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MAGAZINE FOR PARTNERS

Transmashholding

Technical Regulations of the European Union

p. 4

New "Ermaks": Modified Series

p. 8

3D Train Design Technologies

p. 20



**"Anniversary"
Car Captures the Track**

p.14

Magazine for partners
of CJSC Transmashholding

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4



8



20



24

company news 2

cooperation
Anarkhan Kurazov
Speaks About Work
on the Technical
Regulations
of the European Union 4

production
Ermak Electric Locomotive:
State-of-the-Art, Powerful,
Economically Viable 8

cover story
“Anniversary” Trains
Commemorating the 60th
Anniversary of the Saint
Petersburg Metro 14

innovation
How Can a Train Be Made
with Employment of 3D
Technologies? 20

traditions
The First Domestic
Railway Snowplow
Turns 60 Years! 24

Production

Showcase of Machine Builders

Tver Carriage Works (TVZ), a member of Transmashholding, presents to Chairman of the Russian Government Dmitry Medvedev railroad machinery produced in recent years by the company's plants.

Machinery exhibition was organized for participants in the meeting on development of the Russian transport machine building business chaired by the head of government. Guests' attention was drawn to two state-of-the-art electric trains, which are the principal projects of basic platforms of the promising Russian suburban trains, namely: the EP2D train manufactured by DMZ and the EG2Tv Ivolga from Tver. Serial production of these electric trains is capable of delivering the objective of advanced domestic rolling stock supply for rail transport needs, specifically in high-speed service (160 km/h). The trains are primarily



made from the Russian components, accounting for more than 80% of production cost.

Passenger cars manufactured by TVZ in recent years were the central part of the display. The attention of head of the Russian government was

drawn to both state-of-the-art mass products and double-deck cars (4-berth compartment carriage, restaurant car, seater), the pride of the enterprise and its design team. RIC car designated for international service and a new baggage and mail car were introduced to the meeting participants, too.

Guests were offered the opportunity to appreciate cutting-edge urban transport solutions, namely: single- and three-section low-floor trams (City Star, Vityaz, Varyag), the Admiral trolleybus, which production is up and running smoothly at TVZ.

The Prime Minister also viewed cutting-edge railroad machinery for freight transportation manufactured by the Bryansk Machine Building Plant, such as the 2TE25A mainline freight diesel locomotive and the TEM TMX modular-type shunting diesel locomotives.

Upgrading

All-Union Approval

The TEM18DM diesel locomotive proves compliance with the Customs Union's standards.

The TEM18DM shunting diesel locomotive manufactured by the Bryansk Machine Building Plant obtained certificate of compliance with safety standards under the Technical Regulations of the Customs Union. The certificate entitles to manufacture the locomotives of this series for five years until February 2021.

The machine has shown good results both on domestic railroads and the

mainlines of CIS- and non-CIS countries due to its reliability, high quality, easy control and service. The TEM18DM is operated in Mongolia, Ukraine, Uzbekistan, Belarus, Lithuania, Tajikistan and Kazakhstan. Throughout their history, they have been bestowed with quality marks and confirmed certificates of compliance with the rail transport safety requirements.

In the past ten years, BMZ has manufactured more than 1,400 diesel locomotives of this series.



By the Way

Certificate obtainment is a mandatory requirement for all rolling stock as the Technical Regulations of the Customs Union entitled "Concerning Rail Transport Infrastructure Safety" have been effective nationwide since last August.

Prospects



Bryansk Grain Hoppers Are on Their Way to Kazakhstan

Bryansk Machine Building Plant completes the delivery of 100 hoppers to Kazakhstan.

Contract for delivery of cars with a large-size body (19-3058 model) was signed with TOO Logos Grain last July. The first 75 cars were shipped to the customer in quarter four of 2015. The remaining 25 hoppers left for the neighboring republic this February.

The new 19-3058 hopper model produced by the Bryansk Machine Building Plant was first displayed at the 5th International Rail Salon EXPO 1520 last September. This car can carry up to 118 m³ of cargos (versus 112 m³ transported in serial cars), whereas its cargo carrying capacity is similar to that of the basic model (70.5 tonnes). The car is equipped with a damper unloading mechanism, which does not only protect cargos against theft, but also regulates the unloading. It allows the possibility of suspending or discontinuing the unloading process.

In Brief

Новости компании | Акция | Страны | Услуги | Контакты
Блог Трансмашхолдинга

Nothing but Live Communication

Transmashholding opens its LiveJournal blog.

No official press releases and boring reports – only interactive communication, real-time news and interesting stories about our holding and its people.

Come to visit us on:

<http://tmholding.livejournal.com>

Read, discuss, comment! We will be happy to participate in “live” web communication!

Cooperation

Passengers Will Like It!

Transmashholding presents its new EP2D electric train. Its operation will be first launched by Central Suburban Passenger Company.

The presentation of the new EP2D passenger electric train was hosted by Rizhsky Rail Terminal in Moscow. Its six-car version was presented to the public. However, the train can be made up of 2 to 12 cars. This ensures high-level adaptability of the train for operation on any routes, including low-density ones. The EP2D is able to operate on low- as well as high-platform lines. The basic platform allows quickly generating modifications in compliance with the customer's requirements adjusted for specific operating conditions, including individual-design cars of various classes. The compartments feature new passenger coaches and overhead racks for luggage, state-of-the-art light lines; two-line indicator panel of the passenger address system; climate system of salons without air feeders on the roof.

The train is equipped with the systems of passive safety (crash system) and indoor climate with air decontamination function. It employs a set of energy-saving electrical equipment, which allows saving up to 20% of energy; a powerful static converter for auxiliary needs, whose employment allows reducing significantly the level of noise and vibration inside the compartments. The upgraded compartment structure with a dismountable ladder prevents unauthorized access to the body end of compartment and to the roof.

Currently, the EP2D is preparing for dynamic tests at the test drive ring of All-Russian Rail Transport Institute in Shcherbinka, Moscow Region. The certification process is expected to be completed as early as this spring.



Cooperation



Development of a Genuinely Efficient System Is Our Common Goal

TECHNICAL REGULATIONS OF THE CUSTOMS UNION ARE AN IMPORTANT TOOL OF COOPERATION BETWEEN THE MEMBER COUNTRIES. THEIR EFFICIENCY HAS DIRECT IMPACT ON THE WORK OF THE UNION'S MACHINE BUILDERS, INCLUDING TRANSMASHHOLDING. IN THIS ARTICLE, ANARKHAN KURAZOV, HEAD OF INDUSTRIAL SAFETY AND TECHNICAL REGULATIONS OF TRANSMASHHOLDING, DISCUSSED THE PARTICIPATION OF THE COMPANY'S SPECIALISTS IN UPDATING THE LIST OF STANDARDS AND REVISING THE TECHNICAL REGULATIONS OF THE CUSTOMS UNION.

The Agreement on Uniform Principles and Rules of Technical Regulation in Russia, Kazakhstan and Belarus was signed in November of 2010. The document is called to reconcile differences between national standards and align the regulation rules of the CU with the best global practices. Since then, a lot of effort has been put into regulating the operations of rail engineering companies in the area of safety of rolling stock and rail transport infrastructure.

CHALLENGING, BUT EXCITING

All stakeholders joined the work on the "new rules of the game." The technical regulation procedures developed during the past ten years for the rail transport were implemented through a set of normative legal acts of the

Ministry of Railways, standardization documents, and documents on the system of certification at the federal rail transport, which until this day are in effect at the network of rail transport ensuring the existing level of safety and efficiency of traffic. However, the national technical control system underwent changes after the collapse of the Soviet Union. It is a challenging, but exciting task to rectify differences between the regulations and incorporate into them the best international experience. At the initial stage, the main role in improvement of the standards belonged to the specialized institutes of Russian Railways – Russian Railway Research Institute, All-Russian Research Institute of Railway Hygiene, and Rolling Stock Research and Design Institute. Later,

manufacturers, including our holding, joined these efforts. We were united by the common goals set forth in the technical regulations, that is prevention of operation of unsafe equipment and radical decrease of possible incidents.

Many initiatives of the technical regulations of the Customs Union (TR CU) received universal support. For instance, the new rules allow companies to obtain a certificate or declaration of conformity for their products for five years (previously, the term was three years); there is a possibility of certification of innovative products without development of certification framework, and a possibility of extension of a certificate for a period of up to one year subject to an application of the certificate holder for the purpose of completion of work on renewed

Cooperation

Members of the Customs Union



certification. However, some proposals made by subject-matter experts received mixed response in the professional community, which caused “slippage” in devising documents and revealed flaws in the TR CU.

Let us consider those that we find significant.

First of all, it should be noted that examination of applications for certification of products submitted to a certification authority takes a long time (more than a month); decisions may be interim; later on, they may change a few times, which makes planning difficult and drags out the whole certification process.

Another important thing is selection of testing centers for certification tests of components. Specifically, selection may be carried out a few times for electromagnetic compatibility, but no decision will be made due to the unavailability of a testing facility, which speaks of the failure to prepare for working under the conditions when compliance with the technical regulations needs to be verified.

A number of challenges have to do with cancellation of distance selection of samples of products for certification tests on condition of provision of technical documents and photos.

TRANSMASHHOLDING SPECIALISTS BECAME INVOLVED IN DEVISING NEW REGULATIONS AT INITIAL STAGES OF THEIR DEVELOPMENT

According to the new requirements, selection should be performed by the specialists of a certification authority. For several objective reasons, it is difficult to plan a visit by an expert, which results in delayed shipment of a sample for tests to a testing center, where all activities are planned in advance, and in the long run derails certification.

The technical regulations have restrictions on the time frame for consideration of the results of tests (no more than five years), which is an additional challenge for a manufacturer.

As was noted earlier, the purpose of the technical regulations is to prevent

operation of unsafe products and reduce the possibility of incidents. According to the document, for this purpose the degree of the risk that products pose needs to be assessed. However, the problem is that the assessment methods are not described in the technical regulations; they simply do not exist. Who will determine the acceptable level of risk for given products and how the compliance of products, especially innovative equipment, with established risk levels can be verified are open-ended questions. Additionally, the current version of the technical regulations says that rail rolling stock must comply with the requirements of energy efficiency. We believe that they have to do with economic performance, not with safety requirements.

If we examine the process of performance of full-fledged certification tests of serial production goods for verification of their compliance with the requirements of the technical regulations, we will see that it is far from being perfect. Even if small changes not related to safety requirements are introduced to the serial production goods (components of rolling stock) that are certified, new

tests will have to be performed or the production facility for these goods will have to be inspected. Tests require finances, to say the least about time expenditure.

This impedes and drives up the cost of implementation of innovations in manufactured equipment.

These are only a few examples of controversial provisions of the technical regulations.

OUR CONTRIBUTION TO THE COMMON CAUSE

Transmashholding specialists became involved in devising new regulations at the initial stages of their development. Our employees conducted some sort of an audit of the existing technical regulations in terms of the adequacy of the necessary legal framework (certain standards that are adhered to, which confirms compliance of the rolling stock of railways with the document's requirements). As a result, jointly with the representatives of the Association of Railway Equipment Manufacturers (OPZT) and Russian Railways (RZD) we succeeded in establishing new standards which supplemented the existing rules. It is worth noting that based on the performance of Russian technical committees on standardization in 2014, the management of the Federal Agency on Technical Regulating and Metrology awarded first place to TC 45 "Rail Transport" (out of 254 committees). To a great extent, this can be attributed to Senior Vice President of RZD Valentin Gapanovich.

We assumed responsibility for development of a host of supporting standards (norms that ensure compliance with the clauses of the technical regulations). Additionally, our company became one of the initiators of changes to the clauses of the technical regulations and was engaged in devising them. The new standards were developed at the holding's research organizations - All-Russian Research and Development Institute of Electric Locomotive Engineering (VEINII) and Tver Institute of Carriage Building. Whenever we lacked

WE WILL ACHIEVE OUR COMMON GOAL - HARMONIZATION OF UNIFORM RULES AND DEVELOPMENT OF A SYSTEM OF TECHNICAL CONTROL AND STANDARDIZATION THAT MEETS THE CRITERIA OF MODERN SCIENCE AND ENGINEERING

competences, the work was outsourced to our contractors (Transmashholding provided full funding for 12 standards). From 1 to 1.5 years were spent on revision of a standard; it took 1.5-2.5 years to have standards developed by third-party research institutes. A great contribution to development of standards was made by S.N. Zakharov, A.A. Schuchkina, I.L. Vasilchenko, A.A. Yukhnevsky, V.V. Schneidmueller, V.A. Tunikov, Yu.A. Orlov, and others.

NOT TO BE CONTENT WITH ACHIEVEMENTS


All of the above does not mean that the work aimed at the introduction of the TR CU is complete. On the contrary, the new rules are just about to be implemented. According to Resolution No. 710 passed on July 15, 2011 by the Customs Union's commission regarding adoption of the Technical Regulations of the Customs Union "On Safety of Rail Rolling Stock", "On Safety of High-Speed Rail Transport" and "On Safety of Rail Transport Infrastructure" (revised on February 3, 2015) cl. 3.2, the term of interim provisions shall expire in July of 2016. Even today we discover weak areas that could not be prevented at the theoretical stage of development of the regulations.

Transmashholding specialists work in close cooperation with their colleagues from other member countries in order to promptly deal with any difficulties that may arise. The expert community (specialists from the certification register, certification centers, testing

labs, and other organizations) plays an important role in devising safety requirements and ensuring adherence to them at the rolling stock of railways. It is necessary to ensure maximum efficiency of their work and information exchange and recruit qualified specialists for this work.

In order to cut costs in the process of assessment of compliance and verification of evidence, it is necessary to strive for the minimum sufficiency of requirements, determine them clearly and reflect them in appropriate standards. It is also necessary to take into account those tests that were conducted earlier and not to establish very short validity periods for certificates. It is important to approach testing programs with caution in order to improve and optimize them on a regular basis.

Additionally, it is necessary to enhance the capabilities of testing centers and labs through their automation and digitalization, which will help reduce the time of tests and cut costs. For the purpose of specification of the volume, necessity and adequacy of tests, it is necessary to update the list of standards that, if performed voluntarily, ensure compliance with the requirements of the technical regulations of the Customs Union.

I am sure that we will achieve our common goal - harmonization of uniform rules and development of a system of technical control and standardization that meets the criteria of modern science and engineering. 

STATE-OF-THE-ART, POWERFUL

RZD ENHANCES ITS REQUIREMENTS FOR THE OPERATIONAL EFFICIENCY OF RAIL TRANSPORT. IN THIS REGARD, THE PRODUCTS OFFERED BY TRANSMASHHOLDING ARE ON A PAR WITH THOSE OF ITS GLOBAL PEERS. SPECIFICALLY, NEVZ IN COLLABORATION WITH VELNII DEVELOPED AND LAUNCHED THE PRODUCTION OF MODIFIED ELECTRIC LOCOMOTIVES OF THE ERMAK SERIES – 2(3,4)ES5K.



Valery Zadorozhny,
Manager of the Direct Current
Electric Locomotives Group, NEVZ



FLAMING MOTOR

Traction motor is the heart of any electric locomotive. Motors which can be used as electric locomotive traction motors must meet at least two requirements. First and foremost, they must allow the possibility of control within broad rotational speed limits. This allows changing the train speed. Furthermore, the possibility of control within broad limits of traction force, i. e. motor torque, is a must, too. For

instance, the electric locomotive's motors must ensure considerable traction force when the train starts, accelerates, overcomes steep rises, etc. and reduce it under easier movement conditions.

From the standpoint of movement organization, it may seem preferable for a train to move at permanent speed regardless of movement resistance changes or for such speed not to change considerably. Dependence

UL, ECONOMICALLY VIABLE



between the locomotive motors' traction force and its speed is called traction performance. It can be soft and tough.

Series-excitation direct current commutator motors with soft traction performance are most common tractions motors employed in alternating current electric locomotives on the Russian railroads. At heavy loads, such motors as a result of speed reduction consume less capacity from power supply system. However, series-excitation motors have a major defect – electric locomotives with such motors are prone to skidding, which sometimes triggers overspeed.

Independently excited direct current commutator motors are characterized by tough traction performance, which significantly contributes to skidding discontinuation as in this case traction force is sharply reduced even at minor skidding, creating more chances for re-adhesion.

As shown by the experimental studies conducted by VNIIZHT (Railway Research Institute), MIIT (Moscow State University of Railway Engineering), VELNII (All-Russian Research and Development Institute of Electric Locomotives), OMIIT (Omsk Institute of Rail Transport Engineers) on the VL-22M, VL -60RN, VL-80RN, VL85 No. 061, VL80R No. 1669 electric

THE ERMAK USES THE MODEL OF INDEPENDENTLY EXCITED TRACTION MOTORS AND INDIVIDUAL (AXLE-BY-AXLE) CONTROL OF TRACTION MOTORS IN TRACTION AND RECUPERATION MODES

locomotives equipped with various independent excitation systems, enhancement of traction force and braking reaches 15-20% as compared with serial electric locomotives with series excitation of traction electric motors. However, despite their many benefits, the above-mentioned locomotives have never been put into serial production due to failures to solve the problems of equalizing the loads of traction motors and arranging effective quick-action protection of traction motor cable chains against heavy currents.

The problems were not solved until the microprocessor-based control system was first employed in serial electric locomotives.

COMING OF THE ERMAK

In 2013, Transmashholding in close cooperation with RZD came up with the 3ES5K No. 434 electric locomotive and one year later, with its modification – the 4ES5K No. 001-003 electric locomotive. In these two, several unique design solutions.

THE EMPLOYMENT OF AXLE-BY-AXLE TRACTION FORCE CONTROL COUPLED WITH ADHESION ADAPTATION SYSTEM CREATES THE RELOCATION OF LOADS BETWEEN WHEEL BLOCKS AND MOTOR UNITS



Power unit (PU). Lateral view

Independent excitation of traction motors (TEMs): now in traction as well as in recuperation mode.

The series fields of TEMs on the 3ES5K No. 434 and 4ES5K No. 001-003 electric locomotives are fed from the

VUV-257 common full-wave rectifier excitation unit.

Several innovations are employed to ensure individual feeding control for traction motor armature windings.

First, the MSUD-015 microprocessor-based control and diagnostic system is used, it is designated for:

- a) control of the electric locomotive's traction drive, control and protective circuit switches;
- b) implementation of extended functions of equipment troubleshooting and axle-by-axle control of traction electric motors, specifically in traction mode with TEM independent excitation.

The second innovation is employment of the VIU-4000-2M rectifier inverter device, which, unlike the VIP-4000M, is employed in the 2(3) ES5K electric locomotives. This device consists of two (instead of one) independent channels of gradual individual feed control for two pull traction motors in traction mode and for conversion in regenerative

braking mode. The converter's dimensions are the same as in the serial device, although higher-class silicon controlled rectifiers are used. The VIU-4000-2M has an expanded diagnostic function versus the VIP-4000M. Its diagnostic unit controls the operation of two channels and differs significantly from a similar unit of the VIP-4000M as it features a communication channel connecting it with the MSUD-015 microprocessor-based control system.

The third innovation is invention of the R-45-03 remotely controlled circuit breaker. It is used to ensure enhanced viability and operating reliability of the electric locomotive. Equipment breakdown in any traction circuit motor triggers disconnection of its power supply circuit together with the VIU-4000-2M device. Electric locomotive continues functioning without a single traction motor (whereas two bogies' motors at the same time are disconnected in a serial electric locomotive).

The MSUD-015 hardware is composed of:

BU-006, BU-006-01 control units (for the execution of arithmetic and logical operations, processing of sensor signals, generation and strengthening of control signals and information exchange among the MSUD-015 components);

VS-3742 indicating unit (for display on the driver's control panel of graphic and audio information about preset and actual values, controlled parameters, equipment and control system condition, equipment operating mode, etc., as well as the input of commands from multifunctional keyboard);

BS-008 alarm unit (for visual display of generalized information about the diesel locomotive's equipment condition (using LED indicators) on the driver's control panel).



HAPPY JOURNEY!

The 4ES5K No. 001-003 electric locomotives with axle-by-axle control have been in operation since last January. Locomotives circulate amid the most challenging natural landscape



R-45-03 remotely controlled circuit breaker with the ATL20 screw-gear motor

Three VIU Units

Power unit (PU) consisting of two absolutely identical channels (No. 1 and No. 2)



Lateral view

Front panel



Diagnostic unit (DU) which controls the condition of silicon-controlled rectifiers of arms of the power unit (PU), transistors of power supply units (PSUs) and controls units (CUs)

Front panel



Front panel

Power supply unit (PSU) which supplies power to controls units (CUs) and diagnostic units (DUs)

within RZD network on the Smolyaninovo – Nakhodka route. It is characterized by mountain-pass sections with steep hills and slopes and steep-curve line sections. They are operated under normal conditions, all critical comments are promptly eliminated by the representatives of the Novocherkassk Electric Locomotive Plant.

Last September, the 3ES5K No. 434 electric locomotive was sent to Chita Depot of the Zabaikalie Railway to which it is assigned. It is operated along the

longest (2,500 km) and most responsible section of the Transsiberian Mainline from Petrovsky Plant to Arkhara. Maintenance of the electric locomotive in the course of its operation is carried out at numerous locomotive depots, which allows receiving both positive feedback about operation and proposals (recommendations) concerning its structural improvement.

The employment of axle-by-axle traction force control coupled with adhesion adaptation system creates the relocation of loads between wheel

blocks and control units, which allows supporting the implemented traction force of the electric locomotive virtually at a preset level in the context of worsened adhesion between wheel and rail. This is accompanied by the reduction of sand consumption for sanding during skidding (sliding), decreased wear and tear of wheel set tires, improved use of the inherent capacity of electrical equipment. Owing to all these benefits, the Ermak will live long throughout this large country. ©



EP2D Direct Current Electric Train

MANUFACTURED BY DEMIKHOVO MACHINE BUILDING PLANT.

THIS IS THE FIRST ELECTRIC TRAIN TO BE BUILT IN COMPLIANCE WITH THE TECHNICAL REGULATIONS
OF THE CUSTOMS UNION OF THE EURASIAN ECONOMIC COUNCIL.



Cover story

“Anniversary” Car



“Anniversary” Train at the Station

Captures the Track

IN COMMEMORATION OF THE 60TH ANNIVERSARY OF THE SAINT PETERSBURG METRO, SPECIAL TRAINS COMPOSED OF THE “ANNIVERSARY” CARS PRODUCED BY TRANSMASHHOLDING CAN NOW BE SEEN CIRCULATING ON SPB METRO LINES.

These unique cars are produced under the contract between the Saint Petersburg Metro and the Oktyabrsky Electric Car Repair Plant which is based in the Northern Capital of Russia. Initially, the enterprise specialized exclusively in the repairs of electric train rolling stock (as its name clearly indicates). However, after joining Transmashholding, OEVRZ mastered new types of business and in 2010 the plant was awarded the tender for new metro car construction.

The enterprise's new products are represented by the 81-722/723/724 cars, which were named “Anniversary” cars in commemoration of the 60th anniversary of the Saint Petersburg Metro. They were devised by the holding's engineers under a big contract for the delivery of the new metro cars for Saint Petersburg underground. A total of 11 such trains are expected to be delivered. They are extraordinary due to their design as well as innovative nature: the car compartments' inner surfaces are illustrated with images of the most emblematic parts of the Saint Petersburg Metro architectural structure and the «Northern Palmyra» architectural monuments.

The trains are composed of eight cars of the new series – head motor cars (81-722 model) with in the rear and head ends of the train, two intermediate motor cars

(81-723 model) and two non-motor trailers (81-724 model) in the middle. Their flexible platform allows compiling trains with custom-tailored characteristics.

It should be noted that in terms of their technical characteristics the new cars are as close as possible to the well-known

IN HEAT OR COLD

The “Anniversary” cars can be used in tunnels and open space areas alike. This



Emergency talkback between driver and passenger





Car's passenger compartment



Floor space arrangement system

is a major advantage given the construction-related peculiarities of engineering structures in the Northern Capital of Russia due to which metro stations and hauls are increasingly often built above ground. Weather conditions vary fairly significantly, too: according to developers, the operation of the new cars is possible in tropical as well as moderate climate. Moreover, the "Anniversary" cars are characterized by high carrying power and are able to carry more than 50,000 passengers per hour.

Developers put a special focus on the durability and reliability of cars. For example, the "Anniversary" cars have

DIRT- AND GRAFFITI-RESISTANT COMPARTMENT FINISHING

all-metal bodies made from welded structure with load-carrying stainless-steel outer skin. The body frame is made from high-strength low-alloy steel. The head end of the head car body features an emergency ladder for the emergency evacuation of passengers and the compartments are equipped with

lightweight steel ceiling panels and plastic windows. Factory-installed equipment includes two-level microprocessor-based safety control and diagnostic system, indoor and outdoor video surveillance system.

RIDE WITH COMFORT

The "Anniversary" car developers care about passengers, too. The interior and exterior of the trains were devised using state-of-the-art solutions – the cars feature comfortable handrails made from polished stainless steel. The compartment is illuminated by LED lighting line, which consists of two separate modules, ventilation is ensured

Key characteristics of the train's cars

Parameter	Car Models of Six-Car Train		
	81-722 Head Motor Car	81-723 Intermediate Motor Car	81-724 Intermediate Non-Motor Car
Minimum number of seats,	36	44	44
including minimum number of folding seats	4	12	12
Number of spaces for wheelchairs	2	–	–
Occupancy at 8 people/m ² of vacant floor space, inclusive of seating passengers (number of passengers)	253	272	272
Maximum train occupancy (number of passengers)	1932		
Number of seats on the train, inclusive of folding seats	248		
Design speed, km/h	90		
Maximum acceleration, m/s ²	1,2		

by the system based on high-performance axial-flow blowers.

It was decided to leave the traditional passenger compartment configuration unchanged – longitudinal seating configuration, console-type semi-hard passenger seats. There are a few innovations, too, though still uncommon: 4 seats in the head car and 12 seats in the intermediate car are folding and fixed when in an upright position.

The peculiarities of the new cars, which are likely to make work easier for maintenance personnel, include dirt- and graffiti-resistant compartment finishing, which is easy to clean with special detergents based on water-base weakly alkaline solutions. In addition, finishing materials allow minor damage to be removed.

The “Anniversary” cars are equipped with double-swing sliding doors. They are air operated, which is necessary for the door leaves to move smoothly. Moreover, the doors are equipped with a retarder which serves to slow movement at the end of stroke and facilitates mechanical fixing in a closed position, which may seem to make the phrase “Do not lean against the door!” to lose its meaning. Furthermore, there are light and sound indicators above each doorway to warn about closing doors, thus ensuring passenger safety. In addition, doorways are equipped with sills to reduce the gap between a car and the platform edge (the use of these elements ensures further safety of entering and exiting passengers); they are easy to disassemble as needed.

DRIVER-CONSCIOUS

Designers have devised a very high-tech and comfortable driving compartment. It features primary and secondary control panels in readily accessible zone, including the driver’s controller, brake valve, car systems control button and radio station. The compartment is equipped with sun shield and has an electronic route panel installed in the head end to display information about the end of the line and line number.



Driving compartment

ALL STEPS WERE TAKEN TO CREATE A COMFORTABLE WORKING ENVIRONMENT FOR THE DRIVER: AIR-SPRING HEIGHT ADJUSTABLE DRIVER’S SEAT THAT ABSORBS VIBRATIONS, LATERAL VIDEO SURVEILLANCE CAMERAS INSTALLED ON BOTH SIDES OF THE DRIVING COMPARTMENT, INDOOR CLIMATE SYSTEM



Driving compartment



Car equipment control panel



Entry/exit safety threshold

DEVELOPERS PUT A SPECIAL FOCUS ON THE DURABILITY AND RELIABILITY OF CARS. FOR EXAMPLE, THE "ANNIVERSARY" CARS HAVE ALL-METAL BODIES MADE FROM WELDED STRUCTURE WITH LOAD-CARRYING STAINLESS-STEEL OUTER SKIN

Every step is taken to ensure maximum comfort for the driver: air-spring height adjustable driver's seat that absorbs vibrations, lateral video surveillance cameras installed on both sides of the driving compartment (images from all cars of the train are displayed on the screen), indoor climate system to ensure ventilation, air conditioning and heating.

Yet the key peculiarity of the compartment is control room behind the driver's seat. It features a stand with the Vityaz-SP safety control and diagnostic system units, digital information system with the integrated compartment video surveillance system, as well as auxiliary console, car and train- safety control unit and panels.

The "Anniversary" cars will add to the beauty of the Saint Petersburg Metro and it will not be long before its citizens will pay tribute to their comfort level and high quality. 🌀



Control room with auxiliary car and train- safety control unit and panels



Intercar safety gear

Innovative Structural Characteristics

A whole range of innovative solutions is employed in the structure of the “Anniversary” cars:

- implementation of the new train driving principle, which allows the driver to set gradually the values of tractive effort torques and braking efforts (stepless instead of step control);
- employment of by LED lighting line, which will allow reducing power consumption, increasing the service life of lights and improving passenger comfort;
- short circuiter is installed for the first time, it allows triggering stress removal from the third-rail conductor in emergency (with the aim of enhancing passenger safety);
- the original antiskidding system is installed with the view of enhancing traffic safety;
- employment of the new system structure for passenger evacuation through the head end of cars, which is adjusted for the requirements concerning the evacuation of passengers with disabilities and does not limit observability for drivers under normal operating conditions;
- these models are the first to employ a new brake control system on the fundamentally new element base with software control option;
- train set structural principle, i. e. distribution of traction and auxiliary equipment throughout the full length of the train with the aim of reducing the number of equipment units being used, optimizing train loading and increasing useful load;
- breakthrough state-of-the-art design of cars with employment of newly-structured LED lights;
- employment of promising and improved traction drive with the fundamentally new layout solutions, which, coupled the use of state-of-the-art element base, allowed significantly reducing the dimensions and weight of the traction inverter’s container and improving its operational characteristics.

HOW TO BUILD A TRAIN IN



TODAY, 3D GRAPHICS ARE PERCEIVED AS AN INTEGRAL PART OF OUR LIFE. THIS TECHNOLOGY WAS DEVELOPED IN THE 90S OF THE PAST CENTURY AND BECAME VERY POPULAR IN COMPUTER GAMES, MOVIES, ADVERTISING, AND THE RAIL INDUSTRY IN RUSSIA. EVEN BEFORE THEIR MERGER INTO ONE HOLDING, MANY OF TRANSMASHHOLDING ENTERPRISES HAD 3D DESIGN TOOLS, ALONG WITH FLAT, TWO-DIMENTIONAL PAPER DRAFTS



3D model of a rail car

Design centers that started to implement these technologies existed mainly at Tver Carriage Works and Demikhovskiy Engineering Plant. At the time, there were only a few 3D drafting software applications on the market. They somewhat differed from each other, as some were tailored for designing objects with complex shapes or could create parametrical drafts; others had simple modeling functions but allowed creating objects

consisting of a large number of parts and assembly units. Today, such software suites have become similar in their functionality. Most of Transmashholding enterprises use 3D modeling technologies. However, even today the share of 3D modeling reaches only 70%. It should be noted that the global leaders in the industry use 3D drafting almost 100%. Nevertheless, it is still quite difficult to implement complex 3D modeling. This can be attributed to several factors. First, it has to do with high costs of such software products. Second, it is necessary to train specialists who

” **NIKOLAY SIROTOV,**
Deputy
Chief
Designer
of Tver
Carriage
Works
(TVZ):



— Today, implementation of 3D drafting becomes a priority. Its objective is to expedite design work and improve its quality. It is necessary to realize that the more accurate the draft is, the easier it is to manufacture a product.



SERGEY PEROV,
Head of Department of New Product Development of Transmashholding CJSC:



— In 3D drafting, besides the image, the model incorporates properties of materials, for example, their density, the required precision of manufacturing, the parameters of surfaces, such as their roughness, the manner of joining, and, if necessary, much more. Incorporation of physical properties into the models of components allows modeling, calculating and analyzing the properties and characteristics of a future product at the designing stage. If the design has inaccuracies, the 3D model will show them. Almost any tests, whether static or dynamic, motion simulation on tracks or emergency collision, sound, vibration or climatic tests, can be conducted virtually, which will save the company time and money. The most important thing is that today we have started configuring products in 3D modeling, which at the initial stage of drafting allows eliminating a lot of errors that designers might make. For instance, new rail cars that are designed by Metrovagonmash are initially 3D drafted. In December of 2014, at another enterprise of the holding, Bryansk Engineering Plant, for the first time ever in the history of Transmashholding enterprises, a new product, the 19-3058 hopper, was designed with 100% utilization of this technology.

would use these technologies, which is very time-consuming. Third, there is no time for retraining available specialists due to their busy schedules.

Today, an enormous and challenging task is being fulfilled by the holding, which consists in development of a single information space with organized exchange of information from a uniform library of utilized components, materials and parts of drafted products. Currently, our specialists are working on providing access to the single database to service enterprises, such as depot and repair works. This way, relying on the utilization of 3D modeling, we arrange end-to-end design and develop a process that calls for digital presentation of a product at all stages – from the idea to its lifecycle management. In the long run, the electronic base will significantly simplify the work for manufacturers and operating personnel.

Main 3D tools are used at all stages of product development – drafting, designing, manufacturing and marketing.

Among main tools are modern 3D software suites Autodesk Inventor, Siemens NX and CATIA that allow engineers to draft and create 3D models.

The 3D printer is another tool of 3D modeling at the disposal of TVZ specialists. It constitutes an interim link between real and virtual tests. The 3D printer allows printing prototypes of

components and accurate downsizes copies of items. The set parameters help you see if the item matches the draft and evaluate how it will fit into the assembly. The 3D printer allows multifold reduction of the costs of designing and preparation for manufacturing.

The virtual reality center, or the 3D room, as the most powerful 3D tool is located in the central office of Transmashholding and serves two purposes.



ARTEM SUDAKOV,
Head of Department of Automated Design Systems, TVZ JSC:



— If earlier some components required process preparation of the production and manufacturing of equipment, with each iteration involving additional adjustment of equipment and costs, today we can immediately print everything on the 3D printer. Even if we are wrong, we only incur printing expenses. These expenditures are by far smaller than those related to the manufacturing of a new component, both in terms of time and money.

The 19-3058 hopper was designed with the help of 3D technology





The 3D room at Transmashholding

The 3D room allows visualization of drafted objects and analysis of the quality of the design. As for potential customers, it ensures the greatest effect of presence and the possibility of demonstrating or modifying the item at earlier stages.

The approved 3D models are later put into production. Those components that have the most complex configuration and will require machining with numerical control machine tools are drafted with 3D software in the first place and later put

into production, which simplifies the work of technologists who develop programs for machining of these items. Modern machine tools are capable of making components based on digital 3D models without drafts. Many CAD specialists (computer-aided design) believe that today it is more efficient to use hybrid modeling with utilization of both 2D and 3D software suites.

Some day 3D systems might replace 2D suites completely. In any case,

specialists agree that the 3D software suite allows reducing the time spent on development, cutting the cost of development and testing, reducing both the costs and time at all stages of production and operation, and creating a single information space with a high degree of information exchange and demonstrativeness among enterprises of the holding and service and repair companies throughout the lifecycle of products. 🌀

THE VIRTUAL REALITY CENTER, OR THE 3D ROOM, AS THE MOST POWERFUL TOOL IS LOCATED IN THE CENTRAL OFFICE OF TRANSMASHHOLDING.

” **SERGEY PEROV,**
Head of Department of New
Product Development of
Transmashholding CJSC:

— According to the most modest estimates, utilization of 3D tools allows at least 30% reduction of labor content of the whole process of product development and manufacturing.

OVERLAND ICEBREAKER

IN 2016, OJSC TRANSMASH CELEBRATES A LANDMARK DATE – THE 60TH ANNIVERSARY OF THE LAUNCH OF ITS FIRST RAILWAY SNOWPLOW.

The history of domestic snow grooming equipment extends back more than one or two decades! This is a major concern given Russia's well-developed mainlines and cold climate. Never-ending problems associated with winter road maintenance cause the reduction of transport and cargos travel speeds, downtime, failures to meet timetables and schedules, higher transportation prices and economic losses.

NEVER-ENDING BATTLE

Historically, battle against snow started from liquidation of the implications of snow drifts – periodic manual cleaning of roads using shovels and plows of all kinds. The first mechanical snowplows date back to the 1880s whereas the 1930s witnessed the beginning of snow clearing equipment boom.

The most successful structure of a railway snowplow was proposed in 1893 by Russian engineer Burkovsky. It came in the form of a plow equipped with two side wings underneath the car body. Such snowplow remained in use until 1935.

As agriculture evolved, the use of railroads necessitated maintaining their reliable and rhythmical operation, specifically in the wintertime. New structural solutions were tested on snow clearing equipment. Heavy-weight air-operated snowplows were launched, which considerably increased the speed and flexibility, reducing maintenance teams.

3,500 GIANTS

The Pokrovsky Mechanical Plant, as OJSC Transmash was called back in 1956, decided to make a contribution to the development and production of snow



clearing equipment. At the initiative of plant's director Sergei Aleshkov and the maintenance function it was decided to launch the production of powerful all-metal snow blowers, shortly SDPM, each capable of reducing the labor input and efforts of two hundred workers.

Relying on the drawings prepared by the Moscow Design Bureau of the Ministry of Transportation, the plant's engineers enthusiastically started refining the drawings and upgrading the principal components of the machine. 1957 saw the launch of their serial production. However, the SDPM series snow blower was not churned out until 1964, Ivan M. Svistunov was Chief Structural Engineer at the time.

Since 1956, the plant's team has manufactured more than 3,500 machines, specifically for the infrastructure of RZD, NK KZht, the largest manufacturers, such as Gazprom, Mechel Trans Vostok and other companies.

The snowplow has no rivals in this market segment and at the same time

remains a very inexpensive machine, which performs all necessary functions relating to the removal at high speeds of up to one meter high snow drifts from railway tracks at snow density of 0.5–0.6 tonnes/m³.

The designated service life is 35 years, yet even upon expiration of the above-mentioned service life the snowplows of OJSC Transmash still perform well on the railway tracks of RZD and other enterprises. This is primarily due to their operational simplicity and lack of extra costs, which is an important factor given the existing production and economic conditions.

Our enterprise is improving its snowplow structure on an ongoing basis and is currently carrying out "deep" upgrading of SDP-M2 with the aim of enhancing comfort level for our maintenance team and the item's compliance with the requirements set forth in the Technical Regulations of the Customs Union (CU TR 001/2011). ©



TRANSMASHHOLDING

HOLDING'S PRODUCTS AND SERVICES:

- mainline and industrial electric locomotives;
- mainline and shunting diesel locomotives;
- freight and passenger cars;
- electric train and metro cars;
- road-rail buses and diesel trains;
- car casting;
- diesel locomotive and marine diesel engines;
- diesel generators and turbine-driven compressors;
- components for transport;
- spare parts;
- repairs and maintenance.

IN THE PAST FIVE YEARS, THE COMPANY HAS MANUFACTURED

over
3000
locomotives

more than
4000
passenger cars

more than
3000
electric train cars

over
230
cars of
road-rail
buses

more than
1500
metro cars

over
2700
diesels



VYKHINO
Moscow Transport

- Transmashholding – No. 1 IN CIS COUNTRIES in rolling stock output and sales
- Transmashholding is ranked among THE WORLD'S TOP TEN MANUFACTURERS of railroad machinery
- Transmashholding – RUSSIA'S ONLY COMPANY, with experience in developing and manufacturing technical equipment for arctic conditions
- The technical equipment of Transmashholding is operated IN ALL CLIMATIC ZONES ON EARTH

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