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A Magazine
for Transmashholding Partners

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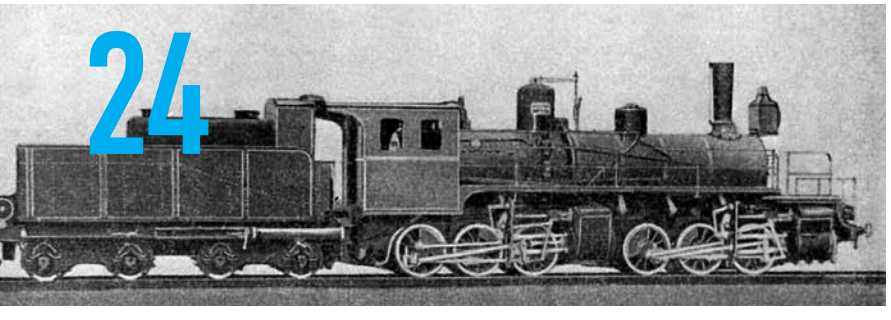


Happy Journey!

RZD Receives "Scythians"

Novocherkassk Electric Locomotive Plant (NEVZ, a member of Transmashholding) delivers to RZD the first two 2ES5 Scythian freight electric locomotives.

The locomotives have been delivered to Vikhorevka Depot of the East Siberian Railway. They will become a crucial element of the development strategy for the Russian rail transport with regard to developing heavy hauling service and reaching the target of freight traffic increase along the Baikal-Amur and Trans-Siberian main lines. By 2020, two hundred 2ES5 electric locomotives will be supplied to Russian Railways under the existing contract.

It is noteworthy that the 2ES5 Scythian is Russia's first AC mainline freight electric locomotive with asynchronous traction motor. The electric locomotive's capacity is 8,400 kW. The new locomotive meets all reference requirements and rail transport safety regulations.

Tests

TEM33 diesel locomotive successfully tested

The new TEM33 shunting diesel locomotive with a double diesel engine unit manufactured by Bryansk Machine Building Plant (BMZ, a member of Transmashholding) successfully completes its 300-hour test in service.

During its tests at Bryansk-II Depot, TEM33 demonstrated its significant advantages over the serial diesel locomotives operated by the same depot. It is equivalent to two ChME3 shunting diesel locomotives and can deliver cargos weighing from 5,000 to 6,900 tons to a hump yard. TEM33 consumes 10% less fuel than the locomotives operated by Bryansk-II Depot. Environmental friendliness is another advantage of the new locomotive; its operation will allow reducing air pollutant emissions to 20%.

According to drivers, TEM33 differs from its predecessors in its enhanced control comfort, noise isolation, diesel locomotive safety, and amenities. In late 2014, the locomotive will undergo further acceptance and certification tests at the test center.

Production

BMZ Creates Another Hopper

Bryansk Machine Building Plant (BMZ) manufactures a prototype of a hopper with a large-size body (19-3058 model) for transportation of grain and other bulk food cargos requiring protection against precipitations.
The new car will carry up to 118 m^3 of cargos (versus 112 m^3 transported in serial cars), whereas its cargo carrying capacity is similar to that of the basic model (70.5 tons). Operation of the hopper with a large-size body will reduce the costs of transportation of cargos with relatively low bulk density, such as barley, oats, buckwheat, sunflower seeds, etc. Structurally, the body of the new car does not feature the main beam, which allowed changing the structure of hoppers and, accordingly, increasing the body volume and improving car unloading conditions. The car is equipped with a new 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 the near future, the 19-3058 prototype model will undergo preliminary and subsequent certification tests; in the first half of 2015, manufacturing of the car consistency batch will be launched.

Implementation

Double-Deck Car Undergoing Tests

Tver Carriage Works (TVZ, a member of Transmashholding) delivers an experimental double-deck car with soft seats to the Belorechensk test site (North Caucasian Railway) for dynamic tests.
The 61–4492 model car is a new product of TVZ, which continues the lineup of domestic double-deck rolling stock. It is based on the cars with sleeping berths built by Tver Carriage Works in 2013. However, it differs from them significantly both in its exterior and interior. Double-deck cars with soft seats have not been manufactured in Russia before.

A key feature of the new rolling stock is a modified side wall with radial windows. The interior design is a product of cooperation with Italian company ItalDesign-Giugiaro, the leader in industrial and transport design. However, domestic components used in manufacturing this car account for more than 90%.

Upon completion of the test stage and obtainment of conformity certificates, Tver Carriage Works will deliver to Federal Passenger Company 15 double-deck cars with soft seats (5 business class and 10 economy class cars). The first delivery is expected in the second quarter of 2015.

Cooperation

Transmashholding's Trains Bound for Serbia

By the end of 2017, Metrowagonmash (a member of Transmashholding) will deliver to Zeleznice Srbije (Serbian Railways) 27 two-car diesel trains (DPS) and spare parts.
Under the agreement, the first two trains will arrive in Serbia within 15 months from its entry into force (subject to approval by the Ministry of Finance of the Russian Federation). The diesel train is designated for operation on railways with 1,435 mm gauge tracks, which are common in most European countries. Currently, the Republic of Serbia is successfully operating 12 trains delivered in 2010–2012.

The DPS diesel train is equipped with Hubner (Germany) passageway between the cars ensuring safe and comfortable passage through the entire train. The driver's cab and passenger compartments feature heating and ventilation systems by Webasto (Germany). In the car with a sanitary unit, near the entrance door, there is a multifunctional room for baby strollers, bicycles, wheelchairs, and oversize baggage. Folding seats are available in the same area; they are mounted on the side walls and in front of the sanitary module.

Service and Its Pr

Control of the life cycle of manufactured equipment is a critical area in the company's business.

VIKTOR IVANOV, DEPUTY DIRECTOR GENERAL FOR AFTER-SALES SERVICE AT TRANSMASHHOLDING, DISCUSSES THE BUSINESS SEGMENT DEVELOPMENT.

ospects

—Viktor Pavlovich, your business department is in charge of technical equipment maintenance services. What are the holding's current goals and objectives and what is their time frame?

— Recently, our consumers, primarily the largest companies, such as RZD JSC and Moscow Metro, have adopted new policies in their relationship with suppliers. They expect from us ongoing maintenance of technical equipment throughout its lifecycle. After a new machine (diesel locomotive, electric locomotive or diesel) is manufactured, it has to be operated with a certain average availability ratio until the end of its service life; the customer is willing to pay for that accordingly.

This business area is relatively new to the holding; we are actively developing both the lineup of our rolling stock and forms of customer interaction. Maintenance services may be carried out throughout a life cycle or with a certain frequency, for example every 10–15 years; different targets can be determined at each consumer's discretion.

It is no coincidence that we have realized the need for developing a special business area dealing with maintenance.

A few years ago, we launched a business unit specializing in maintenance of products manufactured over time by our enterprises — TMH-Service. Its work has proven to be successful both in terms of business and the condition of the fleet.

RECENTLY, RZD JSC AND MOSCOW METRO HAVE ADOPTED NEW POLICIES IN THEIR RELATIONSHIP WITH SUPPLIERS

In general, advanced models of technical equipment, such as the EP20 and 2ES5 electric locomotives and new metro cars, require from personnel special qualifications, training and expertise. We will not be able to handle this without our partners, primarily Alstom.

AFTER WINNING THE TENDER FOR METRO CAR DELIVERIES FOR MOSCOW METRO IN FEBRUARY 2014, WE STARTED PROVIDING MAINTENANCE SERVICES AT NOVOGHIREYEVO DEPOT

We made a decision regarding the new technical equipment we are developing in cooperation with our European partners and decided to create a separate business enterprise dealing exclusively with after-sales services. At the initial phase, this will be delegated to manufacturing plants. For instance, the EP20 electric locomotives will be handled by NEVZ. In the future, we plan creating a business entity together with our partners; it will be offering life-cycle maintenance services.

— How will the work of such enterprise be organized? Where will it be based?

— Of course, this enterprise will be organized in Russia, most likely, in Moscow. It will specialize in maintenance services for new high-tech rolling stock and consist of business units accountable for different products of the holding. At the moment, we consider this new company as an entity handling the products developed in cooperation with our colleagues from Alstom, such as EP20 and 2ES5. If jointly with them we manufacture a tram or electric train, they will be discussed, too.

As far as the products manufactured by Transmashholding are concerned, they will not necessarily be transferred into the new company's balance sheet. The potential of manufacturing plants and TMH-Service is likely to be utilized.

It is the customer's (RZD JSC) decision, not ours. EP20 and 2ES5 supply contracts have helped us

resolve the issues related to the maintenance services for locomotives, whereas, normally, the customer invites tenders and determines who will provide services. From our perspective, the transfer of such functions to an entity connected with the manufacturer is very reasonable. This also prevents disruption in the technical equipment life cycle (design — production — operation). During each phase, rolling stock is handled by more or less the same specialists who are familiar with technical equipment. In the course of monitoring rolling stock in operation, it is possible to make further structural improvements and upgrades at low cost.

— What are the prospects for this maintenance business unit in five years?

— We understand that maintenance services are a separate business area and the company should profit from it. What would we want to achieve in five years from now? The maintenance service system must function in a distinct and concerted manner. There is an important aspect that concerns metro car maintenance services, which is the possibility of further work expansion directly at the depot. In recent years, all tenders invited by Moscow Metro have been awarded on life cycle contractual terms. After winning the tender for metro car deliveries for Moscow Metro in February 2014, we started providing maintenance services at Novoghireyevo Depot. The expected project timeline is at least 30 years.

The efforts aimed at developing the life cycle contract system necessitate implementation of a multi-service information platform. It aims to monitor the technical parameters of rolling stock while it is operated on the railway line in real time mode. This would allow reducing maintenance costs and enhancing the reliability of technical equipment. Benefits from its implementation include significant decrease in line failures, components base control and increase in overhaul life, transparency enhancement, spare parts optimization, and quality control.

Summarizing our performance throughout the year, we have put forward proposals for expanding services for state-of-the-art car of series 81–760/760 at a few more depots of Moscow Metro apart from Novoghireyevo Depot. Currently, the process is being negotiated. This concerns the metro cars already delivered by us to Moscow Metro but not covered by life cycle contracts.

Advanced cars feature in-built electronics and software. As manufacturers, we are more familiar with them and can offer maintenance of rolling stock at a higher quality level.

— Why is the life cycle contract mechanism used in some instances, while in others rolling stock maintenance is outsourced to maintenance service companies?

— It all depends on our consumers' preferences. They pay for maintenance services and it is their prerogative to decide. The customer may even be willing to perform maintenance and repair operations using their own resources. What is a life cycle contract? It is the same as lease but with maintenance services during a certain period of time. Infrequently, the question of mechanism use is raised when the consumer lacks funds to purchase rolling stock immediately. In such case, it engages a bank in financing the process; the buyer (for example, municipality or metro) pays for the rolling stock in equal annual installments. One part is payment for the rolling stock through the lease mechanism. The second part of payments is made under the contract on maintenance support, warranty and post-warranty repairs during 30 years. In other words, we are willing to use different mechanisms in our work once the customer makes a decision.

WE HAVE A FAIRLY FLEXIBLE SYSTEM — POSSIBLE OPTIONS INCLUDE ON-THE-JOB TRAINING AND ON-SITE VISITS BY EXPERTS

— Some areas have been allocated for EP20 maintenance services at Moscow — Sortirovochnaya — Ryazanskaya Depot. Where will the 2ES5 maintenance service center be located?

— Currently, the contract on maintenance services for the Scythians is being devised. These locomotives are expected to be maintained at Severo-Baikalsk Depot. The technical procedures involving approval and execution of the contract is underway. It will be similar to the procedures for EP20. The service cost per km run is being determined. Subsequently, we will issue monthly invoices for relevant repairs. The same applies to the consumers of other products. The metro life cycle contract stipulates purchase, maintenance and payments from the very beginning.

— Given that we, as technical equipment manufacturers, know it and are able to use it, how do you organize training for the operating personnel?

— First of all, we train drivers. NEVZ has a training center where EP20 drivers are trained. Similar efforts aimed at training drivers for 2ES5 Scythians are underway. We have a fairly flexible system — possible options include on-the-job training and on-site visits by experts.

From the standpoint of maintenance service, it is important to train specialists to handle maintenance and subsequent repairs. They undergo training at our production facilities. A close look at the first experimental maintenance service center specializing in the EP20 maintenance shows that one part of its team is professionals from NEVZ and the other part is local personnel with significant experience in working with RZD JSC. All those specialists improve their skills on an ongoing basis.

We have developed a training program with a schedule and offer weekly classes for repair personnel that involve mandatory practical training on a locomotive. If technical or process support is required, we invite specialists from the manufacturing facility. Our colleagues from Alstom are a great asset in this regard — we train our specialists to operate their equipment as well.

OUR NEW EP20 DUAL-SYSTEM LOCOMOTIVES HAVE ALREADY TRAVELED 11 MILLION KM AND WE DO NOT STOP THERE

— What results have been achieved so far?

— Our new EP20 dual-system locomotives have already traveled 11 million km and we do not stop there. Many issues with their reliability that we had at the initial stage of their operation have been resolved. Our goal is to make sure that the locomotive conforms to technical requirements (which are very stringent: not more than 0.4 failure incidents of type 1 per 1 million km run by a locomotive). I am certain that the holding's experts will be able to achieve that.

— Is the economic effect evident today?

— We are at the very beginning. New and challenging types of repairs are yet to be mastered. The company is paid based on the cost of per kilometer run (on the metro it is based on the operational readiness of the fleet). Virtually, it includes our future costs to be incurred by the maintenance enterprise in 5–10–15 years. Receiving these funds today, we will have to carry out even a more complicated and cost-intensive regulatory work and repairs in the future — and not only at our current depots.

We will have to deal with factory repair issues. Today, we are thinking of where such repairs will be based. For example, in two years from now, it will be time for track raising operations and mid-life repairs for EP20. A tentatively selected base is Ozherelie Depot. However, the final decision will depend on cost effectiveness. Possibly, we will cooperate with Yaroslavl or Rostov locomotive repair plants or develop all necessary infrastructure at our NEVZ plant.

— What about our partner Alstom? Will it participate in selecting repair facilities?

— Of course! Let's take, for example, the traction converter installed at EP20; it is purely an Alstom product. Please keep in mind that we have a joint venture in Novocherkassk (RailComp) that manufactures such converters. So, we will have to decide how and where to handle the converter during mid-life repairs.

Possible options are to install a new one or to carry out refurbishment work, such as hardware replacement, at RailComp.

This is a dynamic process — we cannot make predictions for the next 40 years. By that time, mathematics will make a step forward, software will undergo major changes.

THE HOLDING SOLVES THE TASKS THAT ARE PRESSING TODAY. WE WILL STRIVE TO PERFORM MAINTENANCE SERVICES FOR EVERYTHING WE MANUFACTURE

The holding solves the tasks that are pressing today. We will strive to perform maintenance services for everything we manufacture. For instance, electric trains have not been included in this area yet. The EG2Tv urban electric train is about to be manufactured and will require maintenance as well. The products purchased by Central Suburban Passenger Company will also require maintenance services. Our colleagues have expressed their interest in working under a life cycle contract. We have enormous plans.


РЖД
001
43C5K

4ES5K No. 001 freight mainline electric locomotive

WORLD'S MOST POWERFUL 4ES5K ELECTRIC LOCOMOTIVE

IN AUGUST 2014, NOVOCHERKASSK ELECTRIC LOCOMOTIVE PLANT (NEVZ) UNVEILED THE WORLD'S MOST POWERFUL ELECTRIC LOCOMOTIVE — 4ES5K ERMAK WITH ENHANCED HAULAGE CAPACITY. IN DECEMBER, IT WAS DELIVERED TO THE CUSTOMER — RZD, AT ITS SMOLYANINOVO DEPOT (FAR EASTERN RAILWAY). THE ERMAK IS EXPECTED TO HELP UPGRADE THE BAIKAL-AMUR MAINLINE AND TO CONTRIBUTE TO BOOSTING THE ECONOMY OF PRIORITY DEVELOPMENT AREAS.

Before the 4ES5K launch, heavy-tonnage trains were hauled only by combined multiple-unit (MU) locomotives, such as 2 x 2ES5K, using distributed traction with employment of radio channel locomotive control systems (RCLCS) and brake control systems (TBCS). Smolyaninovo, Khabarovsk-2 and Amurskoye locomotive depots are currently operating fifty-one 2 x 2ES5K electric locomotive systems. However, the preset critical train mass for the 2 x 2ES5K electric locomotives for the Smolyaninovo — Nakhodka section does not exceed 6,300 tons.

HEROIC MIGHT

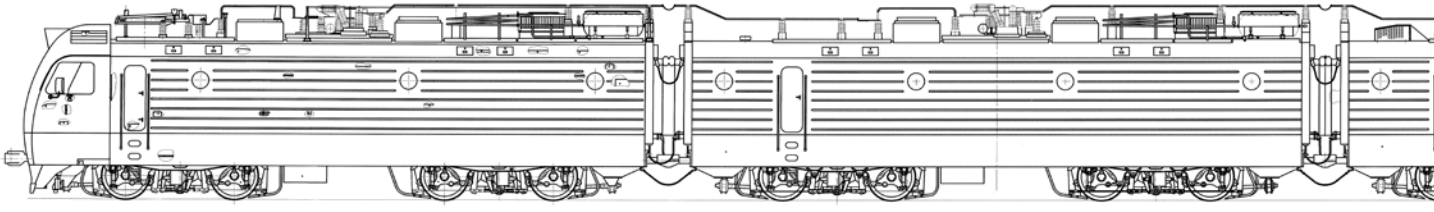
The haulage capacity of the Ermak has been enhanced through the implementation of new solutions. For example, the axle load has been brought to its optimal value of 245 kN (25 ton-force), which allows increasing the rated traction force of electric locomotives, preventing greater track wear and impaired reliability of the mechanical components of locomotives.

Bogie with rolling axle wheels and motor unit

The axle-by-axle control system includes individual rectifier inverter devices (VIU-4000–2M). Coupled with a flexible adaptive system of antiskid protection, it ensures the maximum coefficient of friction for each traction axis and the optimal distribution of traction loads between the axes. This results in the increased traction force of the electric locomotive and, in many cases, allows eliminating the need for sanding even in adverse weather conditions and on dirty tracks. The Ermak uses a system of independently excited (IE) traction motors within 0–50 km/h speed range. In the most challenging operational modes (pickup, starting and operation in sections with gradients) the SE operational model is used; series excitation (SE) is used during operation in lowland sections at high speeds. Another innovation is energy-optimal operation of the train due to the flexible forming of a hauling unit of required power based on RZD JSC site conditions (number of traction axes: 4 to 16; repetition factor: 4).

Employment of the VIU-4000–2M rectifier inverter device, which, unlike VIP-4000M, was used in the 2(3) ES5K electric locomotives, consists in two (instead of one) independent channels of gradual individual feed control for two pull traction motors 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.

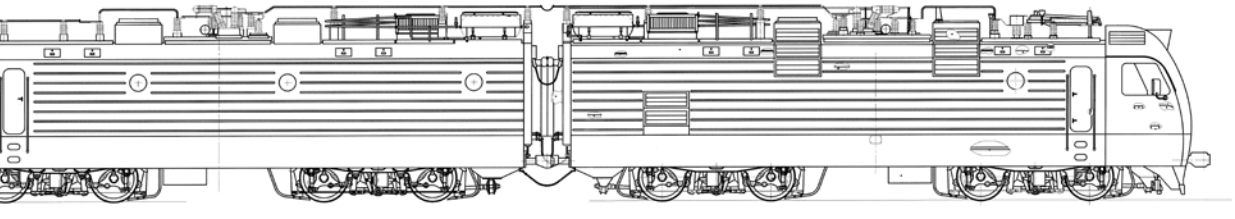
The VIU-4000–2M has an expanded diagnostic function versus the VIP-4000M. Its diagnostic unit controls the operation of two channels and differs significantly from a similar unit of the VIP-4000M as it features a communication channel connecting it with the MSUD-015 microprocessor-based control system.



General view of the 4ES5K electric locomotive

Comparative technical characteristics of the 4ES5K and 2 x 2ES5K electric locomotives

DESCRIPTION OF PARAMETERS	TYPE OF ELECTRIC LOCOMOTIVE	
	2 X 2ES5K	4ES5K
Wheel arrangement	2(2o–2o)* 2(2o–2o)	4(2o–2o)
Type of traction motor	NB-514B	NB-514E
Axle load, kN (ton-force)	24 ± 0.5	25 ± 0.5
Electric locomotive adhesive weight with 0.67 sand capacity, tons	192*192	400
Wheel block and motor unit	with sliding axle bearings	with rolling axle bearings
Axle-by-axle traction force control	None	Yes
Control system	MSUD-N	MSUD-015 with extended diagnostic functions
Pull traction motor field system	Sequential	Sequential / inde-pendent
Sanding nozzle control	Section by section	Individual
Through passageway between all four sec-tions	None	Yes
Sanitary module	None	Yes
Personnel room for short stay	None	Yes
Distributed train brake control system (RCLCS)	None	Yes
Continuous rating speed (km/ч)	51	
One-hour rating kW	13,120	
Electric braking	Regenerative	



Driver's workplace

The MSUD-015 microprocessor-based control system with an extended equipment diagnostic function is designed for controlling towline and control line equipment, axle-by-axle traction electric motor (TEM) control, specifically in pull mode with the independently excited EM, and diagnosis of the principal systems of the electric locomotive for protection purposes.

The control system can inform the driver of wrong actions or those actions that are necessary for ensuring proper functioning of the electric locomotive systems. Furthermore, MSUD-015 registers data pertaining to the condition of the electric locomotive vehicle-borne equipment. The system is able to promptly transmit information (through the BRPD-003 unit via GSM networks in real time mode) to the plant and locomotive depot servers and inform about the condition of electric locomotive primary equipment, the driver's control actions and the locomotive's location (coordinates determined with the GLONASS system) in case of emergency. Relying on the above-mentioned information, locomotive repair depots will issue assignments specifying the scope and frequency of repairs of the vehicle-borne equipment.

COST EFFECTIVENESS AND EFFICIENCY

The ES5K significantly reduces operating costs associated with maintenance and repairs. The 4ES5K electric locomotive features a wheel block and motor unit with rolling axle bearings instead of the sliding axles employed in the 2(3)ES5K serial electric locomotives. Rolling axle bearings offer a number of benefits, which primarily include quantitative reduction in the electric locomotive maintenance (TO2) coupled with an increase in overhaul life from 72 to 240 hours. The use of new axle bearings allows eliminating the consumption of costly axle oil for refilling, filling-up and seasonal change, as is the case with sliding axle bearings. The new units allow reducing operating costs associated with the maintenance and repairs of axle bearings by reducing labor input (as a result of removal of axle repair operations such as priming, boring of bearings, etc.). Other benefits include cutting traction power costs as a result of reduced friction torque in bearing units and enhanced electric locomotive performance; reliability improvement, longer service life of the traction motor, traction gear, increased wheel set axle resource. With the view of raising the reliability and faultless performance of the electric locomotive, as well as detecting unacceptable operating modes, the most critical pieces of electrical equipment feature thermal condition control sensors. These include traction transformer, smoothing reactor, reversible converter, and traction motor. Information about the thermal condition of equipment is displayed on the driver's control panel.

SAFETY AND COMFORT

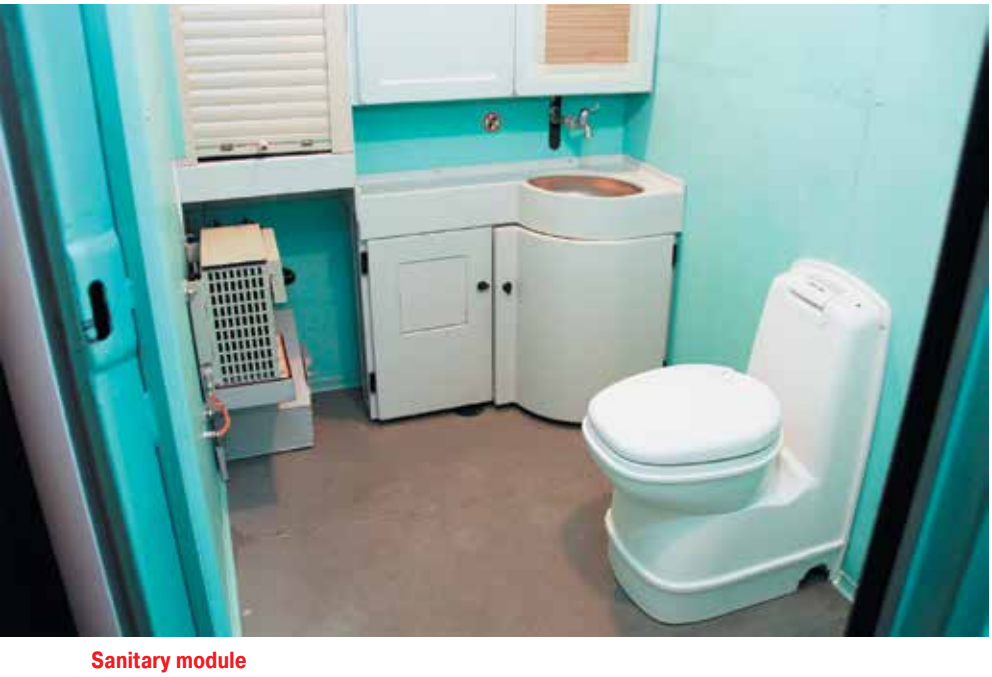
Pursuant to the fire safety instruction for locomotives and multiple units (TsT-TsUO/175 dated April 27, 1993), while on the train and as a back-up, the assistant locomotive driver must inspect diesel (machine) rooms of all sections regularly in conformity with the local instructions approved by the head of the locomotive facilities of a railway company, paying special attention to the condition of fire-hazardous units, and communicate the inspection results to the driver. Such requirements are impracticable when the 2 x 2ES5K electric locomotives are connected as multiple units (MU) due to the impossibility to pass between the moving locomotives, which affects adversely fire safety and railroad network traffic safety. Booster sections with a through corridor are designed to meet all requirements set forth in the fire safety instruction, as well as to control and assess the technical condition of equipment in high-voltage cabinets in all sections of the moving 4ES5K electric locomotive.

In terms of shape and properties, the new electric locomotive is very similar to the Ermak family locomotives, although it offers more convenient and comfortable working conditions for drivers. The 4ES5K differs from the 2 x 2ES5K electric locomotives MU system as it features two booster sections with a different structure. Type 1 booster section features a sanitary module equipped with a closed loop toilet system meeting the requirements set forth in paragraph 4.15 of GOST R 55364–12 standard. Type 2 booster section features a personnel room for short stays only outside their working hours (on the way to their destination or permanent location).

The personnel room features two tiers of shelves, a wardrobe for clothes, folding table, air conditioner, insulated glass unit in the window frame built into the side wall of the car's body, TV set, main, local and night lights, interior set with built-in heating panels, and a heating panel for heating the personnel room.

HELP FOR ALL

The 4ES5K electric locomotives can be used in trains with heavy tonnage and greater length. A critical indicator in operating a train with heavy tonnage and greater length, affecting its safety, is the overall dynamics of the freight train, especially at braking. For the purposes of distributed control of brakes in heavy-tonnage long freight trains, the 4ES5K electric locomotive is equipped with the RCLCS.395 system. The system is used for synchronous or asynchronous control of automatic brakes when operating freight trains with heavy tonnage and greater length with one or more locomotives.



Sanitary module

Personnel room in type 2 booster section

The equipment is located in the head end of the electric locomotive and operates in concert with the 395M driver's brake valve and tail car block type 034 installed on the automatic coupler between the cars and on the last car of a freight train. The RCLCS system featured in the electric locomotive will allow operating trains weighing 9,000 tons and consisting of more than 100 cars.

Vitaly Kinzhigaziev,
Deputy Chief Technical Officer for New Technical Equipment, PC NEVZ, LLC

Valery Zadorozhny,
Manager of the Group for AC Electric Locomotives, Serial Products Unit, PC NEVZ, LLC

Moving to a New

In early October, Russia's largest manufacturer of metro cars JSC Metrowagonmash (a member of Transmashholding) delivered to Moscow Metro the 81–760a/761a/763a eight-car train with a through passageway for standard tests.

Level

The decision to develop new cars was made following the study of the situation with the rolling stock fleet on the subways of the Russian Federation, CIS, and Eastern European countries. Consideration was also given to development trends and promising technical solutions of the world's leading companies in the industry.

The 81–760A/761A/763A cars are characterized by high optional adaptability, ergonomics and low life-cycle cost. Close attention in the design was paid to passenger and driver safety and comfort. As a result, these cars have a strong competitive edge both in the domestic and external markets. Such train would be able to carry up to 80 thousand passengers per hour.

By late 2014, JSC Metrowagonmash, in collaboration with the Test Center for the Rail Transport Hardware and Software and Moscow Metro, plan to conduct standard tests for the 81–760A/761A/763A cars. They will include tests of braking, pull and energy efficiency, as well as of the air conditioning system of the passenger compartment.

DESIGN FEATURES

The cars launched by the manufacturer represent a modified version of the 81–760 model. The key difference from the 760 series is through passageways and trailer non-motor cars, which reduces the train weight, raising its cost effectiveness and energy efficiency. Electricity consumption is reduced by 5%.

Passageways between the cars allow passengers to move freely throughout the train.

CLOSE ATTENTION IS PAID TO SAFETY AND COMFORTABLE ENVIRONMENT FOR PASSENGERS AND THE DRIVER

The sliding plug doors of the cars with an independent drive are equipped with anti-trap systems. They feature state-of-the-art exterior, leak integrity, and enhanced corrosion resistance.

An additional innovation is the design of spotlights. They are installed in the recess of the head car noze on the left and right sides (laterally). The light-emitting-diodes allow saving up to 40% of electricity as compared with quartz-halogen bulbs. For electricity saving purposes, bulbs are equipped with a light sensor, which enables the

driver to control their brightness depending on the situation.

UPGRADED COMPARTMENT

The compartment's interior focuses on comfort and safety as well. The new cars are equipped with state-of-the-art vandal-proof seats, information systems, video surveillance, ventilation, air conditioning, heating and air decontamination systems.

The intelligent climate control system automatically maintains the preset temperature in cars, thus making passenger travel comfortable. It allows controlling the external air feed supply depending on the number of passengers, thus ensuring significant electricity savings.

Compartments are finished with easy-to-clean stain-resistant materials. The state-of-the-art solutions employed in the design of the compartment increase the durability of its interior and simplifies care.

The video surveillance system records all events in the compartment and saves records in its non-volatile memory. Information is displayed in real time mode on the driver's control panel; the system is turned on automatically when feed voltage is supplied.

THE KEY DIFFERENCE FROM THE 760 SERIES IS THROUGH PASSAGEWAYS AND TRAILER NON-MOTOR CARS, WHICH REDUCES THE TRAIN WEIGHT, RAISING ITS COST EFFECTIVENESS AND ENERGY EFFICIENCY

ATTENTION TO DETAIL

Depending on the customer's preferences, the car's compartment can be equipped with optional add-ons. Among them are special seats for the handicapped with wheelchair mounts. They can be used for transportation of folding bicycles. The passengers with disabilities will be able to enter the front door of the first car via a special gangway.

Additionally, cars can be equipped with displays with information, such as metro navigation and station change options, as well as a dual air decontamination system. It uses ultraviolet radiation for combating microorganisms and reduces the risk of airborne contagion.

Furthermore, cars are equipped with a regulated dimming system depend-

ing on the time of the day. Following the recommendations of psychologists, light in cars can be bright in the morning and somewhat dim in the evening. In the future, 30% of the seats in the 81–760A/761A/763A model trains will be raised during rush hours in order to reduce overcrowding in cars.

FOSUC ON SAFETY

A key priority to Metrowagonmash specialists is to ensure passenger and driver safety. Therefore, the body of this new metro car is made exclusively from stainless steel. Such body requires labor-intensive production, as compared to an aluminum body, but it is durable and fire-resistant. Despite its enlarged doorways and lighter weight, the body conforms to all strength standards. Its structural rigidity preserves the inner geometry of the passenger compartment, when affected by the compressive force of 50 tons or lower and the tension force of 35 tons or lower.

In most cases, this allows preventing passenger injuries in case of accidents. Even given the critical level of Moscow Metro passenger traffic, the contemplated body service life is 35 years.

Bogies with air-ride allow for soft and quiet train movement

In manufacturing metro cars, Metrowagonmash complies with all GOST standards for their body and associated equipment, control compartment, passenger compartment, bogies, brakes, automatic coupling devices, and pneumatic equipment.

Special attention is paid to materials and components, safety and environmental requirements. The driver's cabin and passenger compartment are finished with non-combustible and low-combustible materials and equipped with state-of-the-art fire-fighting systems.

Metrowagonmash uses multiple-phase quality management system at all stages of production. Not a single car is allowed on the rail line without prior tests. All operating assemblies and units of the train are inspected at a special test station and test site. Train delivery to the customer is preceded by a mandatory depot run of at least 300 kilometers.

A critical element of the state-of-the-art metro car safety system is a microprocessor control and diagnostic system. A two-stage train monitoring system of Metrowagonmash trains allows monitoring of up to 100 operational parameters at a time. Key parameters are transmitted to the situation room in real time mode. Passenger compartments are equipped with landing ramps for fast evacuation of passengers in case of accidents or in-service door interlocking. The control panel conforms to ergonomics requirements.

Each compartment's video surveillance system consists of four cameras (two flank and two side cameras). From them information is transmitted to the situation room through the radio channel. The system includes outdoor surveillance cameras installed on the head cars. Images from the cameras are displayed on the monitor on the driver's primary console.

Technical characteristics of 81—760A/761A/763A cars

Parameter	Car type		
	81–760A	81–761A	81–763A
Passenger seats	308	330	330
Maximum occupancy, passengers	308	330	330
Design speed, km/h		90	
Maximum acceleration, m/s		1	
Acceleration time (seconds to 80 km/h)		35	
Maximum deceleration, m/s 1.3		1.3	
Length over pulling faces of couplers, mm	20,120	19,140	19,140
Width at floor, mm		2,686	
Car height, mm		3,620	
Empty weight, tons	38	36	29
Traction motor rating, kW	170	170	
Maximum gross static load of wheel set on track, tons		15	

Dmitry Slavin, Chief Power Engineer at Transmashholding: "Power Engineering is a Key Instrument Supporting Production Processes"

Direct payments made by the holding's enterprises for energy resources from 2007 to 2014 have grown by 260%. How can the energy consumption costs of production facilities be optimized and the energy equipment fleet be renewed at the same time? **WE HAVE DISCUSSED THIS AND MANY OTHER ISSUES WITH DMITRY SLAVIN, CHIEF POWER ENGINEER AT CJSC Transmashholding.**

Dmitry Lvovich, the holding comprises 13 principal production sites of varied scope. This is a fairly large and diverse business; power engineers are often assigned totally different tasks. Could you please tell us about your current department, how it is organized and what issues it addresses?

— Transmashholding does not directly manage energy matters of factories and plants. Therefore, energy matters of the holding are handled by its technical department.

As far as the department is concerned, its employees work at the production facilities. Typically, it is Chief Technical Officer's or Operations Manager's department, the Chief Power Engineer and energy units that are in charge of thermal and energy equipment, its operation and any related matters. The total headcount of the business units is about 2,500 people.

— What advantages and disadvantages does the structure have?

— The principal advantage of such organizational structure is prompt decision-making with respect to direct management. In other words, issues are solved on site, and in case of any on-site failure or accident there is no need to obtain approval from Moscow.

— In other words, every facility appoints a person in charge of power engineering?

— Not one person but separate units — typically called the Chief Engineer's departments. Its employees are in charge of operational management of all energy facilities of the plant, whereas the holding makes strategic decisions, decisions on major projects as well as decisions related to primary energy supplies to the production facility. However, the main load is, naturally, carried by people on site.

USEFUL COMPLEXES

— How is the performance of such functions assessed at different levels ranging from facilities and production sites to the entire holding?

— There is only one criterion for the holding, given that CJSC Transmashholding is an economic entity, i. e. the share of energy costs in the cost of principal products manufactured by production facilities. Energy costs depend both on tariff growth and energy supply management. However, the criteria used at the operational level,

that is within a specific production facility, vary. We have 13 plants and factories, all of them are large (with the possible exception of KMT), in some of them the headcount reaches 10,000. I can only mention the objectively universal criteria. These include per-unit energy consumption of energy equipment, the department's performance, as well as the criteria related to repair costs. Yet, generally, every plant has its own efficiency policy determined by its manager.

— Are there any performance targets to be achieved?

— Our target is annual 5% reduction of the share of energy costs in the output. However, it can sometimes be difficult to measure the parameter objectively. What are the energy peculiarities of TMH production facilities? TMH comprises large plants and factories that used to operate at full load before 1991. These are enormous production facilities, large energy systems for power and heat supply, vast areas. Economic recovery after the stagnation of the 1990s did not begin until TMH establishment in the mid-2000s. If some 5–6 years ago a cold, unheated shop was a norm, today the requirements to working conditions and operation of the new state-of-the-art process equipment have changed drastically.

— What changes await power engineering units at the production facilities and the holding as a whole? How will they change due to the implementation of the energy strategy?

— There is an illustrative example of how power engineering can be reorganized. Our Bryansk Machine Building Plant is being restructured now. It is the largest production facility of the holding in terms of its production area and, maybe, the strongest in energy terms. The plant was restructured in the 1980s but by 2004 discontinued its operation. It is going to be restructured completely and will have reduced production areas and territory. It will have fully rebuilt premises and structures, replaced cables, discontinued steam boiler room and other energy infrastructure facilities. These activities alone resulted in 25–30% cost reduction. Effect will be produced not only by spatial reduction but also by the fact that renovated shops will feature new state-of-the-art

13 plants:
number of large production facilities of Transmashholding

up to 500 people:
headcount of the company's largest plants

2500 people:
headcount of the Holding's energy business units

high-performance production equipment with low-energy consumption rate. Within BMZ alone, investments under certain projects of production base upgrading are worth hundreds of millions of rubles.

At this point, I would like to say that mere equipment replacement, as I see it, is the easiest and often ineffective solution. Efforts should be made in all areas, across all fronts, generating comprehensive effect. In most cases, not a single project aimed at energy efficiency or energy-saving equipment installation alone and not related to complete technology upgrading is able to produce a major economic effect.

EXAMPLE TO FOLLOW

— Could you tell us about the measures that will be taken to implement the holding's energy strategy?

— It is important to understand that the principal energy-related decisions are aimed at achieving the maximum performance of the holding in general rather than at fuel savings. In contrast, previously, BMZ had to accomplish a comprehensive task. The plant was reconstructed not for fuel-saving purposes but with a view to launch new products using a new technology. Energy is tool number one in supporting production processes.

The first strategic line is to reduce idle production sites and to decommission low-loaded equipment of boiler rooms, compressor units, and pump stations. For example, the capacity of the BMZ boiler room was six times greater than required. The plant's management went even further and today they consider closing the shared central compressor unit and installing local boiler rooms near each shop. Therefore, the second strategic area is the so-called distributed, decentralized energy. Consider this: contemplated losses alone in the old chain "boiler room — pipe — shop" are as high as 10–15%. BMZ reconstruction allowed for energy savings of some 30%. This is significant.

— Will it become a pilot project for the remaining production facilities and will it be scaled?

Energy is preceded by production. However, it would be useful to all power engineers to familiarize themselves with BMZ experience.

— What will happen to equipment? Will it be upgraded and replaced?

These are ongoing processes, there is no need to implement a special strategy. Furthermore, relatively large energy programs have already been implemented — we have replaced compressor stations, partly restored boiler facilities, pipes, etc. Recently, several hundreds of millions of rubles have been invested into energy equipment upgrading and replacement.

— Can any other Transmashholding production facilities be considered showpieces to be looked up to in energy terms?

Every production facility has its own history and "big" life. For instance, we have two plants in Saint Petersburg — OEVRZ and KMT. KMT is a very small production facility with a highly-developed production culture and a small energy function. Yet, its local nature caused the establishment of "Western" business (in a positive sense).

At present, the Oktyabrsky plant is primarily involved in rolling stock repairs. Its planned rehabilitation is expected to change the situation.

In my view, TVZ is an example of how power engineering must operate. It is a fine-tuned powerful machine in all (both production and energy) respects. Another Tver-based plant (Tsentrosvarmash) is the first experience of the holding with regard to comprehensive rehabilitation. Production premises and process lines have been renovated; currently, the energy sector is being brought to the required level.

The Demikhovo plant is another exemplary enterprise from the standpoint of energy organization. This is a relatively young production facility, which launched its transport machine building business in the late 1980s. Accordingly, its equipment dates back to the late 1980s and early 1990s; the plant has a good team of power engineers. However, there is a small problem — the plant is located within a densely populated area heated by the enterprise's thermal facilities, which entails a heavy social burden.

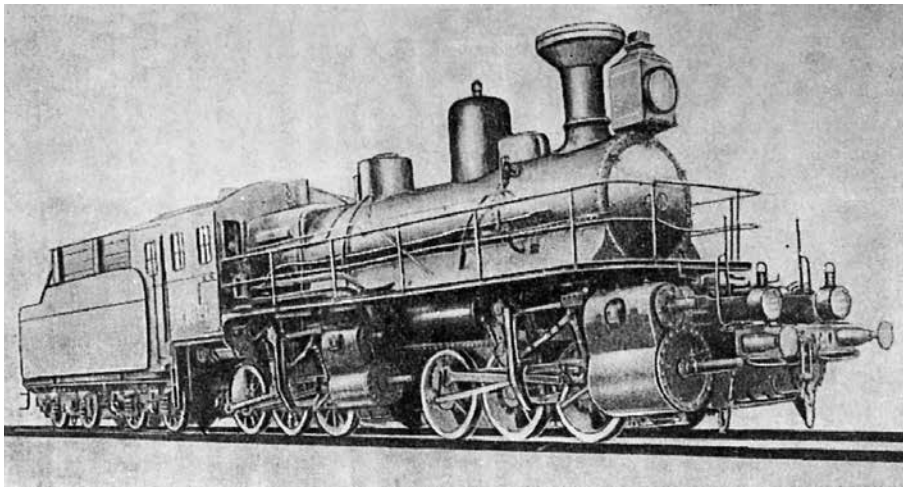
— In general, are TMH production facilities in a good energy situation?

— I would say — stable. A perfect situation is when production receives any amount of resources at any moment at any place; a poor situation means that they cannot be provided in the foreseeable future. Power engineers are working hard and will continue striving for the best. In such case, all of our employees will always enjoy warmth and light.

Showcasing the Fita in

100 YEARS AGO, RUSSIAN STEAM LOCOMOTIVES WERE NOT ONLY COMPETITIVE WORLDWIDE BUT BECAME A SENSATION IN THE EUROPEAN CAPITALS AND WERE DELIVERED TO THE UNITED STATES.

They were manufactured in Bryansk, where the good traditions of the railroad equipment production are still alive.



The Bryansk plant construction began in 1873 near the village and station of Bezhitsa of the Bryansk county (uezd) of the Orel province. Initially, it manufactured tracks and rail fastenings from the iron it produced; from 1877 onwards, it produced steel as well.

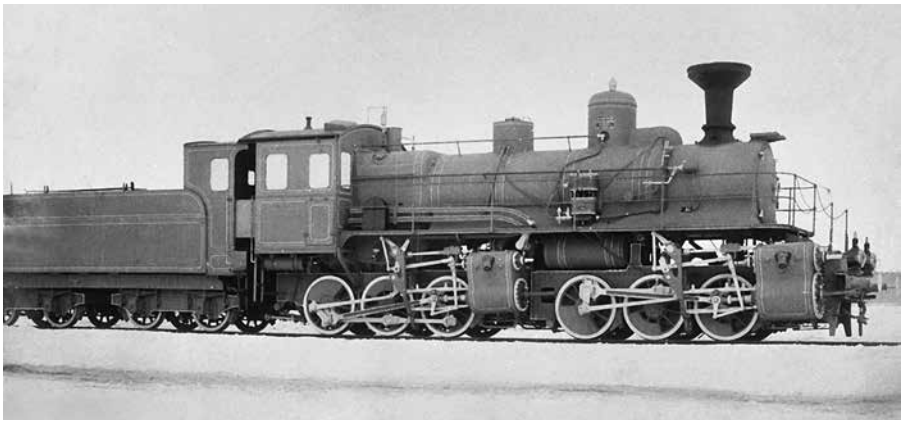
Market conditions changed — so did the plant's product range. As a result of a decrease in railway construction in the 1880s, the plant switched to mechanical production and started manufacturing railway cars, bridge structures, iron and steel plates, profile iron, tracks, etc. In the 1890s, the plant became a large manufacturer of steam locomotives and cars. At the time, a joint-stock company invited a number of renowned experts to the production facility to develop new designs of locomotives, cars and cisterns.

Steam-locomotive building became the "spokesmodel" of the production facility for 50+ years to come. Railroads were built rapidly spurring the demand for locomotives and rolling stock. The plant started producing a powerful (for its time) steam-locomotive building base. In 1894, the production facility manufactured 85 steam locomotives versus 118 in 1895. High quality of the Bryansk plant products ensured their robust sales.

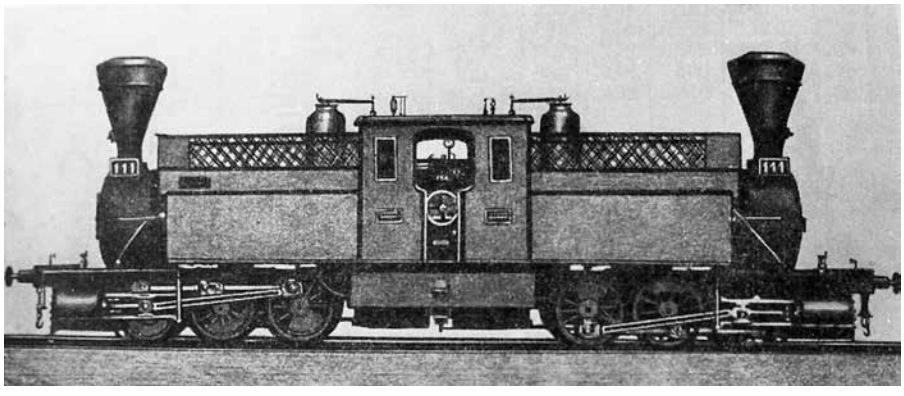
In the 1890s, a joint-stock company of the Moscow-Kazan Railway encountered problems with the overloaded Ryazan — Ruzayevka line. It was necessary either to lay the second track or to use more powerful (i.e. with a smaller axle load) steam locomotives, which necessitated replacing all tracks and strengthening bridges. An engineer by the name of Yegor Noltein proposed the third option: to operate duplex steam locomotives with six axles, ensuring sufficient traction force at the axle load of 13–14 tons. In 1886, the Moscow-Kazan Railway instructed him to develop a design of a duplex steam locomotive, delivering the relevant order to the Bryansk plant. Based on Noltein's design, the plant developed and later built new powerful steam locomotives with six moving axles and articulated frames. Their traction force was 1.5 times greater than the potential of the most powerful locomotives of that time.

Fita series steam locomotive by Bryansk plant

Europe!



Duplex steam locomotive with six axles and frontal swivel bogie



Ferly type steam locomotive of the Transcaucasian Railway

FITA IN PARIS

The H810 duplex steam locomotive, type 0–3-0+0–3-0, series Θ ("Fita") in its original version ("Ferly" type) featured two boilers connected with each other by a shared stoking casing (due to its small width, the steam locomotive crew was seated alongside). Each boiler was supported by a triaxial swivel bogie with steam cylinders.

The above steam locomotives owe their creation to mountain railways, which could not use locomotives with wheels in a single rigid frame. In 1898, ten locomotives were delivered to the railways. One of them was premiered in 1900 at the World's Exhibition in Paris as the most powerful among the existing steam locomotives. The "Fita" from Bryansk became a sensation as an outstanding engineering achievement. Three years later, Americans began manufacturing the same steam locomotives under a license from the Bryansk plant.

Success at the exhibition resulted in new orders. The Bryansk plant manufactured 35 duplex steam locomotives.

TECHNICAL WONDER FROM BRYANSK

Steam locomotives had the following technical performance characteristics: adhesive weight of 83.1 tons, operational speed of 45 kilometers per hour, steam pressure of 12 atm, which, for the stroke cycle of 650 millimeters and high and low pressure cylinder diameters of 475 and 710 millimeters respectively, ensured traction force of about 14 tons.

It should be noted that an automatic coupler was nonexistent at the time and a 12 ton effort was considered acceptable for the screwed coupling. Therefore, it was decided to use a special locking consisting of powered tethers on each side of the tender. After the steam locomotive was connected to the rest of the train, a wire was connected with hooks to the 10th or 15th car and stretched using hoists. The same tension and curved tracks passing was ensured using long air cylinders with pistons fed by compressed air from the brake line. Officially, the system was deemed necessary before 1910; however, drivers would operate trains without wire-rope tricing lines.

The "Fita" series steam locomotives with a swivel bogie and small axle load exceeded expectations and ensured mass transportation of cargos by railways with a weak track structure. In 1910, the steam locomotive was declared the "wonder of engineering thought" at the International Railway Congress in Bern, Switzerland.

At the same time, duplex steam locomotives proved to be less cost effective in terms of fuel consumption as considerable steam condensation took place in the long steam pipe connecting the boiler, high-pressure cylinders installed on the frame and low-pressure cylinders installed on the bogie.

In 1910, the Bryansk plant developed a design for the "Fita-Chb" (Bryansk) steam locomotive with a higher-performance superheater and somewhat greater adhesion weight (88.7 tons). The upgraded duplex steam locomotives rated at 970 hp were built by the Bryansk plant and later the Kolomna plant for the Moscow-Kazan and Transcaucasian Railways until 1916.

A total of about 350 duplex steam locomotives were manufactured before the revolution.

TRANSMASHHOLDING

PRODUCTS AND SERVICES OF THE HOLDING:

- mainline and electric industrial locomotives;
- mainline and shunting locomotives;
- freight and passenger cars;
- electric train and subway cars;
- rail buses and diesel trains;
- car casting;
- diesel locomotive engines and marine diesels;
- diesel generators and turbochargers;
- transport components;
- spare parts;
- repair and service maintenance.

OVER THE PAST FIVE YEARS, THE COMPANY HAS PRODUCED:

over **3000** locomotives

over **4000** passenger cars

over **3000** electric train cars

over **230** rail bus cars

over **1500** subway cars

over **2700** diesels

- Transmashholding is NO. 1 IN CIS COUNTRIES in terms of the volume of rolling stock production and sales
- Transmashholding is among WORLD'S TOP TEN LEADING MANUFACTURERS of railway equipment
- Transmashholding is THE ONLY RUSSIAN COMPANY to have experience in creation and manufacture of the machinery for the arctic service
- Transmashholding machinery is operated IN ALL CLIMATIC REGIONS OF THE EARTH

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