and analyze reliability indicators to provide the information required for the preparation of measures to improve the designs of manufactured and operated locomotives.



2006: DEVELOPMENT OF THE PERSONNEL COMPETENCE EVALUATION SYSTEM FOR RUSSIAN RAILWAY LOCOMOTIVE FACILITIES

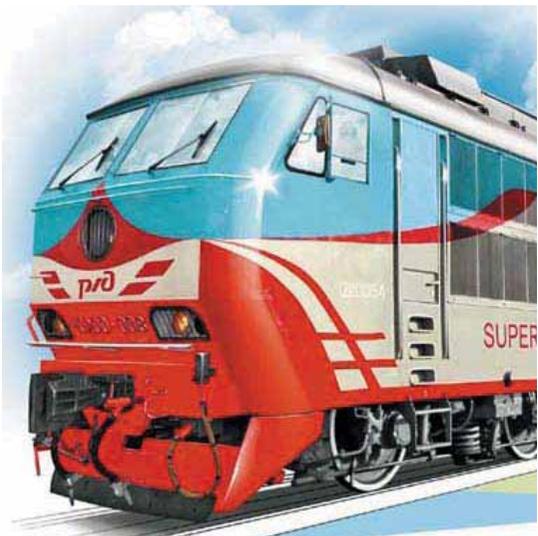


As requested by the Department of Locomotive Facilities, the Design Bureau has developed the Personnel Competence Evaluation System. The system has been implemented across all the organizations within the Traction Directorate, Directorate for Repair of Traction Rolling Stock, and Motor Car Rolling Stock Directorate. The Personnel Competence Evaluation System has become one of the elements of an end-to-end technological process that allows for knowledge testing along with personnel training depending on the test results, operational violations detected, and results of simulation cycles.

2007-2008: DEVELOPMENT OF HIGH-SPEED RAILWAY LINKS

As per the orders of the Russian Railways President, Departments of High and Very High-Speed Motor Car Rolling Stock were established. Specialists of the Departments were directly involved in the implementation of such important projects as Sapsan and Allegro high-speed electric trains, Lastochka high-speed electric trains, 611M railcars across all stages of their life cycle. Today, the Departments participate in development, launching into manufacture, testing, and certification of very high and high-speed motor car rolling stock





2011-2014: DIAGNOSTIC LABORATORIES

Since 2011, the Design Bureau has been developing self-propelled diagnostic laboratories. They are designed for the continuous automated monitoring and evaluation of railway infrastructure technical condition under increased in-traffic axial loads. This is especially important for lines where high-speed and heavy trains run.

In 2012, a high-speed laboratory based on a ЧС200 electric locomotive and a self-propelled track-measuring laboratory based on a ВЛ11м freight electric locomotive were developed and manufactured. In 2014, a multifunctional laboratory based on a 2ТЭ 116 diesel-powered locomotive, including the diagnostic equipment for AC/DC overhead lines, came online for the needs of the Eastern Test Site

2015: ACCREDITATION OF THE METROLOGICAL SERVICE AND TEST CENTER

As per the Order of the RusAccreditation National Accreditation Institute of January 22, 2015, the Design Bureau has been accredited for verification of diagnostic devices of rolling stock brake equipment (Accreditation Certificate No. RA. RU. 310555).

During the same year, a Test Center for threshold standard values of locomotive-driven freight train masses was established as part of the Bureau (Accreditation Certificate of the Russian Federal Service for Accreditation No. RA.EN.21AE45) to assess the possibility of increasing weight standards for heavy trains and push-pull trains



SCOPE OF ACTIVITY

SIMULATOR COMPLEXES

Development, manufacture, and maintenance of simulator complex for locomotive crews. All simulators offered by the Design Bureau are produced as per the design documentation of locomotive manufacturers and based on original algorithms of traction rolling stock control



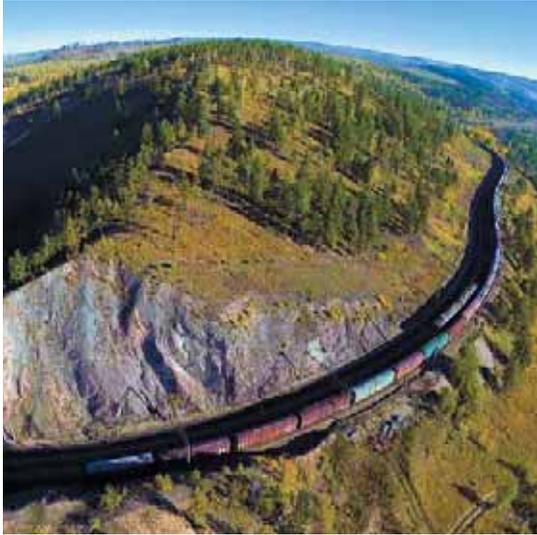
TRAINING LOCOMOTIVE CREWS

Development and maintenance of an Integrated System of Locomotive Crew Fault Accounting and Analysis during Training and Competence Evaluation, which incorporates simulator complexes and competence evaluation and improvement systems

TECHNICAL DOCUMENTATION DEVELOPMENT

Providing regulatory and methodological support for locomotive facilities, developing design and process documentation, standard technological processes, projects for modernization and improvement of traction rolling stock in order to increase reliability and reduce costs for its operation and repair





PULL AND ENERGY EFFICIENCY TESTS

Conducting pull and energy efficiency tests of various locomotives at the test sites of all 16 RussiRailways of Russia. The Design Bureau is the only EAEU-based accredited test center authorized by the State to determine the maximum permissible mass standards of trains and to identify bottlenecks in the maintenance of the heavy haul infrastructure

EXPERT EVALUATION OF REGULATORY AND TECHNICAL DOCUMENTATION

Expert evaluation of design, technical, process, and regulatory documentation, consulting services, development of technical requirements and specifications for the rolling stock and its components



MANUFACTURING CUSTOMIZED PROCESS EQUIPMENT

Developing and manufacturing the process, testing, and calibration equipment to maintain and repair locomotives at repair plants and in metrology centers throughout Russia and the CIS

All equipment is developed as per the updated design documentation provided by manufacturers of locomotives and components



BRAKE EQUIPMENT MAINTENANCE

Integrated maintenance, calibration, repair, and updating of the software installed in various brake equipment diagnostic devices. The Design Bureau is accredited by the Russian National Accreditation System for Measurement Uniformity to perform work and provide services for verification of measuring tools as part of the base arm of the Russian Railways Metrological Service

A screenshot of a software application window displaying a data table. The table has multiple columns and rows, with a header row in blue. The data appears to be organized in a grid format, possibly representing a schedule or inventory list. The software interface includes standard Windows-style window controls and a menu bar.

CALCULATING THE BALANCE OF THE RUSSIAN RAILWAY LOCOMOTIVE FLEET

Calculating the balance of the Russian Railway locomotive fleet using the Electronic Passport Automated System in order to optimize the Russian Railway investment program to procure only the most in-demand traction rolling stock, providing the systematic utilization of production capacities and locomotive building and repair plants during the entire planning period, considering the long-term programs of locomotive write-offs, repair, and modernization

MAINTAINING TECHNICAL DOCUMENTATION ARCHIVES

Maintaining technical documentation archives covering all types of the Soviet and Russian traction rolling stock, software of locomotive control systems, regulatory documents, scientific and technical developments. Provision of the required documentation and customer service to locomotive facilities



APPLYING SIMULATOR TECHNOLOGY IN THE DEVELOPMENT OF UNMANNED LOCOMOTIVES



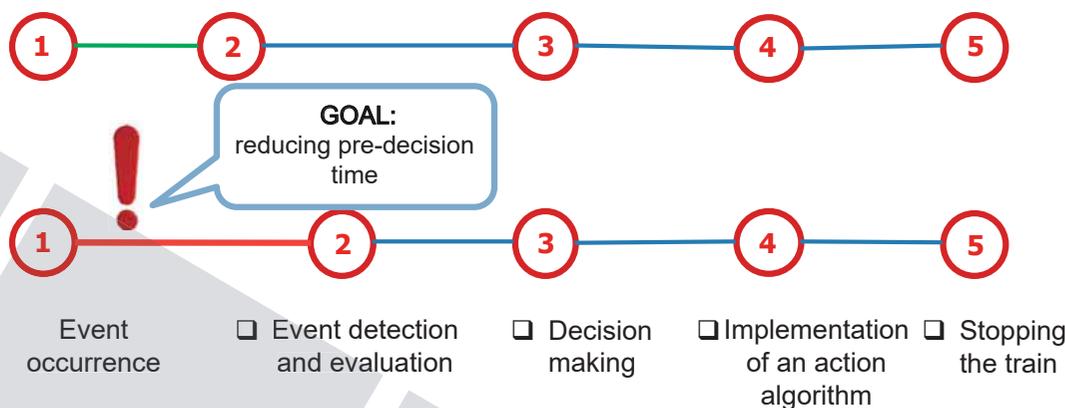
When developing an up-to-date unmanned locomotive, it is advisable to use simulator technology in terms of training neural networks of such an unmanned locomotive, testing and verification of algorithms, as well as an additional control system during real trips

The unmanned system communicates with the environment simulation system via an interface and receives data from the video system thus simulating sensors and lidars

Human



Artificial intelligence



The data library the Design Bureau uses for scenario processing contains more than 55,000 km of track sections captured and more than 100 stations in 3D. The simulator environment scenario library currently covers over 100 various non-standard and emergency scenarios. Both libraries are being constantly expanded and enriched.

When checking whether the training session of an unmanned locomotive's neural network was adequate, it is necessary to monitor the development of several situations. One of the most challenging issues is the development of a rolling stock control evaluation system, including in terms of emergency scenarios, pre-decision time, and the correctness of algorithm applications. To compare artificial intelligence with a human, it is necessary to have data on the actual time of decision-making spent by human drivers. It is worth noticing that the time of a human reaction depends on his or her psychic, emotional, and physiological state, while the pre-decision time spent by the system is a constant value.

SIMULATION TECHNOLOGIES FOR TRAINING OF LOCOMOTIVE CREWS

The Design Bureau is one of the main developers and suppliers of simulator complexes for the railway network.

More than 300 simulators manufactured by the Design Bureau for the main series of locomotives and electric trains are operated by Russian Railways

A conventional simulation complex creates the effect of presence in a real locomotive.

The simulator includes:

- Visualization system with a library of track sections captured (about 55 thousand km) and 3D track sections
- Real driver's cabin and a control panel equipped with modern safety devices and control systems
- Creating various scenarios for trains (including non-standard)
- Automatic fault detection
- Integrated personnel evaluation system (including the driver's passport)



In 2019, the Bureau developed a new (procedural) type of simulator. It is intended to shape basic skills and refine certain procedures, and also to practice the action scenario locomotive crews shall follow until it becomes automatic when studying various systems of the locomotive, to master working with safety systems and microprocessor control systems. Thanks to using touch screens capable of displaying any system of operation of the locomotive, procedural simulators are multi-purpose.

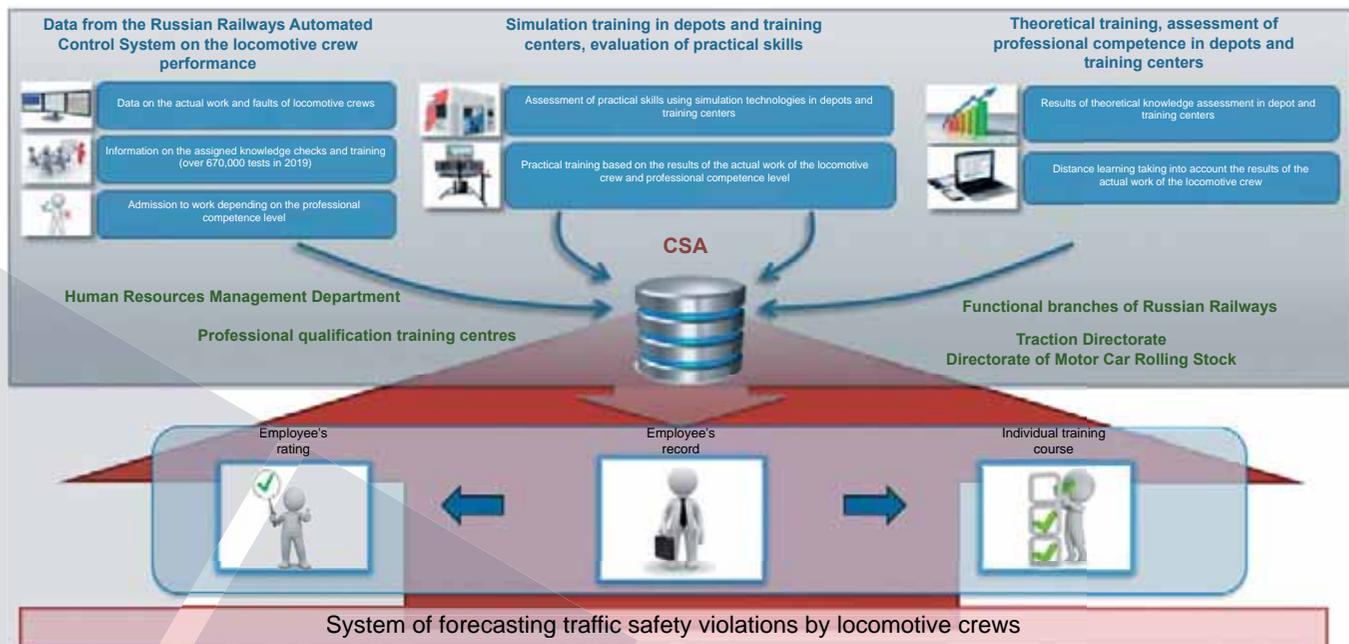
They are fitted with a software package to simulate the operation of all locomotives and electric trains available in the Russian Railway fleet, while their cost is much lower than that of full-scale models and foreign analogues

New simulators complement the range of the conventional ones: upon mastering basic skills and practicing them until they become the second nature, trainees shift to a full-scale simulator. Both simulators are integrated with knowledge databases of locomotive crew competence evaluation systems to make up individual training programs. It allows operating in the modes of test site simulation, joint training of several drivers at once on one and the same test site under the guidance of a shared instructor, who will assign individual tasks for each trainee. Training in such classes will follow the Regulations on Training, approved by the Order No. 904 of May 12, 2017.

INTEGRATED SYSTEM OF LOCOMOTIVE CREW TRAINING AND COMPETENCE EVALUATION

The Integrated System of Locomotive Crew Training and Competence Evaluation analyzes the information sourced from various information systems of Russian Railways.

The Personnel Competence Evaluation System employed by the Russian Railways locomotive facilities daily transmits information about faults of locomotive crews identified in the decoding of speed-measuring tapes and memory modules, which were analyzed with the locomotive crew blamed for the fault identified



Depending on the received data on faults, the Personnel Competence Evaluation System automatically develops a training plan and an evaluation session on the faults identified, and this information is transmitted to simulator complexes to create a training trip assignment.

DELIVERABLES OF THE INTEGRATED SYSTEM OF LOCOMOTIVE CREW TRAINING AND COMPETENCE EVALUATION

- Analysis of the results of theoretical knowledge and practical skills evaluation
- Creating an individual system of locomotive crew training given the level of competence and performance of locomotive crews
- Implementing barrier functions to allow locomotive crews to work considering the level of competence
- Establishing risk groups of locomotive crew members

CHILDREN'S RAILWAY TRAIN CONCEPT

At first sight, the Children's Railway (CR) is just an amusement ride, yet there is much more about it. The difference is that here everything is done by schoolchildren of Grades 5 to 9. Here they act as conductors, switchmen, station duty officers, dispatchers, and even a driver is also a school child.

CR is a place where future railroad talents are born. During a three-year period, in winter, schoolchildren study the basics of railway business, while summer provides the young lovers of railways with a long-awaited opportunity to practice their knowledge.

The Design Bureau has developed a unique tool for training young railway lovers, that is an innovative diesel train with the electric power transmission and the ability to operate from traction batteries. This approach gives young railwaymen an opportunity to know what steam, electric, and multiple units are like.



TRAIN FEATURES

SOLUTIONS FOR SIMULATION

- Increased capacity cabin
- Tutorial multimedia with QR labels on equipment
- Combination of several occupations



PASSENGER COMFORT

- Cabin layout and the unique conceptual design of seats
- Charging ports, Wi-Fi, mobile services
- Places for people with disabilities
- Vending machines
- Anti-bacterial handrails



EXTERIOR

- 360° windows and roof
- Hidden tow hitch
- Closed carriage structure
- Led lights



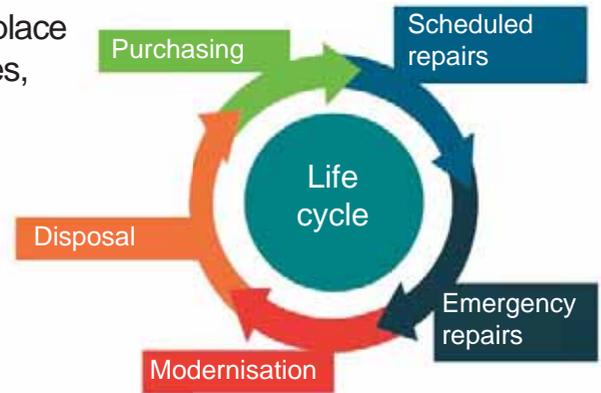
OPERATION

- Boarding using high and low platforms
- Changing train sets during different periods of operation
- Hybrid drive, rechargeable batteries
- EURO-5 engine



ELECTRONIC PASSPORT AUTOMATED SYSTEM

The Electronic Passport Automated System (EP AS) is a single place to store information about all events of the life cycle of locomotives, motor car rolling stock, their units and assemblies. More than 8 million passports are registered in the system. All enterprises of the Russian Railways locomotive and motor car facilities, service providers, locomotive building and repair plants, as well as the Central Suburban Passenger Company are connected to the EP AS. Currently, more than 10,000 users utilize the system.



The EP AS is the only system that makes it possible to perform operational monitoring of the traction rolling stock and its equipment

The EP AS sends information to the Trusted Environment Automation System, where locomotive facilities store their data during the entire life cycle

**LOCOMOTIVE ELECTRONIC
PASSPORT**

**TRUSTED
ENVIRONMENT**

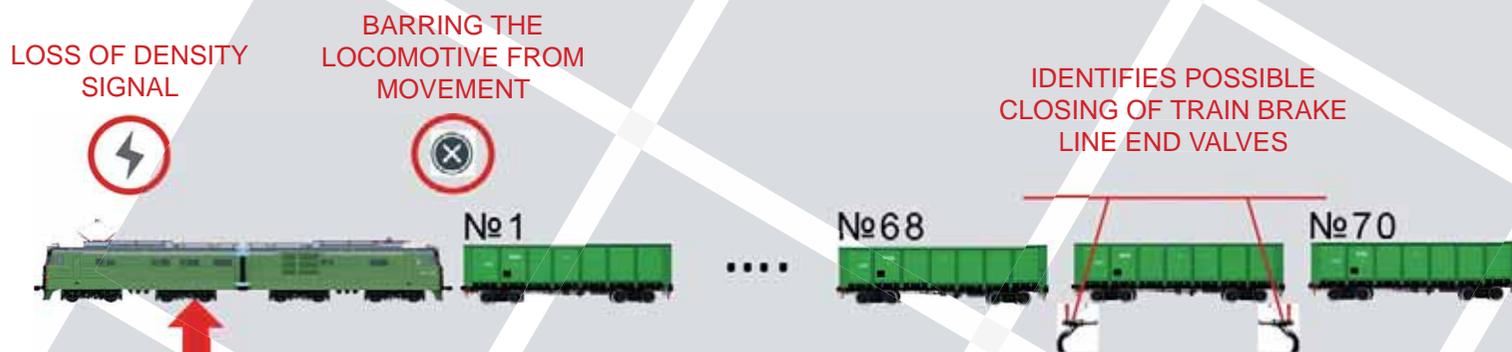


BRAKE LINE DENSITY INDICATION SYSTEM

Closing (freezing) of brake line end valves leads to dire consequences in terms of train safety. The brake line density indication system (BLDIS-395), developed by the Design Bureau together with Electromechanika, OJSC (Penza), allows to reliably detect the closing of the brake line even in the last third of the train, and also to ensure whether the full or reduced testing of the brakes and the brake integrity checks were adequate in the departure of the train after stopping

PURPOSE OF THE SYSTEM

- Continuous monitoring of the freight train brake line integrity
- Checking the brake line integrity before the train departs
- Blocking off any movement if the brake line density changes
- Control of the adequacy of full and reduced brake tests



SYSTEM FEATURES

- Minimization of the human factor influence on brake integrity checks and fault monitoring
- Increasing the throughput and reducing the turnaround time for locomotives and locomotive crews
- Saving traction and energy resources
- Control of the adequacy of full and reduced brake tests

SYSTEM FOR HIGH WEIGHT AND LENGTH TRAIN BRAKE CONTROL

The System for High Weight and Length Train Brake Control is designed to be used at railway rolling stock for automatic braking synchronous or asynchronous control at the train's head and tail when driving freight trains of high weight and length with one or more active locomotives in the head.

AUTOMATIC TRAIN OPERATION SYSTEMS



STBC



DRIVER'S ELECTRONIC BRAKE VALVE



Currently, the System for High Weight and Length Train Brake Control is implemented on 470 locomotive and 760 car sets. It is installed on 276 locomotives (463 sections) The System has certificates of conformity to Specifications and Technical Regulations of the Customs Union 001/2011. The serviceable technical condition of the System is ensured by a single service system of the Design Bureau

In 2017, within the framework of the New Link competition, a project of the system's modernization called Intelligent System for High Weight and Length Train Brake Control (ISTBS) was presented, whose implementation was approved by the expert commission. The ISTBS retained the functionality of and compatibility with the previous versions of the STBC, and has expanded the latter towards integration with automatic train operation systems and driver's electronic brake valves

ISTBS BENEFITS

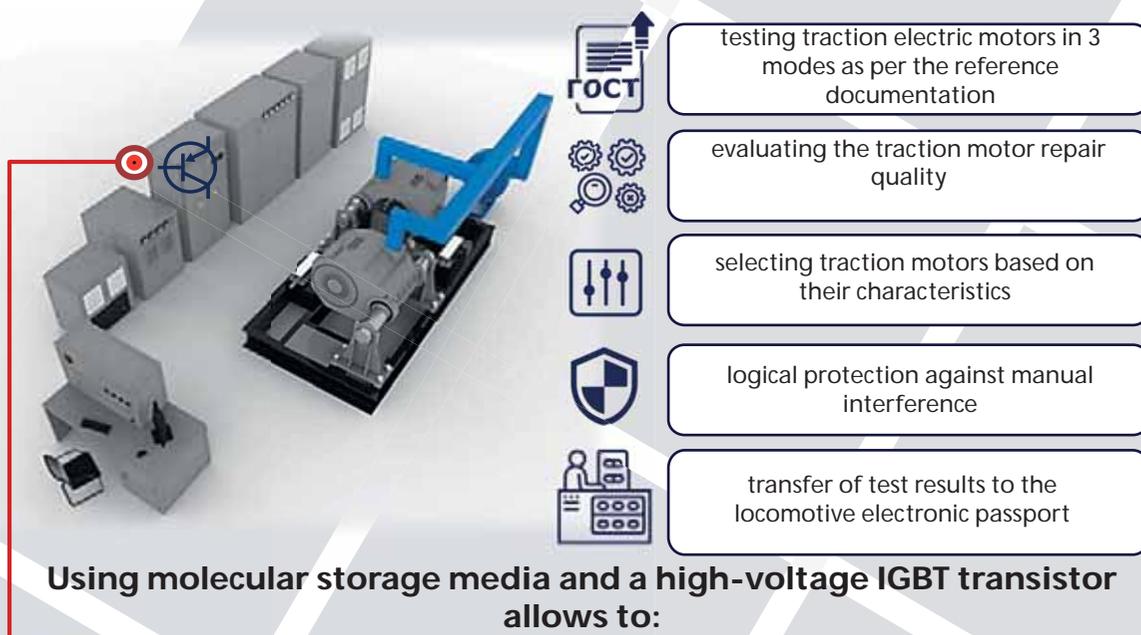
- Reducing the cost of maintaining the locomotive fleet.
- Integration with automatic train operation systems and driver's electronic brake valves
- Increasing the level of driving process automation
- Simplified installation, operation, and maintenance of the system

It is planned to conduct preliminary and acceptance tests at the brake station and on 2ЭС6(10) and 3ЭС4К electric locomotives and to take measures for approval and putting the system into mass production by the end of 2019

DEVELOPMENT AND MANUFACTURING OF NON-STANDARD PROCESS EQUIPMENT

Testing, metrological, process, and energy-saving equipment for rolling stock maintenance and repair, as well as measuring tool verification (calibration) equipment is developed and manufactured in the in-house experimental shop of the Design Bureau.

MODERN TECHNOLOGY: STATION FOR TESTING COLLECTOR-TYPE TRACTION ELECTRIC MOTORS OF NEW GENERATION LOCOMOTIVES



The Bureau continuously updates the process equipment to meet the latest requirements and the future demands of the Digital Depot system, which means automatic registration of all test parameters, generation of test reports in digital form with the possibility of subsequent transmission to electronic media and parallel save in the database.

INTEGRATED MAINTENANCE OF DIAGNOSTIC FACILITIES, SIMULATOR COMPLEXES, AND TRAIN CONTROL SYSTEMS

The regional service centers of the Design Bureau provide the integrated maintenance of the equipment operated by the Russian Railway car, locomotive, and multiple sets, and also by the Human Resources Department and private companies

14 REGIONAL SERVICE CENTRES



Maintaining train diagnostic and control systems

- Monitoring of equipment technical conditions and failures
- Systematization of equipment failures and analysis of their causes



- Developing and updating the related software
- Equipment development and modernization

- Routine service and metrological maintenance, as well as equipment repairs

Integrated maintenance of simulator complexes

- Maintaining and updating software versions
- Updating information in the simulator complex database
- Monitoring and diagnostic control of simulator complexes using electronic means of communication
- Advising on the simulator complex operation by the Bureau experts

OUR PARTNERS

The Design Bureau cooperates with 240 plus enterprises based in the Russian Federation, the CIS and far abroad



ADD YOUR
NOTES



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