## Contents

### company news

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
</tr>
</tbody>
</table>

### cover story

**Tsentrosvarmash** — leading national manufacturer of welded structures

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

### personality

Interview with Andrey Solovey, general director of JSC Tsentrosvarmash

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
</tr>
</tbody>
</table>

### innovations

Smart car by Transmashholding

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
</tr>
</tbody>
</table>

### introduction

**ED8** — new commuter electric train for suburban railway

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
</tr>
</tbody>
</table>

### technologies

Project management of success

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
</tr>
</tbody>
</table>

### times

First Kiev tram

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
</tr>
</tbody>
</table>
News

RIC Cars Set Off to Customer

Tver Carriage Works (TVZ) sent the first batch of 12 RIC passenger sleeping cars for international traffic to OJSC Federal Passenger Company. The supply contract for 200 cars was signed between OJSC TVZ and JSC Russian Railways in August of 2009. The Contract is to be in effect until 2014. The project is being carried out in cooperation with Siemens.

RIC (Reglamento Internazionale delle Carrozze) cars of the 61-4476 type are designed for operation in international traffic. They have been certified to Russian and European standards and granted a permit to operate in Russia and Europe.

RIC cars are equipped with two sets of undercarriages: undercarriages produced by Siemens will be used for the 1435 mm gauge and rolling stocks with new generation undercarriages developed and produced by OJSC TVZ will be operated on the Russian 1520 mm gauge. The undercarriages are designed for operation at the speed of 160 km/h with the possibility of acceleration up to 200 km/h. They are equipped with electric and pneumatic connectors to minimize their replacement time.

All up-to-date requirements to safety and comfort have been met. Each compartment has a wash basin built in the table. A temperature regulator allows providing a comfortable environment for passengers in each compartment.

It is expected that the new RIC cars will be operated within the Moscow – Nice, Moscow – Berlin routes and other high-demand European routes.

BMZ Started Supplies of TEM18B Diesel Locomotives

Bryansk Engineering Plant (BMZ) delivered to representatives of JSC Russian Railways the first two TEM18B diesel-locotive shunters equipped with Finnish diesel engines produced by Wartsila.

The new diesel locomotives arrived at Oktyabrskaya Railway. RZD will receive 30 additional diesel locomotives within 2013.

The TEM18B diesel locomotive is based on the proven TEM18DM diesel locomotive. A number of changes have been introduced in the base structural design, and a 882 kW diesel electric engine produced by Wartsila has been installed. TEM18B diesel locomotives are notable for highly reliable power equipment and low environmental impact as compared to the diesel locomotives of the previous generation.

The first diesel locomotive was produced in 2011 and passed manufacturing, operational, certification and acceptance tests successfully. The Federal Railway Transport Certification Register issued a certificate for the manufacture of a pilot batch of 25 locomotives.

The structural design includes a heating system agent for diesel heat transfer that maintains optimum temperature, when the diesel engine is inactive. It allows for fuel saving during winter storage of diesel locomotives.
Transmashholding and RZD Signed Maintenance Agreement for EP20 Electric Locomotives

Alexey Vorotilkin, the Vice-President of JSC RZD, and Alexander Chebakov, the General Director of CJSC Roslocomotive, a part of Transmashholding Group, have signed their names on the document.

The agreement stipulates that CJSC Transmashholding as a locomotive manufacturer will be responsible for routine and non-routine maintenance through the whole locomotive life cycle. The Group will bear responsibility for the operability of locomotives, perform all types of maintenance and repair work, including mid-life and overhaul repairs.

The agreement comes is effective from the date of its signing and is valid within 40 years after the last locomotive is accepted for maintenance. EP20 dual-voltage electric passenger locomotives have been designed as per JSC RZD order by TRTrans, an engineering center established by Transmashholding jointly with Alstom Transport, a French engineering corporate group. Locomotive supplies started in November 2012. In total, Russian Railways will receive 200 electric locomotives until 2020.

The 2ES5 design embodies cutting-edge technologies, specifically: traction drive with asynchronous traction motors with individual voltage inverters, oil-free piston compressors with air cleaning and drying systems, microprocessor control and monitoring system. The locomotive manufacturing plan anticipates that key components of 2ES5 (including those engineered abroad) will be produced at Russian facilities.

Sales Increase by 22%

As per 2012 performance results, Transmashholding sales of products and services increased by 22% reaching RUB 130 billion against 2011.

Peak sales were achieved in locomotive and freight car sectors. Sales of mainline freight electric locomotives and mainline freight diesel locomotives increased by 40% (from 308 to 434 sections) and 36% (from 124 to 169 sections), respectively. The Group’s supplies of freight cars to its customers increased by 80% (8,810 units versus 4,905).

JSC Russian Railways remained the largest consumer of the Group’s products. Major purchasing foreign countries were Bulgaria, Byelorussia, Kazakhstan, Ukraine and Serbia. The largest export group of products was metro cars, passenger diesel locomotives, freight cars, platforms, and diesel trains.

2ES5 Electric Locomotive Undergoing Tests

Engineers of Transmashholding and Alstom are performing shop tests of the first 2ES5 AC mainline electric freight locomotive at Novocherkassk Electric Locomotive Plant (NEVZ).

2ES5 is the first Russian AC electric freight locomotive with an asynchronous traction drive. After completion of shop tests that include static tests, as well as dynamic tests on the test tracks, acceptance tests of the locomotive will be carried out on the proving ground of the Russian Scientific Research Institute of Railway Transport (VNIIZhT). At the same time, certification tests will be conducted to assess compliance with railway transport safety standards. Future plans include the manufacture of the second locomotive unit to accelerate the tests at NEVZ.

The 2ES5 design embodies cutting-edge technologies, specifically: traction drive with asynchronous traction motors with individual voltage inverters, oil-free piston compressors with air cleaning and drying systems, microprocessor control and monitoring system. The locomotive manufacturing plan anticipates that key components of 2ES5 (including those engineered abroad) will be produced at Russian facilities.
The plant’s history spans over 40 years. Since its first days the enterprise started its active collaboration with the Russian Scientific and Technical Welding Society. In addition to manufacturing of metal working machine and press frames, production of metallurgical nonstandard equipment, excavating machine assemblies, motor frames and other products was implemented. In 1985, the product range included 300 items.

In 1992, the plant became Tsentrosvarmash Joint Stock Company. In 1999, the plant became Tsentrosvarmash Joint Stock Company.

At the end of the 1990s and the beginning of the 2000s, Tsentrosvarmash had to reposition itself in the sales market and adjust to the conditions of decreased production. Experience in producing metal structures for various sectors of the national economy helped overcome the difficult times with minimum losses. The downturn became the time for researching new ways of development, implementing complex orders from customers and developing numerous products.

Thus, it was the first plant in Tver that entered into a cooperation agreement with the municipal administration and became its partner in the program for reconstruction and development of the main city in the region.

Undercarriage manufacture
DEVELOPMENT OF AN UNDERCARRIAGE TRUCK OF AN ELECTRIC TRAIN PAVED THE WAY TO THE NEW PERIOD IN THE PLANT’S HISTORY — MANUFACTURE OF PRODUCTS FOR RAILWAY ROLLING STOCK MANUFACTURERS.
Cover story
for rolling stock was developed. Under the contract with Tver Carriage Works there were arrangements to produce 70 frames and 240 units of undercarriage bolsters, as well as five undercarriages of passenger cars per month. Economic difficulties forced TMZ to decline the order and make an effort to enter the market independently. As a result of these efforts, two first trailer undercarriages for an electric train were manufactured and delivered to Demikhovsky Engineering Plant.

At the same time, boiler manufacture was implemented, and development of new products in cooperation with Leningrad R&D Institute named after Polzunov started. The market situation forced the enterprise to extend its scope of activities. OJSC Tsentrosvarmash received a number of licenses outside of its core business: such as licenses for manufacture of pressure vessels and mining equipment, overhaul repair of cranes, etc.

In 2001, the plant executed an order placed by TsKB TM for manufacture and installation of the facility for replacement and repair of undercarriages of the Sapsan express train in Saint Petersburg (a 500 m railway track of this elevated structure equipped with supports for car adjustment and ramps for undercarriage withdrawal from the rolling stock without separation). Tsentrosvarmash produced a hydraulic unit for taking the rolling stock down from the elevated structure. Uralmashzavod ordered continuous blank casting machines.

Tsentrosvarmash developed production of new products (for example, in 2002, a 28 m ejecting bar for coke cutting and ejecting from the furnace was produced) and introduced new continuous flow production (including large orders for JSC Severstal, Torzhok Carriage Works, JSC KalugaPutMash, Kirov Foundry and other enterprises in the industry). The plant also manufactured products for the construction industry. Thus, the enterprise became a reliable supplier of beams to SU-155, a Moscow-based company, and metal structures to Kaliningradskaya, Ivanovskaya power plants and Kalininskaya nuclear power plant.

These innovations helped the plant significantly change the line of its business within a few years. Development of an electric train undercarriage truck paved the way for a new period in the plant’s history — manufacture of products for railway rolling stock manufacturers.

In 2005, Tsentrosvarmash became a member of Transmashholding. Since that time, intra-group cooperation has been expanding. In addition to undercarriage production, manufacture of metal structures for locomotives was developed. Serial production of frames, items and parts for the TEP70 frame by Kolomna Plant was implemented. (Since 2008 and 2010 Tsentrosvarmash has been supplying common base frames and sections of EP2K end, main, center pivot frames, respectively. Tver Carriage Works completely transferred the manufacture of bolsterless undercarriages to the enterprise.

Tsentrosvarmash gained vast experience in the manufacture of processing equipment. Manufacture of products for metallurgical, coke and by-product processes was implemented. The list of customers includes prominent mechanical engineering and machine tool building enterprises: JSC Ryazan Machine Tool Plant, CJSC Dinamo-Plus, JSC Krasny Proletariy, JSC Silovye Mashiny (Saint Petersburg), NPO TveMos and others.

The plant’s products are in demand at metallurgical and coke-chemical enterprises — Magnitogorsky, Nizhnitagilskiy, Cherepovetskiy, Novolipetskiy, Kemerovskiy, Altayskiy, West Siberian, Orsko-Khalilovskiy complexes; and at military industrial complex facilities. Products are exported to Austria, Belgium, Germany, Switzerland and other European countries, as well as to the CIS countries — Ukraine, Byelorussia and Kazakhstan.

Currently, OJSC Tsentrosvarmash’s management plans to introduce new products, increase production volumes, expand the product range, and diversify the production. After the manufacture of excavating machine assemblies was implemented under the contract signed with Hitachi Construction Machinery Eurasia Manufacturing and metro rolling stairs in 2013, the production capacities are set to expand.

The enterprise sets a high value on development of partnership relations with consumers from Russia, the CIS countries, Western European countries, and Transmashholding enterprises.

Reconstruction, modernization and robotic automation, as well as introduction of state-of-the-art technologies, including energy-saving technologies, will serve as the basis for implementation of these ambitious plans.
Personality

Andrey Solovey: «We Focus on

Andrey Mikhailovich Solovey became General Director of JSC Tsentrosvarmash less than two years ago. Despite this short time in the management position, his work is already a success. His major achievements include persistent growth, production modernization and stable enterprise performance.

Andrey Mikhailovich, you came to the plant at a difficult time. How did you change the situation for the better?

— The Transmashholding management appointed me to the position of the plant’s director in May of 2011. I came here with a new management team – in particular, Sergey Golikov, the Director of Economic and Financial Affairs, Andrey Guskov, the Security Director, and Pavel Konstantinov, the Production Director. At that time the situation at the plant was difficult. The fact is that Tsentrosvarmash is not an end product manufacturer. We produce component parts, which means that we are just a link in the chain of production cooperation between a number of enterprises. Therefore, our work depends on who wants to manufacture products, end products they want to manufacture.
and if they are willing to order components from our enterprise. We had to promote our capabilities and adjust them to the market demands. And we faced all those challenges.

There were a few other factors that added to the situation, such as lack of stable customer orders and adequate plant management. The plant executed only those orders that were related to intra-group cooperation, which comprised more than 80% of the total production volume.

At that time, we produced electric train undercarriages for Demikhovsky Engineering Plant and component parts for Kolomna Engineering Plant. We also had the opportunity to produce bolster undercarriages for passenger cars.

— What measures were taken on the priority basis?
— After we analyzed the situation together with the Transmashholding management and colleagues from TVZ, a program for Tsentrosvarmash’s sustainable production by the end of 2011 was adopted. According to one of its essential objectives, the production plan was to be executed without reserve and within the timeline agreed on in the contracts. Some staffing measures were taken, where we managed to optimize the number of employees without large-scale redundancies. We transferred some of our functions (secondary workshops and machining) to outsourcing.

Cooperation had to do with the necessity to reduce expenses, optimize production processes and organize efficient work, and Tver Carriage Works had to find additional facilities. Eventually, both enterprises were on the winning side: OAO TVZ was able to establish production of double-deck cars and metro train undercarriage frames, and we increased the manufacture of own products at reduced facilities. Moreover, it was decided that our partners should transfer complete production of bolster undercarriages and all required tooling to our company. Tsentrosvarmash became the largest manufacturer of this type of products in Russia.

The enterprise managed to fulfill all of its obligations to the customers, organize the manufacture of the main products and eventually shifted to a 5-day working week providing a complete work load for staff and equipment.

Additional funds enabled us to renovate the main building of the enterprise. The roof was repaired and the building facades were insulated. This work didn’t only improve the working environment, but was one of the serious measures of the energy-saving program.

The second stage of our work involved searching for potential customers, as it was evident that we couldn’t develop only on the basis of the available product range. This work was carried out jointly with Transmashholding’s commercial management and became a success. Kryukov and Torzhok Carriage Works, carriage repair enterprises in Russia
Personality

and Byelorussia became our major customers.

We paid special attention to ensuring the high quality of our products and introducing innovative technologies. We continued to re-equip welding workshops and switched to more advanced materials. This way we could offer undercarriages of a better quality as compared to the products of our competitors.

We had new customers, and under the instructions of the Transmashholding management and jointly with the technical management we were able to join the production of rolling stairs equipment for metro service, serial items of which have been delivered to the customer this February.

Among other significant projects for extension of the product range, I could mention a contract with HITACHI on manufacturing of excavating machine side frames that will be produced at the facility constructed in Tver Region. HITACHI is very selective in seeking potential partners: proposals of more than 50 enterprises in Russia were reviewed.

Tsentrosvarmash’s major achievement is a European certificate of quality assurance for welding production. It expanded our opportunities significantly and provided the possibility for delivery of products to any EU country. This has already brought about changes: a manufacturing facility for production of traction transformers for railway transport has been constructed in Voronezh. Its owner, Siemens Group, considers JSC Tsentrosvarmash as a potential manufacturer of transformer tanks.

All these facts serve as a good example of how to change radically an unfavorable economic situation for the better by adjusting the product range accordingly.

— Today, Tsentrosvarmash is an active member of the Transmashholding program for implementation of lean production. How is your work progressing in this area?

— We joined the program within “the third wave,” however, we managed to achieve significant results. At first, the following objectives were set: to reduce the stock by 30%, to improve the quality by 30%, to reduce the occupied facilities by 20% and to increase labor efficiency by 20%. And the most important objective was to improve the working environment and occupational safety.

Personally, I adhered to the lean production concept when I worked for TVZ, therefore, at Tsentrosvarmash my goal was to involve the maximum number of employees in this business philosophy.
By all means, you cannot implement such system in one easy step or only by the discretionary decision of the management.

This requires changing of the philosophy – from the heads of departments and production sites on to maintenance staff. I am convinced that we will succeed. I saw how lean production was implemented at HITACHI in Japan...

More than a half of production facilities have implemented lean production since last October, and we are planning on implementing them throughout the plant by the end of this year.

And we already see the effects. Our corporate culture has improved, which, in its turn, has enabled us to start the process of continuous cost-saving. The product quality has improved – and today every employee is personally interested in the quality...

— Is there any staffing problem at the plant?
— Unfortunately, we could not avoid layoffs in the course of transfer of some of our specialists to TVZ. But, as I have said before, the best specialists continue working for the plant. I am convinced that new employees are needed and we shouldn’t exploit our long-service employees. It is necessary to attract young specialists and form the skill pool. For us as a manufacturing enterprise it primarily means to train highly skilled workers and engineering staff. We invite senior students and graduates from Tver Polytechnic University and specialized colleges for training on a continuous basis.

We also have our own training center and welding laboratory. They are historically associated with the time when the plant had a test facility of the welding department of MVTU named after Bauman and close relationship with Kiev Electric Welding Institute named after O.E. Paton was available. There is a stronger interest in the plant on the part of young specialists and workers now due to the fact that we managed to raise average wages last year. Also, we manage staff turnover successfully.

— In what areas do you perform technical re-equipment of the plant?
— The plant equipment stock has been supplemented with a modern paint spray booth, a portal-type milling machine, a sheet bending press and machining units that are capable of milling and drilling of undercarriage frames on the same mounting (it will allow us to no longer use off-market radial-type drilling and portal-type milling machines).

Some of this equipment is owned by TVZ and located at the facilities rented at our plant, however, it is used to execute Tsentrosvarmaskh orders, which expands our processing opportunities significantly.

Today, we are able to implement production of almost all types of metal structures: both those structures that we are going to produce at the moment and those that are being considered for the future. New machines or equipment are acquired not for modernization as such, but for a particular purpose – to develop production of products that are in demand on the market.

The list of critical tasks also includes activities related to the increase of the enterprise energy efficiency, as it is energy resources that make up the bulk of the expenses in the budget. The new energy saving plan was introduced in the Soviet era and was extremely ineffective. This year, we are going to replace our compressor equipment and switch to localized compressors. Our plans provide for re-equipment of the entire infrastructure of the energy complex for heat and electric power generation. Some results have been already obtained: we have noticeably reduced energy expenditure and the production volume has doubled. Now we have to maintain this trend...

— In your view, what is the principal objective of plant development in the near term?
— I would like to succeed at making Tsentrosvarmaskh attractive both as an employer and a partner for potential customers. ☺
**Smart Car**

Electric equipment was installed in passenger cars in Russia in 1887, when electric lamps were first used for lightning. Batteries were installed in the cars to power them. Later on, generators that generated electric power with a drive due to wheel pair rotation during the car operation were used. The first simple switching and control devices were used for switching car lighting power from the battery to the generator when the car would move and back to the battery when the car would stop. They were called “a set of electric equipment for a passenger car”.

**ELECTRIFICATION**

With each passing year, the electric equipment became more complicated. With the extension of electrified lines, it became more advantageous to use electric power received from the overhead conductor through the electric train instead of solid fuel (coal and fuel wood) for car heating. Forced ventilation was introduced to provide more efficient ventilation of car space. With time, air conditioning systems were implemented.

Since the 1990s the list of electric power consumers has been increased.

---

**Vladislav MIRONOV**,  
Head of Passenger Car Department,  
CJSC Transmashholding
by adding environmentally friendly toilets, hot water supply systems, fire alarm equipment, journal-box heating control, automatic door drive, audio- and video transmission and other systems.

From the beginning of the 2000s, electric equipment of the passenger cars produced at Tver Carriage Works acquired the form, which passenger car attendants and depot workers are used to now. Electric equipment consisted of 3 parts: the control panel in a service compartment, the undercar box and the undercar generator driven by a drive shaft from the wheel pair middle axle. These equipment sets were produced by different manufacturers, but in total they were similar in terms of applied engineering solutions and interchangeable in sets.

The main electric equipment component was the control panel used to control car systems. It had a small display for car systems monitoring and control. Car systems interacted through the RS-485 interface. There were some diagnostic error messages available. But the diagnostic content was not large — most car systems were controlled by their own controllers, and a special laptop computer with service software was required to perform car diagnostics. Another problem had to do with insufficient space on the control panel — the car equipment was constantly increasing. This resulted in arranging a part of the equipment, e.g. the control unit of the antiskid system, in the car attendant’s accommodation limiting the space designated for service needs. This situation impeded passenger car development.

**KNOW-HOW**

In 2011, TVZ Chief Engineer’s Department set out to design a fundamentally new set of electric equipment. The decision to design electric equipment without outside assistance was prompted by the fact that only local engineers were familiar with the car structure and the prospects for its further development, and third-party engineers are not always able to forecast development of car systems within the next several years. In November of 2011, the project was completed and submitted to the acceptance board.

Since TVZ is not an electrical engineering facility, the new product production was implemented on the Promtekhmontazh site also located in Tver, which facilitated cooperation between engineers and manufacturers.

A new set of electric equipment marked a breakthrough for the national car building industry. The high-speed Ethernet interface was used for systems communication instead of low-speed RS-485 interface. It facilitated increase in the volume and speed of communication between the control panel controller and car systems. The volume of diagnostic information received from car systems increased by 50 times. During this process every message displayed contains data on failures, hazard level for car motion and operation and recommendations on troubleshooting. The size of the touch screen display has been increased to 12 inches and acquired a color screen. Today, no service devices are required to detect problems — all information is available on the screen. There are various access levels — for a car attendant (minimum required information volume), a train electrician (information on methods of en route troubleshooting) and depot workers — complete.
information on the nature of problems and a manual for troubleshooting, including tips, figures and charts).

The application program software of the controller is run on the Linux operating system. The large memory space of the controller allowed downloading the electronic car operation manual into the system. Now it is not required of a car attendant to have thick folders of documentation “on board” — he can just open the system and have the required car operation manual section displayed using a simple menu.

A large monitor allows displaying an image from the surveillance video cameras in car corridors and vestibules. The information taken by video cameras is recorded in the car controller memory, and in case of abnormal situations, e.g. unlawful actions, these recordings can be available for viewing.

Electric equipment configuration has also changed. All power safety equipment was removed from the service compartment to the vestibule of the non-operational car end, which allowed clearing space on the control panel and placing there equipment that had previously been located in other places. The equipment itself received a block-modular configuration and is fixed on standard frame bearings, which helps save dismantling and mounting time during maintenance and repair works.

All systems, which have become usual in passenger cars, are maintained. They include the following:

- fire alarm and fire fighting equipment detecting fire and smoke contamination sources in any car compartment;
- wireless radio-frequency information communication system transmitting diagnostic and other information to the train control car, and from the train control car to the ground services;
- access and security control and monitoring system of a passenger train that limits access to the car compartment with an electronic key card issued to passengers boarding the train.

Significant changes have been introduced to the journal-box heating control system. A modern system with digital temperature sensors that record the current temperatures of all eight car axle boxes online is used instead of the outdated system with fuse-type sensors that could only give a signal of car axle box overheating (most often a false one).

CONTROL CENTRALIZATION

One of the main features of the new set of electric equipment is advanced functions of train level. Railway operators seek to offer a lot of new additional services in competition with the other modes of transport. Consequently, a car attendant does not have enough time to monitor and control car systems, being busy with passenger service. A new set of electric equipment allows centralizing control over all train cars in the control car. The train master or the train electrician at the “command console” is able to monitor all train cars, control all systems of any car and monitor problems in all cars.

Communication with car attendants is executed through video conferencing — there are small video cameras mounted above the car panel monitors.

It is possible to control another car not only from the control car, but also from a neighboring one, or from any
other train car. This function is provided for the events when one car attendant serves two or three cars in low-budget trains.

All these functions are implemented through the wireless radio-frequency information communication system. In terms of monitoring, control and diagnostic systems, the passenger train represents a computer network, where a control car serves almost as a "server" and other cars are "personal computers." The network is assembled automatically — when a car is coupled to the train, it is immediately registered in the system, and the control car issues an "IP-address", and communication starts. Small semi-circular communication antennas are installed on the car end walls to implement these functions.

By the beginning of 2013, a new set of electric equipment had modifications for all cars produced by TVZ — compartment, open-plan, control, interregional cars and diners. The trains having centralized power supply with a static converter instead of a generator, including double-deck trains, are also equipped with these sets.

A new set of electric equipment designed by the engineers from Tver has marked a new era in the field of car equipment control. But the opportunities offered by it are not fully used. For example, there is an opportunity to arrange communication with the locomotive. The function that provides for driving a train by one dual-voltage electric locomotive along the whole route, e.g. from Moscow to Adler, may become relevant for the fixed train formation. Therefore, electric equipment and car control systems will continue to be developed and improved.
How to Surprise Passengers?

AS EARLY AS 2015, THE MUSKOVITES WILL BE ABLE TO ASSESS THE QUALITY AND COMFORT OF THE MODERN ED8 ELECTRIC TRAIN DESIGNED FOR URBAN TRAFFIC. IMPLEMENTATION OF THIS PROJECT WILL BECOME A MILESTONE FOR BOTH TRANSMASHHOLDING AND THE MOSCOW RAILWAY INFRASTRUCTURE.

HELPING MOSCOW

Demikhovsky Engineering Plant, a part of Transmashholding, is a leading Russian enterprise engaged in design and serial production of suburban and regional DC and AC electric trains. Today, it produces more than 80% of the total amount of electric trains manufactured in Russia. The enterprise is also the largest plant in terms of the number of electric train cars being constructed in Europe.

For the past 15 years, the highly skilled employees of Demikhovsky Engineering Plant have designed and implemented production of 17 train types, produced more than 4 thousand cars operated throughout Russia, as well as Ukraine, Byelorussia and Kazakhstan. Such iconic products of the electric train car building as ED4M, ED9M and others have become the trademark of the plant. Relying on its vast experience in the production of suburban and regional electric trains, the enterprise is moving to the next stage – design and production of urban electric trains. Demikhovsky Engineering Plant is ready to contribute to the development of the Moscow railway infrastructure.

— The plant’s specialists are building a new ED8 electric train: comfortable, serviceable, reliable and safe.

What is the relevance of the project?

The Muscovites stronger than ever before feel the need for improvement of the capital railway infrastructure. All of us are familiar with the problems that getting around a big city involves. Traffic jams, inconvenient location of metro stations, municipal transport stops, etc. — all of these are time wasters. And electric trains, being part of the Moscow transportation network, mitigates traffic congestion.

For example, ED8 may become a good solution for the project for passenger traffic arrangement along the Moscow rail beltway, which is to be implemented in the next few years.
EXCLUSIVELY FOR THE CITY

The ED8 electric train is designed for urban passenger transportation along designated routes with the round trip section length of 60 km maximum. The maximum speed of the electric train is 120 km/h.

The main ED8 electric train formation consists of 7 cars: two head cars, four motor cars and one trailing car.

The electric train has a total length of 154.7 meters, and the car width is 3.48 m. Two doors on each side are designed for head cars of the electric train, and three doors – for middle cars. The seat arrangement is 2+2. There are 48 passenger seats in head cars and 72 seats in middle cars.

The specific urban character of the ED8 electric train is noteworthy. It will be designed specially for passenger transportation in a megalopolis, where the stops are in close proximity – within a few kilometers. The electric train has to stop and start approximately every 5 minutes. In order to provide fault-free operation of the rolling stock, it should have excellent brake and start dynamics.

Demikhovsky Engineering Plant has a vast experience in the production of rolling stock of similar specifications: the enterprise builds electric trains for passenger transportation in Moscow Region, where the stops are also close to each other.

Today, the project is at the stage of development and agreement of the technical assignment. In the future, the plant’s engineers will be engaged in strenuous work involving production, testing and certification of the new electric train. The first batch of these trains is to be produced in April – May of 2015.

COMFORT FOR PASSENGERS

The ED8 electric train has a high passenger capacity. It has 456 passenger seats. The rated occupancy is 1,260 passengers. It is achieved due to the large volume of free space inside the cars. During rush hours, this train is able to carry 1,957 passengers.

Convenient arrangement of doors inside the ED8 cars provides for good passenger mobility within the limited stopping time of the electric train at the transfer hubs. Every ED8 head car has a special place for a baby carriage. These places are equipped with safety belts, fixtures used to fasten the baby carriage to the car floor, and a hand rail. Toilets which are going to be located in the electric train head cars will be suitable for disabled passengers. Folding ramps (with the carrying capacity of 350 kg) located in the front vestibule of the head car will allow such passengers to get easy access to the cars.

A powerful and reliable microclimate system will make traveling in a car compartment comfortable in any season at any outside temperature. A similar microclimate system will be built in cabins; it will allow a locomotive crew to work in comfortable environment in any weather.

A sealed inter-car gangway provides a number of substantial advantages for passengers and operators: it excludes the need for installation of

SERGEY BEZRUKAVNY,
Technical Director,
Demikhovsky Engineering Plant:

The ED8 electric train has many fundamental distinctive features as compared to its predecessors. They include an asynchronous motor drive, three passenger exit doors on each side of head cars body, and many more. The ED8 electric train design makes it suitable for mass passenger transportation. It should operate in a “metro mode.” Therefore, there is a reduced number of seats and increased room for passengers standing during the electric train movement.

As for its technical characteristics, the ED8 electric train is highly competitive with its Western competitors. In many aspects, it has the edge against them due to complete “russification,” it is more affordable and easy to maintain and repair promptly.

MAIN COMPETITIVE ADVANTAGES OF THE ED8 ELECTRIC TRAIN:

- Excellent brake and start dynamics
- Reliable engineering solutions
- Compliance with Russian safety rules and standards
- Higher comfort level of passenger travel
- Train formation flexibility
- High passenger capacity
- Low maintenance costs

ED8:

- NUMBER OF PASSENGER SEATS: 456
- RATED OCCUPANCY: 1,260
- MAXIMUM OCCUPANCY: 1,957
inter-vestibule doors and eliminates the floor height difference, which allows passengers to go from car to car without any risk of stumbling and provides complete protection from atmospheric precipitations, improves thermal insulating properties and reduces the noise level inside the cars.

At the operator’s request, it is possible to have wireless access (Wi-Fi) to the Internet inside the electric train cars. An audio and video transmission system is provided for convenient communication. It also allows transmission of advertising and information messages. According to the designers’ concept, the ride in the ED8 electric train car should not be a waste of time for passengers. If a long travel is expected, a passenger can enjoy a comfortable seat, browse the Internet, view video clips on the screen or simply rest.

SERVICEABILITY

The ED8 electric train will become not only a comfortable vehicle for passengers, but also a value-enhancing investment for the operator. With all its advantages (adequate power capacity, excellent brake and start dynamics, comfort), the train does not require large maintenance expenses.

An important technical feature is the asynchronous motor. Its major advantages are user-friendly maintenance and operation, and structural simplicity. It is relatively inexpensive, and highly reliable as well. It is almost not prone to failure and withstands significant mechanical overloads. This motor is resistant to environmental impact and can be operated in severe climate conditions.

The important advantage of the ED8 electric train from the operator’s standpoint consists in the base platform flexibility. The operator can at their own discretion form an electric train set. The number of cars varies from 6 to 12. It is also possible to couple two seven-car trains with each other and increase the number of cars to 14. The automatic coupling of two

THE ED8 TECHNICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum service speed</td>
<td>120</td>
</tr>
<tr>
<td>Type of current, kV</td>
<td>Direct current, 3</td>
</tr>
<tr>
<td>Average acceleration to 60 km/h, m/s²</td>
<td>0.9</td>
</tr>
<tr>
<td>Length of cars based on automatic coupling axles, m:</td>
<td>22.6/22.1</td>
</tr>
<tr>
<td>Wheel base, m</td>
<td>15</td>
</tr>
<tr>
<td>Car width, mm</td>
<td>3480</td>
</tr>
<tr>
<td>Car height, mm</td>
<td>1100</td>
</tr>
<tr>
<td>Number of doors per side head/middle</td>
<td>2/3</td>
</tr>
<tr>
<td>Seat arrangement pattern</td>
<td>2 + 2</td>
</tr>
<tr>
<td>Number of passenger seats</td>
<td>48/72</td>
</tr>
<tr>
<td>Body material</td>
<td>Structural steel</td>
</tr>
<tr>
<td>Type of traction drive</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>Number of axles (with motor/general)</td>
<td>16/28</td>
</tr>
<tr>
<td>Empty weight, t Head/motor/trailing car</td>
<td>49.0/63.8/45</td>
</tr>
<tr>
<td>Maximum axle load, ton-force</td>
<td>21.7</td>
</tr>
<tr>
<td>Continuous rating, kW</td>
<td>6400</td>
</tr>
<tr>
<td>Service life, years</td>
<td>36</td>
</tr>
</tbody>
</table>
trains will take not more than five minutes. Upon the customer’s request, a customized compartment of any class can be built.

The ED8 external appearance will gladden the eye of the Muscovites. Its looks will be accentuated by the new modern front part of the head car with a low aerodynamic drag coefficient, a smooth body without external corrugation.

The structure allows creating a customized design of the train exterior, making it unique and turning it into one of the city’s attraction.

**RELIABILITY AND DURABILITY**

The new ED8 electric train by Demikhovsky Engineering Plant was built with the utilization of modern engineering solutions.

The structural steel used in production of the body and special coating of external planes will make the electric train reliable in operation in aggressive environment and resistant to corrosion. Normal operation of the electric train will be possible within the temperature range from +40 to -40 °C. The crash system in the electric train makes traveling safe for passengers. This system dampens the impact energy in case of train collision with an obstacle. It is a well-known fact that the crash system has helped save lives of electric train passengers during collision with an obstacle.

Equipment and components for the ED8 are supplied by Transmashholding plants, as well as leading enterprises from various countries worldwide.

**CONSIDERATION OF STATE-OF-THE-ART TECHNOLOGIES**

The integrated control, diagnostic and safety system in the ED8 electric train performs the functions of automatic train operation, collection and storing of information on its operating conditions. It will make it possible for the train to be operated by one train driver without an assistant driver, as well as to monitor online the technical condition of the electric train.

The train driver’s control panel will be equipped with a telemechanic system of the train driver’s diligence monitoring which will provide continuous control of his condition at work.

When feed voltage is supplied, the video control system in car compartments and vestibules will turn on automatically. It will allow recording events occurring in the rolling stock and saving them in the non-volatile memory. Information about the occurring events will be displayed online on the train driver’s panel.

Counting sensors will be installed on the external doors to register incoming and outgoing passenger traffic and record it. They will enable to control whether the number of sold tickets correspond to the actual number of electric train passengers. This data will be collected and processed by a dedicated onboard computer.

One of the key advantages of the ED8 electric trains is its onboard system of diagnostics and monitoring of the electric train technical condition. The diagnosable electric train assemblies include wheel pair journal-boxes, bearing assemblies of wheel and motor units, reduction trains, converter and compressor, compressed air brake systems of electric trains, electric power circuits and control circuits.

The system allows immediate online transfer of information on the technical condition of individual assemblies and units to the onboard diagnostic station. The built-in GPS module will assist in identifying position of the train, and the RF modem will allow the crew to transfer data from the train in a timely manner.

**OPTIONS OF TRAIN SETS**

- Electric train consists of head (H), motor (M) and trailing (T) cars
- Basic electric train set – 7 cars (2H+4M+1T)
- Possible formation of various electric train sets with 6-10 cars
- Automatic coupling of two trains with the total number of cars in an electric train set up to 12 units takes not more than 5 minutes

**ТАБЛИЦА ХАРАКТЕРИСТИКИ ЭЛЕКТРОПОЕЗДА ОСНОВНОЙ СОСТАВНОСТИ**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Train length</td>
<td>154.7 m</td>
</tr>
<tr>
<td>Passenger capacity</td>
<td>456</td>
</tr>
<tr>
<td>Number of seats</td>
<td>1260</td>
</tr>
<tr>
<td>Design occupancy</td>
<td>1957</td>
</tr>
</tbody>
</table>

**ТАБЛИЦА ХАРАКТЕРИСТИКИ ЭЛЕКТРОПОЕЗДА ОСНОВНОЙ СОСТАВНОСТИ**

- Electric train consists of head (H), motor (M) and trailing (T) cars
- Basic electric train set – 7 cars (2H+4M+1T)
- Possible formation of various electric train sets with 6-10 cars
- Automatic coupling of two trains with the total number of cars in an electric train set up to 12 units takes not more than 5 minutes
CJSC TRANSMASHHOLDING (TMH), a leading stakeholder in the transport engineering market, targets production of high-quality, modern and competitive products that meet Russian and international quality standards. Having gained a leading position among Russian manufacturers, TMH aspires to enter new Western and Eastern markets. The important factor for reaching of the set goal is manufacturing of railway rolling stock which cannot be produced without an efficient management process.
In order to increase the competitive edge of the Russian railway transport, Alstom and Transmashholding signed a partnership agreement, which can be considered as a starting point of implementation of project management fundamentals in TMH. Thanks to this cooperation, Transmashholding has acquired an opportunity to adopt experience in project management from the global transport engineering leader, which allows organizing work on creation and implementation of new manufactured products within the limited period and budget and in accordance with quality requirements.

A lot of the problems that Transmashholding faces and that relate to project implementation are well-known to companies worldwide. Leading foreign companies have already found reliable solutions and continue improving them by summarizing all the knowledge in the project management system that consists of three components: processes, staff, and tools.

**TRAINS ON THE MOVE**

A year ago, the Investment Policy and Project Management Board started implementing project management fundamentals and tools, which were defined in the Project Management Regulations.

The document establishes an organizational structure and a scheme of high level business processes for TMH. The fundamentals stipulated in the Regulations are being implemented in the EP20 and 2ESS pilot projects. Currently, business-processes and management tools are being adjusted based on the management lessons learned. The DFQ quality control procedure is being adjusted on the basis of supervisory checks of the project quality (GR), instructions for project schedule development, communication management tool, risk management tool, adaptation of the organizational structure, etc.

Reformation of the company can be achieved only if its employees realize that it depends on each of them individually.

**Figure 1. Matrix subordination**
In 2012, four of the Group’s enterprises (TMH, TVZ, NEVZ and BMZ) provided training courses on project management fundamentals for their senior management, managers and teams of pilot projects. Another objective of the training program is gradual integration of basic terms and definitions of project management. The meaning of such terms as “life cycle”, “project manager” and “project team”, “communication matrix”, “quality, schedule, budget management” becomes clear to everyone. The main growth driver of projects is the employees. Thus, project management as a subject has a very important section related to working principles and human resources management, which provides for the competencies matrix available for every employee and a plan of his/her development. Achievement of the goals set forth in the plan by the employee and development of new competencies allow establishing the wage level and maintaining motivation at a high level.

Organizational structure is of great significance to the management. Until recently, it complied with the operating business requirements, but it could not respond quickly and efficiently to the processes related to project activities. The organizational structures of Transmashholding and NVZ were changed. These changes helped make the organizational structure correspond to the matrix subordination structure shown in Figure 1. In 2012, Transmashholding established the Project Office which is new to its organizational structure; in 2013, a similar structure was formed at one of the largest plants of the Group, JSC PK NEVZ, based on the example of the holding company.

The Information System of Project Documentation (ISPD) was implemented along with training courses and seminars, adaptation of business-processes and organizational changes with active involvement of specialists from the Information Technologies Department. Application of this system allows managing documents and storing history for standard rules for all projects. The ISPD structure provides easy access to project data and helps to efficiently adapt experience in implementation of previous projects.

Continuous work on the adjustment of three key components of project management, i.e. processes, personnel, tools, will lead to automatic improvement of the system and transfer to the new standard of management. For example, Alstom has been building the project management system for 10 years and constantly accumulating experience in order to avoid mistakes in the future. Transmashholding has the opportunity to introduce project management principles faster due to the partner’s support and experience.

Moving towards target
Making progress in the course of introduction of project management principles is not simple. Even the most powerful locomotive cannot cause the acceleration of a freight train quickly, but the train begins to move car by car and achieves the set speed. Once the first steps of project management implementation have been taken and the first results have been obtained, it is possible to adjust a program of required measures for efficient functioning of the project management system. The major objective that we have for the nearest future is to establish common culture of project management and common vision of the business organization by using standard documents, meetings, training courses and business processes in the Group. Following up upon the training program for personnel of the holding company and enterprises started in 2012; in 2013, we are planning to implement an advanced program for the employees who attended the basic training course in 2012 and to add three other enterprises, where implementation
of the Group’s major projects is planned. The process of introduction of new project management tools will continue along with the training in accordance with the Road Map for project management implementation (Table 1) approved by the General Director. It is necessary to focus primarily on development and improvement of planning, risk and change management and tools of financial cost calculation by components. We are planning on extensive work on the creation of a standard matrix of work sections for each type of product lines. Realization of these objectives will require participation and support of the senior management and maximum involvement of all company business units.

The first group of the set objectives for project management implementation has already been executed at TMH: the foundation that has to grow by using new project management tools has been laid. The introduced project management system puts TMH at the first “maturity level”, which indicates that extensive work on our transfer to the second level lies ahead.

### Road Map for introduction of project management tools (tools introduced currently are in red, tools used in pilot projects are in blue)

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COST</strong></td>
<td>• tools of financial cost control</td>
<td>• tools of financial cost control, including all costs</td>
<td>• computer-aided report</td>
</tr>
<tr>
<td></td>
<td>• monthly financial report</td>
<td>• historical cost information</td>
<td>• monthly report</td>
</tr>
<tr>
<td></td>
<td>• unified financial model. Cost calculation by components</td>
<td>• new monthly financial report</td>
<td></td>
</tr>
<tr>
<td><strong>QUALITY</strong></td>
<td>• quality plan</td>
<td>• extended checklists for quality checks (GR)</td>
<td>• 8D (8 disciplines, problem management process)</td>
</tr>
<tr>
<td></td>
<td>• FMEA (Failure Modes and Effects Analysis)</td>
<td></td>
<td>• ROE (Return on Effort)</td>
</tr>
<tr>
<td></td>
<td>• checks of project quality using checklists (GR) with simplified requirements</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TIME</strong></td>
<td>• principles of time planning (Master plan in MS Project)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>HUMAN RESOURCES</strong></td>
<td>• function description</td>
<td>• training program and plan</td>
<td>• training program and plan</td>
</tr>
<tr>
<td></td>
<td>• organizational structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• seminars for project team managers (DFQ planning)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• training program and plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>COMMUNICATION</strong></td>
<td>• monthly and quarterly project reports</td>
<td>• standard project documentation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• common data base for project document management</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RISKS / ECONOMY / OPPORTUNITIES</strong></td>
<td>• risk list (RR)</td>
<td>• list of opportunities</td>
<td>• project economy plan</td>
</tr>
<tr>
<td></td>
<td>• risk analysis and risk management plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SUPPLIES</strong></td>
<td>• supplies plan</td>
<td>• long term contracts for components supply, including localization plan</td>
<td>• strategy for suppliers backup</td>
</tr>
<tr>
<td><strong>CONTRACT MANAGEMENT</strong></td>
<td>• integration of Sales Manager in project team</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
At the time, this mode of transport was used only in England, Germany, the USA, and France. Kiev authorities were concerned with public urban transport problems as in the city with the population of two hundred thousand people in the 19th century the main means of transport was the omnibus. This is how a contemporary described the omnibuses: “They are awkward and clumsy, drawn by sickly horses. They accommodate up to twenty passengers and move slowly stopping frequently to take in and let out the passengers.” Amand Yegorovich tested all modes of public transport used at that time in Kiev streets (horsecars, steam-driven trams, electric trams), he supplied cars and rails manufactured at his Kolomna Engineering Plant and Iron Rolling Plant in Kulebaki in Nizhny Novgorod Province. The main factor that encouraged him to give preference to electric traction was the steep hill of the Alexander slide on the way between Kreschatik and Podol. Horsecars and steam-driven trams moved along such steep slope with great difficulty. On September 9 of 1891, construction of an electric tram section at the Alexander rise and a temporary station started. On May 2 of 1892, two motor tram cars that had been manufactured for the first time in Russia arrived from Kolomna in Kiev. A test drive took place on May 8, 1892.

Regular passenger traffic started on June 1, 1892. In the presence of hundreds of people, the first electric tram in the Russian Empire ran from Tsarskaya Square to Alexandrovskaya Square. In 1893, two tram lines with the total length of 150 versts were operated in the city. Tram service connected suburban areas (Svyatoshino, Demyevka, Puscha-Voditsa) with the city center.

Electric trams showed its advantages on steep city streets within the first months of operation. In 1893, the proceeds from that line covered not only operation costs for this line, but also losses from operation of horsecars and steam tram lines. The tram would go from one of the two platforms, on each of which a main controller was installed. Passenger capacity was 22 seats and 18 places for standing passengers (the total of 42 people, including the tram driver and the conductor). The tram was lit with five 100V filament lamps. Three lamps were inside the car, and one lamp – at each of the platforms. The weight of each car with passengers was 7 tons.

The residents of Kiev were proud of their tram. An important role was assigned to it in many festivities. For example, in 1897, the metropolitan of Kiev Ionikiy (Rudnev) arrived by tram at the opening ceremony of the Russian agricultural and industrial exhibition. In spite of distrust on the part of many enterprisers and the government, the electric tram became the main transport system in Kiev and, subsequently, in many Russian cities. The electric trams produced by Kolomna Plant were operated in Moscow, Saint Petersburg, Odessa, and Voronezh.
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

TRANSMASSHOLDING is
NO. 1 IN CIS COUNTRIES
in terms of the volume
of rolling stock production and sales

TRANSMASSHOLDING is
among WORLD’S TOP
TEN LEADING
MANUFACTURERS of
railway equipment

TRANSMASSHOLDING is
THE ONLY RUSSIAN
COMPANY to have
experience in creation
and manufacture of
the machinery for the
arctic service

TRANSMASSHOLDING
machinery is operated
IN ALL CLIMATIC
REGIONS OF THE EARTH

POSTAL ADDRESS:
Russia, 127055, Moscow, Butyrsy Val Str., 26, bld. 1
TELEPHONE: +7 (495) 744-70-93; FAX: +7 (495) 744-70-94; E-MAIL: info@tmhholding.ru
www.tmhholding.ru