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TRANSMASHHOLDING WILL SUPPLY MAINLINE DIESEL LOCOMOTIVES AND SHUNTERS TO MONGOLIA

CJSC Transmashholding and JSC Ulan-Bator Railway (UBZhD, Mongolia) have signed contracts for the delivery of the batch of the rolling stock. In accordance with the documents UBZhD will be supplied 35 mainline diesel freight locomotives 2TE116UM and 13 diesel-locomotive shunters TEM18DM. By the end of 2010 4 diesel freight locomotives and 5 diesel-locomotive shunters will be delivered to Mongolia. The end of deliveries is expected in June 2011.

The UBZhD traction rolling stock fleet almost completely consists of the Soviet and Russian diesel locomotives produced in various years. By now the major part of the locomotives is worn out and needs replacement.

The 2TE116UM diesel locomotive is a special modification of the 2TE116U diesel locomotive, in the best way adapted to the operation in Mongolia conditions (high dustiness, highland, considerable temperature differences). It is distinguished by the improved performance values (increased capacity and hauling power applied in the highland conditions), increased reliability, fuel economy and also improved working conditions of the locomotive teams.

UBZhD belongs to Mongolia and Russia on the principle of equality. On the part of Russia the enterprise is managed by OJSC Russian Railways.

RZD WILL GET NEW CARS FOR THE PERSONNEL TRAVEL IN FREIGHT TRAINS

The Tver Carriage Works will create the new accompanying cars for the special rolling stock (rolling stock accompanying cars) for the needs of the OJSC RZD. Such cars are designated for the travel of personnel accompanying freight and maintenance trains and also for the drivers of the track machines. In the ballast trains the accompanying cars will also perform the function of the compressed air supply at the unloading.

In accordance with the technical specification the new cars will be equipped with everything required for the regular work and normal rest of the railway men— sleeping compartments, canteen, wareroom, drier, shower and toilet.

The cars will be completed with fire alarm and fire-extinguishing systems, ventilation and air conditioning systems, heating, water supply, GLONASS/GPS and even work bench with jaws. The canteen is expected to have the fridge, microwave, electric hot plate, TV set. Power supply will be conducted from the self –contained system which operation will be supported by the car generator, cadmium-nickel accumulator, outer three-phase network and diesel driven generating house set.

Specified lifetime of the new cars is no less than 28 years.

It is expected that the prototype model of the new rolling stock will appear in the beginning of 2011 and from the second half of 2011 series production of the new cars will start.

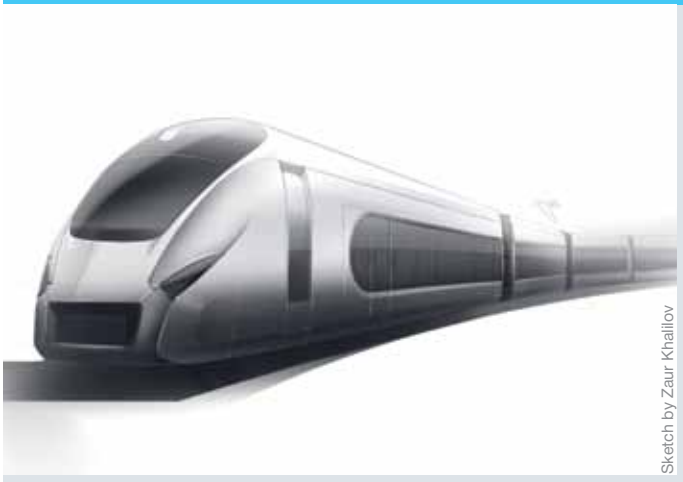
BY 2021 KAZAKHSTAN WILL GET 295 ELECTRIC LOCOMOTIVES

JSC Locomotive (subsidiary enterprise of the JSC National company Kazakhstan Temir Zholy) and Electric Locomotive Assembly Plant LLC (joint-venture between JSC NC KTZ, CJSC Transmashholding and French company Alstom Transport) have signed the agreement for the delivery of passenger and freight electric locomotives to Astana.

According to the document by 2021 Kazakhstan railways will be supplied total of 295 locomotives — 200 mainline diesel freight AC locomotives KZ8A and 95 electric passenger AC locomotives KZ4A. Moreover, the contract stipulates the establishment of the electric locomotives manufacturing facility on the territory of the republic. Components for the electric locomotives will be produced in Kazakhstan and Russia. The prototype models of electric locomotives should appear in 2012, the first delivery is scheduled for 2013.

The electric locomotives production establishment in Kazakhstan is the first foreign project implemented within the framework of the strategic partnership of Transmashholding and Alstom Transport. A memorandum stipulating delivery and location of electric locomotive manufacture in Kazakhstan was signed. On June 19 in the presence of the Russian and French Presidents an agreement for the set up of the joint-venture was concluded. On June 26 the first stone was laid in the foundation of the future electric locomotive assembly enterprise.

TMH AND ALSTOM TRANSPORT DESIGN THE INNOVATIVE ELECTRIC TRAIN FOR THE RUSSIAN RAILWAYS



Sketch by Zaur Khalilov

CJSC Transmashholding together with its partner - French company Alstom Transport started design of the brand new electric train ED10.

The new electric train is designed to operate at the speed of up to 160 km/h, it can consist of 4-12 cars, operate at the multiple-unit system. Bodies will be will be made with the application of the corrosion-proof steels, their service life will make 40 years. The construction will probably include the modern asynchronous traction drive, new bogies ensuring higher smoothness of movement and decrease of the impact on the track, modular cabin. The new train will be equipped with the passive restraint system. ED10 will be able to operate on the lines with both high and low platforms.

The cars will have lighter weight compared to the existing ones which alongside with the application of the asynchronous drive will ensure higher energy efficiency of the new train. Special attention is paid to the development of the conceptually new exterior and interior design. The electric train will be completed with the places for the travel of disabled persons in the wheel chairs and also devices ensuring their comfortable boarding and detraining on high and low platforms.

The prototype model of ED10 should appear in 2012. The train is designed as a basic model which will allow creating new modifications in future. The project on the construction of ED10 is implemented within the framework of the program of strategic partnership of the Russian and French companies by the joint engineering company Rail Transport Technologies. Alongside with the electric train, since 2009 the partners have been developing dual-system electric passenger locomotive EP20 and mainline electric freight AC locomotive 2EC5.

Currently Transmashholding is absolutely domineering in the Russian market of the multiple-unit rolling stock. Annually Demikhovsky Engineering Plant, being a part of the company, produces several hundreds of electric train cars. In 2009 the holding sold 569 units of the rolling stock of this type; the plan for 2010 is 630 units. The current product portfolio of the company includes DC electric trains ED4M and AC electric trains ED9M, high-comfort local transit trains ED4MK and ED9MK, DC electric train for intermodal transportation ED4MKM-AERO. Establishment and mastering of the innovative train production should ensure Transmashholding`s leadership in this market for many years ahead.

BRYANSK ENGINEERING PLANT:

one and a half centuries of successful operation

Bryansk Engineering Plant, being a part of CJSC Transmashholding, is the oldest Russian enterprise and one of the largest in the market of the transport machine building. Currently the plant is developing and producing mainline diesel locomotives and diesel locomotive shunters, freight cars of various types and modifications, marine diesels.

2TE25K diesel locomotive Peresvet. Production

Bryansk Engineering Plant has been sustainably staying up in the industrial market for almost one and a half centuries. The first shareholders — merchant Petr Gubonin and collegiate assessor Viktor Golubev who founded the enterprise in 1873 by the name itself defined its future diversification and strive for meeting the demand of the thriving railroad building. “Bryansk rail rolling, ironworking and mechanical plant for iron smelting, iron and steel manufacture and production of articles for sale out of them» that was the name of the plant in the imperial permit of the Russian emperor Alexander the II for the establishment of the joint-stock company.

The first products of the plant were iron rails and rail fastenings. In 1875 the manufacture of more complicated products started- iron bridges and parts for them. Under the order of the Ministry of Railway Transport the plant constructed sections for the 366-meter bridge across the river Dnieper, 1590-meter bridge across the Amu-Darya, landing stages for the Bryansk (now Kiev) railway station in Moscow and Warsaw railway station in Saint Petersburg. In the list of the products during the first decade of the plant`s operation there were iron pontoons for throwing of the bridge across the river Danube, barges and steam-boats, freight two-axle cars and platforms, railroad tank cars. In 1880 the plant was producing 30% of all Russian steel and by 1911 33 out of 49 Russian railroads were railed with the rails of the Bryansk Engineering Plant.

The important stage of the plant`s development became the order of the Ministry of Railway Transport obtained in 1890 for the construction of the four-axle freight steam locomotives of “Compound” type (where the steam did work at expansion twice: first in the high-pressure cylinder and then in the low-pressure cylinder) for the South-Western Railroad. Since then, the production of the steam locomotives be-

came one of the primary activities of the enterprise. Moreover, from 1945 to 1956 the plant was called Bryansk Locomotive Works.

In 1882, only after nine years since its foundation, the plant presented its products at the All-Russian Industrial Exhibition in Moscow. Following its results the enterprise obtained the right to put the state Coat of Arms on its products. At the same time the plant masters tied the Bessemer rail in a knot without making any fractures in it.

In 1988, for the first time in Russia, the plant mastered manufacture of the steel cast wheels for steam locomotives and cars instead of welded, produced manually by forging. In 1892 the first OD series steam locomotive with steel wheels was produced and it became the best achievement of transport machine building of the end of XIX century not only in Russia but in the whole world.

The big gold medal, the highest award of the Omsk exhibition in 1905, was presented to the cast-iron pipes produced at the Bryansk Engineering Plant. Many examples can serve as a proof of the enterprise`s diversification and its orientation on the market and national industry demands, ability of reorganizing production promptly and efficiently. Thus, at different times the plant manufactured agricultural products (ploughs, seeders), military equipment (above all artillery projectiles and also indent carts, siege gun mounts, portable forge shops). In 1919 the plant gained the status of the main armoured trains base of the Workers` and Peasants` Red Army. Cranes and lifting machines, accumulator trains, railmotor cars, steam turbines, diesel power plants, refrigerator sections and marine engines were produced here.

In June 1911 the French National Office of the Industrial Enterprises issued a patent № 429 for the design of the composite steel casting method to the plant. This method was patented in Belgium, England, Italy, Hungary, USA, Germany, Sweden, Spain, Canada, Luxembourg and Japan. The author of the invention was the chief plant`s metallurgist engineer Alexander Rozhkov. In a year, in 1912, the committee of engineers of the French government railroads noticed that “Bryansk Plant was on the same level with the best and most outstanding locomotive works of the Western Europe”.

In 1929 BMZ launched production of four-axle 50 ton covered freight cars of the riveted structure based on the method of uninterrupted installation of pre-assembled units, developed as per the project of engineer A. Merzhanov. In 1932 the plant was the first in Russia to cast the tireless chilled wheels which were previously delivered from abroad. In 1937 under the personal guidance of the academic E. Paton automatic welding under his method was implemented at the plant. In 1958 the plant specialists in cooperation with the scientists from the Bryansk Institute of Transport Machine Building designed and manufactured the first in the country gas turbine with 3 550 hp capacity for the gas turbine locomotive. In 1973 the plant`s specialists together with the Kiev Electric Welding Institute named after Paton developed the method of cast crank production with the method of electroslag refining and for the first time in the world made the prototype crankshaft. In 1986 BMZ obtained the task for the development and manufacture of the first in the country rail-grinding complex. In October 1980 for the contribution into the development of international trade and economic cooperation the plant was awarded the international prize “Golden Mercury”.

In 1959 Bryansk Engineering Plant started construction of the diesel production facility with the area of 52 000 m^2. In two years, in 1962, under the license of the Danish company Burmeister and Wain the first marine diesel was produced. Today this diesel manufacturing facility is the only one in Russia to produce slow-speed engines for marine vessels. In 1980 the DB10 engine of the in-house manufacture was created which allowed reducing the license fee. Over 1000 marine diesels have been manufactured. The 1000th was triumphantly handed over to the longtime partner of the enterprise — Murmansk Shipping Company.

The vessels with BMZ engines mounted on the tankers, bulkers, dry-cargo ships, research vessels fly the flags of dozens of countries. The first motor vessel with BMZ diesel was called Boris Butoma. Afterwards the motor vessels which obtained the names connected with the plant were produced — Bezhitsa and Bryansk Machine Builder. The development of engine building despite of the violent decline in demand for the marine engines is not ceasing. In 2007 a license agreement with the Finnish company Wartsila was concluded. During the economic crisis of 2009 the demand for the marine diesels declined. However, a spectrum of measures was taken to preserve the unique and the only Russian production including the capacity utilization with the non-core orders.

In difficult times of the first Soviet reforms the plant not only preserved its personnel and production but strived for development. In 1990-2002 the prototype model of the DB46 marine diesel was created; the prototype of the two-compartment rail-mounted refrigerator was produced; the prototype of the NA-34 turbo-compressor which was previously imported was designed under the MAN Diesel license; the prototype models of the coke-quenching car and electric scales car EVV-40B were fabricated. As a result the plant got the significant international awards — the prize "For the Commercial Prestige" and the "Torch of Birmingham".

TECHNICAL UPGRADE

In October 2003 BMZ became a part of CJSC Transmashholding and this event inaugurated the start of the enterprise`s revival. In 2005 production of locomotives and cars increased more than twice, salaries started to grow and the problem of the lack of the workers of various qualifications arose at the plant. Previously launched operations on the perspective projects continued and new activities appeared.

Today Bryansk Engineering Plant is one of the largest transport machine building enterprises in Russia. The plant occupies a territory of 214 ha. BMZ develops and manufactures mainline locomotives and shunters, freight hopper-shaped cars, marine engines and other products.

The majority of the plant`s metal structures are in-house produced. 600 enterprises are among BMZ partners. They deliver rolled metal products, electric fixtures, various materials, tooling, materials for maintenance needs.

The necessity of the rolling stock renewal which was specified as one of the strategic objectives by OJSC RZD imposes the new operation algorithm on the producers. It is not that just many electric locomotives and cars are required. First of all, high-grade locomotives and cars with long operating life are required. The BMZ team is aiming at such a result of work. Challenges are met with the help of the good production facilities including own metallurgi- →

In the BMZ workshop

cal production and own blanking facility recently renewed by the modern metal-cutting equipment: plasma cutting Cristal machines, MAXIMA 3020 gate shears.

The plant is fitting production for the manufacture of mainline diesel freight locomotives with asynchronous drive model 2TE25A. Certain reconfiguration and rearrangement of the plant`s areas have been carried out. Specialized shops and areas are set up anew. In the course of the preparation of manufacture of mainline locomotives 835 units of jigs, benches, fixtures, tooling have been already produced, design documentation has been worked out including technical processes, cutting charts, control software for CNC machines.

Metal-cutting, forge-and-press, lifting, wood-working and foundry equipment have been purchased and is being mounted. The enterprise`s machinery counts already 2 286 units of equipment, 980 of them are metal-cutting equipment. Implementation of the brand new, modern, effective technologies is continuing. Thus, for example, automatic welding of the longitudinal beams of the main frames is performed on the Fronius machine (Austria) under the Time-Twin technology (effective technology for the increase of welding speed and deposition amount). Machining of the main frames and assemblies of diesel locomotive bogies is carried out at the twin-column bed-type milling machine SHW-UF 6L (Germany). CNC gear-grinding machine RAPID 900 (Germany) with the imbedded measuring system for ring gears and pinions control has been launched. Further purchase and implementation of advanced CNC gear production machinery (on the operations of turning, milling of the gear tooth, thermal treatment of the ring gears with the cementation method etc.) are planned.

For the manufacture of the basic parts of the diesel locomotives vertical machining center MCFV1680 (Czech Republic) has been purchased and is operating. Single-upright milling machine FR-10.000 by SOLARUCE is being mounted for the machining of the diesel locomotive bogie frames.

Whereas the plant`s history makes one and a half centuries, it has always been and is remaining a modern enterprise first of all because it is constantly applying innovations. In 1962 BMZ was one of the first in the heavy engineering industry (in Soviet times the plant was one of the enterprises of the Ministry of Heavy Engineering) to put in operation Minsk–1 computing machine and create a data-processing centre. And in 1970 CAM system ASUP-BMZ was put in operation. Then the computer-aided design system (CAD system) was implemented. Today all the engineering departments are completed with computers.

The plant is heading towards the implementation of the production record of semi-finished products at which all the shops will be united into a single inventory record system. It is planned to keep it in the common database in online-mode with the possibility of controlling the whole chain of the inventories movement. This will allow increasing control, efficiency and accuracy of the information on the inventories movement.

Optical carriers were laid, computing machinery purchased in order for every shop to get access to the common database.

BMZ MODERN PRODUCTS

Within the last two years over 30 types of series manufacturing products and articles of the new machinery were certified at BMZ. This year certificates of conformity were obtained for the mainline diesel locomotives TEM18DM, hopper-cars models 19-3116 and 19-3116-04, air reservoirs type R7-78, R7-135 for the cars automatic brakes, horns of the coupling devices, cast disk wheel centers.

Plans of the enterprise`s technical upgrade are targeted at the increase of the production technical level by means of the implementation of the cutting-edge equipment, technology and project management. Intensification of production, increase of production facilities, improvement of product quality, growth of labor productivity, decrease of materials-output ratio and cost of products are necessary to feel confident in the market of the railway engineering.

Research- and- development activities and engineering developments contribute to

solving this problem. In the framework of the research –and- development and engineering development within the last three years prototype models of the hopper-car with the increased body space of 112 m^3 model 19-3054-04 for the transportation of grain and bulky goods, car for bulky materials with 25 tf axial load model 19-3130 have been produced. Operations on the modernization of the cars model 19-3054-01 and 19-3054-03 for grain transportation have been completed.

Since 2009 series manufacture of TEM18DM diesel locomotives equipped with data collection and record system, automatic alarm system and telemetry system of driver`s vigilance has been launched.

The All-Russian Scientific-Research and Technological Institute of the Rolling Stock carried out benchmark tests of the traction motor/axle wheelset with domestic traction motor support roller bearings of traction DC motors for the diesel-locomotive shunters type TEM18 and mainline 2TE25K. The prototype model of the traction motor/axle wheelset will be mounted on the prototype diesel-locomotive shunter TEM18DM delivered by OJSC RZD.

The certificate of conformity for two mainline diesel-locomotives 2TE25A (№№ 001 and 002) has been obtained. In 2010 a goal is set to obtain the certificate both for the pilot batch and for the series.

Interactive classroom for the programming and practical development of control software for modern systems with CNC and visualization of materials processing processes has been purchased and put into operation. It allows carrying out training of CNC machines operators simultaneously in groups of 5 people.

Slip joint of pipes of the air brake system and joints of the brake leverage mechanism is implemented on the series cars model 19-3054, 19-3054-01.

In the conditions of severe competition it is extremely important not only to respond to the demand promptly but also, when possible, to offer the customer new, modern samples of the equipment. That is why the team of the BMZ specialists continues working on the expansion of the product portfolio. Currently technical project and common concept of the hybrid and double diesel-locomotive shunters type TEM35 и TEM33 are being developed.

The most cutting-edge achievements of locomotive building are introduced in the TEM35, the brand new solutions and modern equipment are applied. The plant put high hopes on the production of the diesel-locomotive shunters with Wartsila diesel electric set.

TEM18V diesel-locomotive shunter with Wartsila W6L20L diesel with the capacity of 882 kW (1200 hp) with electric DC transmission is created on the basis of the existing TEM18DM diesel locomotive with minimal modifications in the structure. It will have the improved cost-performance ratio and reliability, ensure reduction of costs on diesel fuel and oil, locomotive servicing, fee for the emission of harmful agents into the atmosphere.

The designed diesel locomotive will be completed with new equipment: diesel electric set consisting of W6L20L diesel and flange-mounted traction DC generator GP-321 MU2, modified cooling system with ventilator drive via the bevel gear speed reducer with variable filling liquid coupling. The diesel locomotive will be fitted with the reciprocal compressor with the compressed air purification and drying unit, the heating system for the Golfstream diesel heat-carriers, Webasto autonomous cab heater and other technical solutions.

Currently the enterprise is actively preparing for the manufacture of the new diesel locomotives. The new areas are being equipped, unique metal-cutting, lifting, welding, control and measuring equipment of the leading world producers is installed. TimeTwin (Austria) welding technologies, designated for the automatic welding of the main beams of diesel locomotive frames with servo-system are gradually implemented. A range of German equipment appeared in the workshops — German Schlik combined chamber for shot blasting, painting and drying of the main frames of the mainline diesel locomotives, milling machines of Machining center module type with CNC models SHW-5 and SHW-6, equipped with high-productivity Sandvik tooling (Sweden), ISCAR (Israel) and built-in measuring system. For the reduction of the equipment setup time Kelch unit, allowing carrying out adjustment of tooling off the machine, is applied.

CNC gear-grinding machining centre model RAPID-900 (Hofler machine plant, Germany) is put in operation. It has a built-in control-measuring system with the immediate displaying of the desired and obtained during the grinding shape of the toothing. Vertical machining center model MCFV1680 produced in Czech Republic equipped with ISCAR (Israel) tooling is introduced into operation.

IN PERSPECTIVE

Workshop buildings are located quite far from each other at the plant which occupies great territory. The enterprise`s specialists are trying to concentrate some technological processes within production workshops. Thus in the machining blank production shop where the wheelset and assembly area has been created already it is planned to make an area of gear machining, machining of frames and bogies of 2TE25A locomotives. For this plane horizontal milling machining center type FR-10.000 of the Spanish company SOLARUCE — DANOBAT GRUP is installed. Further development of the facilities of the gear processing area is stipulated in the business plan for 2011. Several modern and high production CNC machines will be purchased- gear-milling, vertical lathe, two internal grinding, cutter grinder, equipment for the cementation of the ring gear.

The enterprise has a big equipment stock. However the replacement of the equipment, modernization and acquisition of the novelties are aimed at concentrating on the more efficient equipment which ensures higher quality. That is why the equipment delivered to the plant in 2006-2010 is the most cutting-edge, high technology and efficient. At that in the equipment of the facilities the enterprise has a complex approach: acquires not only equipment but also technologies, software, tooling and trains the personnel.

A new breakthrough has outlined in car production- series manufacture of the drop-bottom cars model 12-3090, which are planned to be produced from the second half of 2011. For the instrumentation of production it is planned to purchase assembly stands, horn machining unit, two radial drills and also some welding equipment.

The perspectives are associated also with the start up of the bogie production aimed at the manufacture of bogies for all the rolling stock fabricated by the TMH enterprises. It is planned to manufacture locomotive bogies centrally for the whole holding. As early as next year the team is ahead to produce the underframe for the 2ES5 diesel locomotive which is designed together with the Transmashholding strategic partner — French company Alstom Transport. ■

BMZ diesel locomotives:
from TEM shunter to the mainline 2TE25A Vityaz

Bryansk Engineering Plant, being a part of CJSC Transmashholding, is one of the largest Russian enterprises in the field of diesel locomotive building. Bryansk designers were the first in Russia to create a unique machinery — mainline diesel freight locomotive with asynchronous drive 2TE25A Vityaz.

Steam locomotives cleared the way to diesel locomotives and diesel locomotive building as an industry. The history of steam locomotive building has many interesting facts. Let`s reveal some of them. In December 1936 the steam locomotive SO 17-635 started unprecedented in the world history voyage. With 1200 ton train it travelled 21 thousand kilometers from Moscow to Vladivostok and back through the severe Siberian winter and difficult mountain crossings without any breakdowns. Only diesel locomotives turned to be able to repeat this record. Steam locomotive SO 17-1613, assembled in 1944 at the facility evacuated to Krasnoyarsk, performed the honorable historical mission – brought the Soviet delegation to Potsdam to the conference. In 30 years it was set up in Dnepropetrovsk as a monument. There is also a monument to the steam locomotive on the BMZ territory.

The first diesel-locomotive shunter TEM1 with the capacity of 1000 hp, accelerating up to 90 km/h, was constructed in 1958. Its prototype was a well-proven diesel locomotive TE1. But instead of the D50 diesel a new type of diesel — 2D50 started to be mounted at the diesel locomotives and it differed from the one applied on TE1 and TE2 with the arrangement of the gas-distributing shaft and turboblower. Main generator and two-unit mechanical set were also previously applied at the TE1 and TE2 diesel locomotives. TEM1 diesel locomotives were manufactured from 1958 to 1968. In June 1964 Bryansk Engineering Plant produced the 1000th diesel locomotive of this series. Total of 1946 diesel locomotives were manufactured. Since the time of TEM1 production diesel locomotive building has actively grown at BMZ.

The most mass family of domestic-produced diesel-locomotive shunters was TEM2 which series production started in 1968. The body structure of these diesel locomotives slightly differed from the body of TEM1 of the first production: side walls of the driver`s cabin were made without slope for the better view on the track. Apart from the diesel replacement the main generator was replaced and some other alterations were introduced. Total of 6 thousand locomotives were constructed at BMZ, half of them for the Ministry of Railroad Transport. TEM2 were supplied to some foreign ➜

THE FIRST DIESEL-LOCOMOTIVE SHUNTER TEM1 WITH THE CAPACITY OF 1000 HP, ACCELERATING UP TO 90 KM/H, WAS CONSTRUCTED IN 1958.

TEM18DM diesel locomotive

Mainline diesel freight locomotive with asynchronous traction drive 2TE2A Vityaz

→ countries including Mongolia, Cuba, Poland and Syria.

Over 100 diesel locomotives operate at the Baikal-Amur Mainline, at that, the first diesel locomotive which passed the BAM golden link in 1984 was the TEM2. The diesel locomotive TEM2-580 produced in 1970 was the first of locomotives to get the national Quality mark. Currently it is the most wide spread diesel-locomotive shunter on the territory of the former Soviet Union.

The first Russian diesel locomotive with asynchronous drive was TEM21, constructed at BMZ in 2000. This machine can be by right called the locomotive of the new generation at which the state-of-the-art developments of national specialists are applied. Its main differences are in the electric AC transmission and microprocessor control and diagnostics system. It was TEM21 which gave a chance of creating the first Russian mainline twin-unit diesel freight locomotive with asynchronous drive 2TE5A.

But the pioneer of the range of mainline diesel freight locomotives at BMZ became the twin-unit locomotive 2TE25K Peresvet with electric AC/DC transfer and collector traction electric engines. Later on the basis of this locomotive BMZ built the first Russian mainline diesel freight locomotive with asynchronous traction drive — 2TE25A Vityaz. So far this technology was not applied at the mainline locomotives in Russia.

Drift from the collector engines at the mainline diesel freight locomotives was undoubtedly a revolutionary process. This makes the traction machines practically eternal. They don`t need to be serviced as collector systems, they do not cause problems during movement. But the main thing is that asynchronous motors allow increasing the haulage capacity of the locomotive many times and eliminating much heavy and energy-consuming equipment which controls usual collector engines from the structure.

The new machine reminds its prototype Peresvet diesel locomotive only outwardly. 2TE25A has a brand new electric AC/DC transfer. The cutting-edge diesel electric set 21-26DG1 was designed at Kolomna Plant especially for the new diesel locomotive with asynchronous traction drive.

For the first time in the country electronic systems of fuel injection and air supply were mounted at this diesel electric set which allows decreasing operating costs

many times. This is for today the most perfect device for diesel locomotives. 12-cylinder V-shape diesel is energy-conserving, eco-friendly and ensures sufficient capacity without the application of accelerated modes. Compared to the diesel electric set D49 mounted at Peresvet 21-26DG-01 possesses much better characteristics.

The field service run of the 2TE25A diesel locomotive Vityaz finished at the end of December 2009. It drew the consist with the weight of 7,5 thousand tons on the difficult track curve with the slope of 8-12 thousandth. This value is far exceeding the abilities of the diesel locomotives forming the basis of the fleet of the CIS states railroads for which the norm is 5,2 thousand tones.

Vityaz with 2x2500 kW capacity with the electric AC transfer with axle-by-axle adjustment of traction force is designated for the drawing of freight trains. The designers managed to apply about thousand of modern design solutions on the locomotive. For the first time a non-pedestal bogie with radial arrangement of the wheelsets and traction motor support roller bearings were applied. This ensures the life of the tire and bearing assemblies for the run of million kilometers without servicing. The motor with electric fuel injection and blow-off system and microprocessor control and diagnostics system are applied. For the improvement of labor conditions of the locomotive team a room climate system operating in the automatic mode is installed in the drivers cab.

VITYAZ WITH THE ELECTRIC AC TRANSFER IS DESIGNATED FOR THE DRAWING OF FREIGHT TRAINS. THE DESIGNERS MANAGED TO APPLY ABOUT THOUSAND OF MODERN DESIGN SOLUTIONS IN IT.

The diesel locomotive is equipped with the CLUB operation security system, pneumatic and electrodynamic brake, alarm, communication, fire safety, heating system ensuring long lay-over in stand-by reserve with the power supply from the depot network. The locomotive is totally designed on the domestic engineering base. Traction converter which is the Vityaz key innovative element was developed at the Scientific-Research and Technological Institute of the Rolling Stock (OJSC VNIKTI) and manufactured by ElectroCI company (Moscow).

Switch to the mass use of the new machines will signify the sharp increase of the labor productivity on railroad transport, will allow enhancing traffic-carrying capacity of railroads. Due to high lifting power the new diesel locomotives will contribute to the decrease of the quantity of bottlenecks at the Russian railroad network.

The machines with asynchronous drive possess a range of advantages associated with railroad profiles — ascends, falls, curves. Minimum 5-7 Russian railroads have composite topography especially in Siberian regions. Due to this the weight of the consist for the collector diesel locomotives is limited to 4,5 thousand tons. Vityaz performance coefficient in such conditions is one and a half-twice as higher. 2TE25A will be the main locomotive on the most intense non-electrified sections of our railroads. These are sections of the BAM, sections of the Zabaikalsk railroad where they will operate within the program of petrol shipment to China and also in other places with intense climatic and terrain conditions.

Moreover, 2TE25A is the first Russian diesel locomotive complying with the «Euro–3» environmental requirements which are 30-40% stricter than «Euro-2». In the opinion of the railmen Vityaz is really a unique machine created in the post-Soviet Russia for the first time. In technical characteristics 2TE25A can be compared to one of the best samples of the foreign locomotive building — the Blue tiger freight locomotive.

The producers hope that 2TE25A will become the base model for the construction of several prototypes of diesel locomotives with asynchronous traction motors. The plant plans production of the single unit locomotive with 3 500 kW capacity, three-unit diesel locomotive with up to 9 000 kW capacity for the operation with the consists weighting about 12000 tons in multiple-unit system in the sets of articulated trains. ■

TEM2 diesel locomotive

Kolomna engines: modularity and unification

At the turn of the XIX–XX centuries the German inventor Rudolf Diesel for the first time created the brand new type of the engine operating process transforming heat energy into mechanical which performance coefficient was firstly a bit more than that of the steam engines. For the first time the process was applied in the reciprocating motor with the inner carburation and ignition of the air and fuel mixture on exposure to growing temperature at the charge compression. Such process possessed huge potential possibilities due to the absence of detonation at the fuel combustion with the densified fractional makeup. This allowed promptly realizing far higher cycle performance coefficient compared to the steam machines. This break-trough turned to be revolutionary in the technical world: diesel engine having passed a range of evolutionary stages till today remains the most efficient heat engine — diesel engine performance coefficient reaches 45% and at the consumption of energy of exhaust gas and utilization of heat energy can reach 85%.

Every type of engine has its own specific features depending on the sphere of its application. At the given capacity the consumption of fuel, oil, emission and also specific weight and dimensional characteristics should be minimized with the simultaneous improvement of reliability characteristics. The customer is interested in getting such an engine at the minimum price.

Kolomna Plant was one of the first not only in Russia but in the world to master production of the diesel engines. Engine building at Kolomna Plant today is one of the main activities, the enterprise manufactures diesel engines on the basis of its own design and engineering developments.

Kolomna Plant has developed wide diesel engine lines of various purposes. The main peculiarity of these lines is unification between the models. At the end of 1960s Kolomna designers for the first time in the world created the so-called modular engine arrangement. Today all the largest Western companies consider modularity to be the compulsory condition of the configuration. Modular arrangement is a set of separately assembled main engine units. Such modules are easy to test and fully check on the special stands before the engine final assembly. It is convenient not only for the production but for the repair also. Visiting Kolomna Plant and studying the modular configuration the specialists of MTU company (Germany) noticed that the structure is «exceptionally balanced with nothing to add to it».

Currently medium-speed diesels and diesel electric sets of the two power ranges CnN26/26 (D49) in the power range from 588 to 4 412 kW and ChN30/38 (D42) with up to 1850 kW capacity are in series manufacture. On the basis of D49 diesels Kolomna Plant created gas diesel engines and gas motors where natural gas, associated gas, biogas, mine and wood gas can be used as a fuel and also engines able to operate on the crude oil. D49 engines are operated in 35 countries of the world.

DEVELOPMENT OF THE NEW PRODUCT PROTOTYPES IS CARRIED OUT ON THE BASIS OF THE MODERN AUTOMATED DESIGN SYSTEMS, UNITED INTO COMPUTER NETWORKS.

Despite the fact that Kolomna Plant has a diversified sales market the railroad industry has been the main consumer of locomotive and diesel products of the plant for many years. In 1995 the Kolomna Plant introduced a proposal of modernization of the outdated locomotive fleet of the Russian railroads: replace the outdated diesels of various producers including foreign at the heavy overhaul of the diesel locomotives type M62, TEP60, TE10, ChMEZ, TEM2 with the diesels type D49. Kolomna Plant at its facilities on its own carried out the first diesel locomotive modernization experiments: replacement of the old diesels with the new ones. Such a solution allowed increasing the life of the existing locomotives without purchasing the new ones and at that the cost of modernization is much less than the purchase of the new diesel locomotives. Thus appeared the Program of the RZD locomotive fleet modernization and the railroads acquired a single unified diesel. D49 type diesels give new life to the locomotives produced 20-30 years ago. The service life of the diesel locomotives, at which now Kolomna diesels of D49 family are installed and operating, has expanded by 15-20 years and the cost of their life cycle has considerably decreased. For this program Kolomna Plant has developed seven diesel modifications including the modernization of the diesel locomotives operated abroad (in Germany, Uzbekistan, the Baltic states, Belorussia, Mongolia). In 2003 the plant completed performance of the contract for the delivery of the engines for 64 electric locomotives within the program of the German railroads diesel locomotive fleet modernization.

Before obtaining the order Kolomna diesels participated in the comparison tests in Germany at the same type of diesel locomotives with the diesels of the leading world producers - Mak-Krupp (Germany)

Diesel production — one of the key activities of Kolomna Plant

and Caterpillar (USA). At the full compliance of the diesel technical level with the customer requirements Kolomna diesels turned to be more efficient and joint tests with German specialists proved that the environmental performance of D9 diesels complies with the European norms.

Marine diesel building is the special activity of Kolomna Plant. Development and manufacture of the perspective ships and vessels require development of the marine power plants. Currently Kolomna Plant is participating in several projects of the Russian Navy on the construction of the surface vessels of Corvette and Frigate classes, submarines of the projects 636, 1650, 01570.

Kolomna Plant holds the licenses for the right of designing and manufacturing of the equipment for the nuclear power plants. The first four 6 200 kW diesel electric sets of the second security class were manufactured for the Bushehr nuclear power plant in Iran.

The engines configuration is constantly improving. The complex of research and development activities is aimed at the increase and improvement of the diesel engine technical level. The main activities here are the improvement of the diesel operating process allowing optimizing specific fuel consumption and environmental performance; development and application of the accumulator type electronically controlled pulse action fuel-feed systems; application of register air supply systems with modern turbo-compressors and inverter drive; reduction of mechanical losses in diesel and decrease of taking off power to the diesel and diesel locomotive units; application of local electronic control and diagnostics systems for the diesel electric set; development and implementation of the waste gas neutralizers of modern construction, with optimal service life and modest size. Development of the new product prototypes is carried out on the basis of modern automated design engineering systems, united into computer networks. Alongside with the traditional, the new advanced research methods are applied such as speed photographing and filming of the working process, laser thermometry, vibrography. New production technologies on the basis of modern software-controlled equipment, ensuring automatic quality control of the parameters indicated in the drawing, are implemented. New constructional materials, having such specific properties as high resistance to aggressive and high-temperature environment, antifrictionality, wear resistance and life till the reduction of initial characteristics, are applied.

Today Kolomna designers are working on the creation of the new series of multipurpose engines in the power range from 4 mW to 7 mW which are of great interest to the railroad, nuclear, energy industries and the Navy. ■

OEVRZ has come down underground

Oktyabrsky Electric Railway Car Repair Plant (St-Petersburg), being a part of Transmashholding, mastered repair and construction of subway cars, thus becoming the third Russian producer of the subway rolling stock. Since 2011 the plant plans to manufacture up-to-date subway cars meeting the latest requirements.

In 2007 the enterprise started with the mastering of repair of the new for the plant type of products — subway cars (together with the formation of the new wheelsets for it and in 3 years the enterprise won the tender for the construction of the new cars for the Novosibirsk subway. Under the terms of the contract a consist of cars model 81-714/717, which have a range of specific features, was delivered to Novosibirsk. In accordance with the customer requirements they are completed with BARS system of automated train motion control, traction equipment in original design. The saloon interior finish is executed not of plastic but of metal with powder painting.

Fast transition from the repair to the subway cars construction became possible due to the high-capacity manufacturing complex functioning at OEVRZ. Quality heavy overhaul and modernization of the rolling stock including the increase of the cars comfort level are carried out at the plant. The plant`s design office is on its own mastering a wide range of the standard process solutions — modification of car frames and bodies, installation of car ceilings, repair and adjustment of the sliding outer doors, cladding of the side walls, repairing of the wheel set gear-box casing etc.

In 2009 56 subway cars were completely overhauled at the plant. In 2010 it is planned to repair 72 cars and in 2011 repair of 90 subway cars is scheduled.

Currently fullscale manufacturing facility has been created for the production of cars. In 2011 production of the up-to-date Russian subway cars meeting the latest requirements for safety, energy efficiency, noisiness and passenger comfort will be mastered on its basis.

The plant`s administration pays attention to the issues of development of the material and technical base. Recently the enterprise has acquired three new wheelset machining devices. Formation of the new wheelsets makes a considerable part of the plant`s orders portfolio. Even now the OEVRZ fully supplies OJSC Metrowagonmash (also being a part of Transmashholding). The specialists of the new formation workshop have successfully mastered formation of the new wheelsets for the subway cars models 81-717/714 and 81-740/741.

Heavy overhaul and subway car production are being mastered by the plant within the framework of the implementation of the program of cooperation development between CJSC Transmashholding enterprises. The subway car repair is made in accordance with the technical documentation and with the assistance of the largest Russian producer of this type of rolling stock — Metrowagonmash.

This is not the only joint work of Oktyabrsky Plant and Metrowagonmash. Today the enterprises can offer the customers manufacture of the new subway cars models 81-760/761. The state-of-the-art global

Subway cars in the overhaul shop

developments in the field of rail transport are applied at the designing and manufacture of these cars. 81-760/761 cars comply with the latest technical requirements for fire safety, electrical safety, lean production, modern standards of passenger comfort (complete climate control with air conditioning of the passenger saloon), they are also convenient in service and apply energy-saving technologies (energy consumption is 30% less compared to the currently operated cars).

Despite the huge amount of work on repair and manufacture of the new cars for the subway, Oktyabrsky Plant continues successful performance of all types of repair and modernization of the passenger rolling stock. Last year the enterprise executed a huge order of the Federal passenger company — repair of 26 cars of the branded tourist train Burevesnik which undergone repairs in the heavy overhaul -1 amount and was painted in house colors. The train is already operated on the route Moscow –Nizhni Novgorod.

FAST TRANSITION FROM THE REPAIR TO THE SUBWAY CARS CONSTRUCTION BECAME POSSIBLE DUE TO THE OEVRZ HIGH-CAPACITY MANUFACTURING COMPLEX.

International cooperation is also developing: in January 2010 an agreement with the Ukrainian company Metiz-2007 was concluded under which OEVRZ delivers freight wheelsets of the new formation with axle boxes. Within 9 months 442 wheelsets to the amount of 34 724,2 thousand Russian rubles were delivered to it.

The plant also carries out heavy overhaul of the passenger cars for small operators, which appeared in the market in the last years — OJSC GrandServiceExpress, WagonRemService LLC, Profenergoservice LLC, Electrochemical plant LLC, Korabel-NN LLC etc.

In 2011 Oktyabrsky Electric Railway Car Repair Plant will celebrate its 185 anniversary. The plant has still a lot to do and solve many problems. The enterprise`s administration has many plans of the OEVRZ development. Operation in difficult economic conditions showed that St-Petersburg car repairmen are able to mobilize all their efforts and responsibly approach modern requirements. The plant passed the test and strengthened its position in the market. ■

Rail buses stand
for operational and environmental safety

OJSC Metrowagonmash, being a part of CJSC Transmashholding, has carried out development of the rail buses since 1977 and during this time 7 models of rail buses have been designed, currently series production of the RA-2 family rail buses is conducted.

Rail buses were created for passenger transportation on the sections of non-electrified railway tracks with heavy passenger traffic and also for the suburban and interregional traffic.

Power unit and main assemblies of the buses are located under the car floor, which allowed obtaining maximum square of passenger saloon. The machines are equipped with diesel engine and hydromechanical transmission. The car body is integrated, welded, made of stainless steel. The body masks are made of fiberglass with steel frames. The body is resting upon two two-axle bogies one of which is power-operated. Axlebox suspension stage is executed as two spiral springs, second suspension stage as a pneumatic spring. The cars are fitted with shoe type brake mechanisms. The saloon finishing is made of fiberglass, the saloon is fitted with seats with soft inserts and the system of forced ventilation and hydronic heating.

The rail bus which became a new type of the railroad electric multiple-unit stock is constructed on the basis of the body and underframe of the Yauza subway car. Its design ensures passenger boarding and detraining both from high and low platforms with the help of the extending ladder. The bus can be operated by one driver who is in one of the two cabins.

The machines are designed in such a way that maximum fuel economy is ensured at their operation. It happens due to the efficiency of the power unit and light load of the rail bus. Due to the increase of the reliability of the power unit and application of stainless steel in the body structure it became possible to solve the problem of maximum cutting of costs on servicing. Moreover, due to the application of the power units complying with the «Euro-2» and «Euro-3» requirements environmental safety of the rolling stock is ensured. In the car saloon the designers created comfortable conditions both for passengers and the driver.

The new modification of the railroad passenger transport — rail buses — has gained considerable development for 13 years. The first machines RA-1 (models 730 and 731) were single-car oriented on 62 seating places. RA-V rail bus (designed for the Hungarian railroads) represents a two-car consist with 142 seats and modern RA-2 is a three-car consist with 222 seats.

Sketch of the diesel train for Serbia

The comfort level has also changed. The RA-1 type rail buses were not equipped with toilettes because they were designated for short routes up to 50 km. Due to their efficiency and low cost of servicing these buses started gaining popularity on the railroads. That is why the following models (RA-B and RA-2) were fitted with toilets.

Metrowagonmash started manufacture of the rail buses PA-2 model 750.05-20 in 2006. MTU (DaimlerChrysler) single- block power unit including 360 kW MTU 6H1800R83 diesel engine and hydromechanical transmission Voith T211 re.4 was located at the head cars.

In the course of upgrading of the rail bus mechanical engineers tried to improve the body exterior. The side plate became smooth (on the first buses it was corrugated). The saloon exterior has been improved, new control system has been introduced, new units of the ventilation system and saloon heating have been developed, and hermetical inter-car walkway has been installed.

For over 10 year history of its existence the rail bus has proved itself as a safe type of transportation. All the RAs manufactured at the plant are equipped with the monitoring and diagnostics control system providing the key control functions, diagnostics of the main units and data storage.

Currently rail buses are operated on 14 Russian railroads: Kaliningrad, North Caucasian (Rostov and Mineral Waters depot), Moscow (Tula and Kolomna depot), South Eastern (Otrozhka depot, Voronezh), Gorkovskaya (Depot Nizhni Novgorod and Kanash), Sverdlovskaya, Volga (Volgograd depot), South Ural, Northern (Danilov depot), East Siberian, Zabaikalskaya, Kuybishevskaya, Oktyabrskaya, West Siberian and also in Lithuania and Ukraine.

This February Metrowagonmash became the winner of the tender for the delivery of ten diesel trains for the Serbian railways (Zeleznice Srbije). By the time this issue was being prepared the signature of the contract for the supply of the two additional consists was being expected. The first car is to be produced in April 2011. ■

KMT automatic and manual doors

Door of the passenger car is the structural component which the passenger comes into direct contact with during the travel on the railroad. It should be maximum safe, hermetic, convenient in service. Door systems for the railroad transport have the domineering share in the total production volume of the KMT company and today this figure makes over 40%.

Welcome to St-Petersburg suburb — the town of Lomonosov where the Russian leading production of various types of doors for the railroad transport is unfolded.

HISTORICAL INSIGNT

Russia purchased the first passenger cars abroad and the first domestic cars of I, II and III classes which differed in the indoor equipment and decoration appeared in 1850 s.

Further creation and modernization of the cars was executed considering the climatic factor, safety factor, passenger status and finally the growing speed of the consist movement.

In the second part of the XX century the car became much lighter and gained the features of the modern passenger car. At that, it was paradoxical that the cutting-edge technologies were introduced in the industry but some of the car elements looked archaic. Actually, until recently the doors of passenger cars were analogous to the ones used in the imperial Russia. They were swing doors opening manually inside the car. The last years became the turning point. Today it`s difficult to imagine passenger railway car building without automatic door systems meeting the modern require-

CAR DOORS

Today KMT produces the following types of new doors for passenger cars:

- Automatic, one-leaf reclining-sliding doors with electric drive (see the picture);
- Automatic, one-leaf sliding doors with electric drive;
- Automatic, two-leaf sliding doors with electric drive;
- Analogues of automatic doors but with manual drive.

Modern reclining-sliding door for the passenger car

ments for safety and comfort, providing the considerable increase of the consist movement speeds.

FROM SIMPLE TO COMPLICATED

KMT manufacturing company was founded in 1991. Its first products were intercar high-voltage connections. In 1997 serial deliveries of aluminum plastic windows for passenger cars started and the company entered the new millennium as the leading Russian producer of these components.

The situation changed in 2006 when the first Russian mass production of swing doors for passenger cars with the capacity of over 150 car sets per month was launched at the plant. For these purposes funds were invested into the construction of the new facilities: leaf production shop and paint and assembly shop. Thus the foundation of the strategically important activity of mastering mass production of the automatic door systems was laid.

It should be mentioned that in the beginning of the 2000s KMT participated in several projects for fitting the branded trains with automatic doors. They were the trains Krasnaya strela, Nevsky express and Burevesnik. It was the first and very valuable experience of the structure optimization though it was not a mass production.

In 2007 Tver Carriage Works proceeded to serial assembly of the new models where the installation of automatic driven reclining and sliding doors was stipulated. KMT prepared for this event beforehand and in due time carried out delivery of the first serial complex of automatic doors.

Currently the range of new cars has greatly expanded and the history of their construction is the history of the creation of the new types of automatic doors at KMT.

NOT BY THE CAR ALONE

With the collapse of the Soviet Union plants producing DC freight locomotives and mainline diesel freight locomotives remained beyond the Russian borders.

In the conditions of the growing passenger and freight traffic the wear rate of the locomotive fleet became critical.

In order to support the increasing transportation load OJSC RZD adopted the program of the locomotive fleet recovery.

The list of products of the Kolomna, Bryansk, Novocherkassk plants was enriched by new, modern types of locomotives complying with the latest requirements for the transportation speed. In Ural, in the town of Verkhnya Pyshma, the Ural Railway Engineering Plant produced its first electric locomotives.

Syndicates with the participation of the world leading manufacturers: TMH-Alstom (electric locomotive ЭР20), Sinara-Siemens (electric locomotive 2ES10) have been established.

Thus formed a favorable market situation for the development of production of the locomotive doors which series manufacture never existed in Russia.

KMT, as a specialized producer, at a short notice was able to provide its first customers with the samples of the doors which quality complied with the strictest requirements for hermeticity, noise — and heat insulation, fire resistance and exterior.

Today all locomotive building plants in Russia are supplied with the door sets and also in the framework of the indicated international projects.

PROJECTS AND PERSPECTIVES

This article would not be complete without the story of how these or that projects are created. So what is happening behind the curtain?

All design works and also work preparation (development of tooling and control software for the CNC machines) is executed in CAD Pro-Engineer system and associated special modules (stress calculations, kinematics, electric cables route location).

The results are 3D-models with the possibility of computer processing of machines movement kinematics.

On the basis of the 3D -models the prototypes of the products are manufactured which then pass comprehensive tests at the plant and at the independent accredited testing facilities.

Implemented into serial production, the door systems are manufactured on the high-precision equipment with the application of laser technologies and modern components and materials.

Accumulated experience, the level of the door production development and the scope of business connections allow optimistic evaluation of the future perspectives associated with mastering of the new market segments. A possibility of equipping electric trains and subway cars with KMT automatic doors is considered as the nearest project. The first working prototype of such a door was presented in the beginning of 2010. These are reclining and sliding two –leaf doors with the combined electropneumatic drive. They can be fitted in the new models of subway and electric train cars. Development and manufacture of such types of cars is carried out at the leading enterprises in the field (OJSC Metrowagonmash and OJSC DMZ).

A range of other projects connected with the Olympics 2014 railroad infrastructure is being considered and put into life.

It all allows looking into the future with optimism and highly evaluate chances of the KMT company as the leading supplier not only of the window but also of the door products for the rolling stock. ■

Locomotive door

LOCOMOTIVE DOORS

KMT produces the following types of new doors for the locomotives:

- Side outer swing doors (see the picture);
- End outer swing doors;
- Cabin fire resistant doors;
- Inner fire resistant doors.

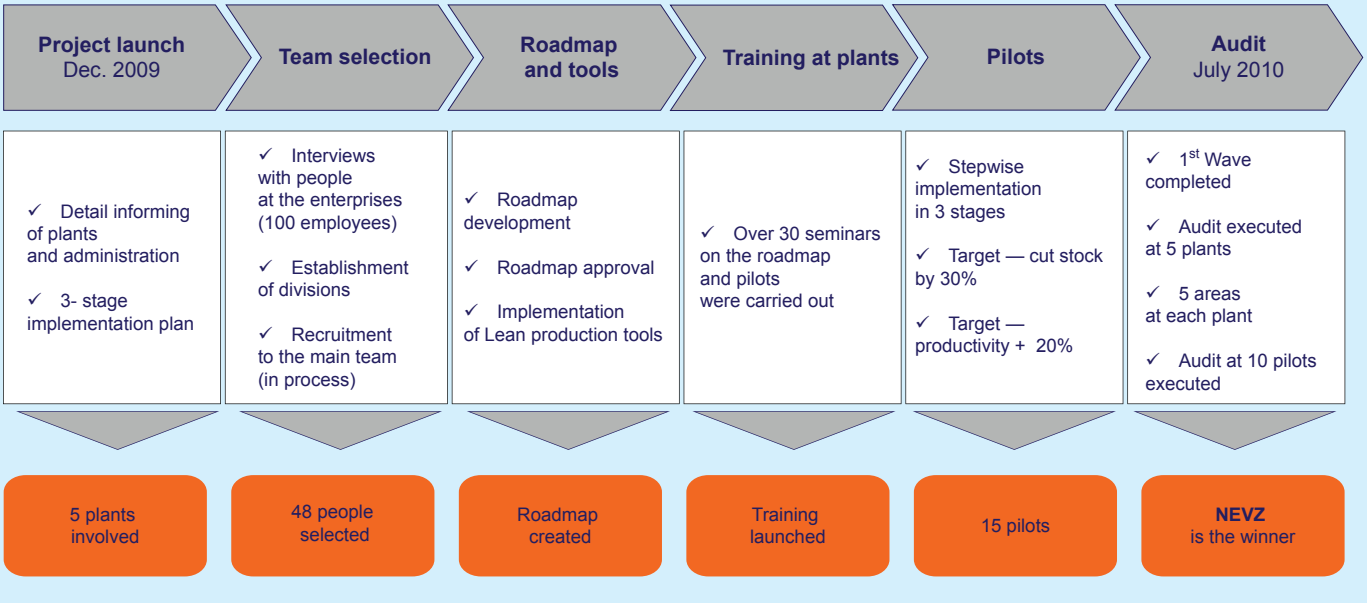
Manufacturing system: heading towards the lean production

Gael Dumetie, Director for Production System CJSC Transmashholding

CJSC Transmashholding — a leader in the Russian transport machine building market has carried out activities on the implementation of lean production at the holding`s enterprises since December 2009.

In accordance with Transmashholding Strategy of restructuring aimed at the modernization of the manufacturing system since December 2009 the enterprises of the holding have started preparation for the implementation of the lean production system. At the preparatory stage the draft of the single roadmap was elaborated together with defining the priority methods and tools for the implementation in the main segments of the production system — quality, production preparation, manufacture, supply and product delivery. The implementation of the lean production system at the enterprises is aimed at improving product quality, adjusting the procedure of its delivery to the customer, ensuring labor safety and also cutting operating costs. Transmashholding plans to arrange the implementation of the lean manufacturing system by strengthening of cooperation and exchanging experience between the holding`s plants and also with the enterprises of the partners — OJSC RZD and Alstom.

Key Milestones of the Implementation
December 2009 — June 2010

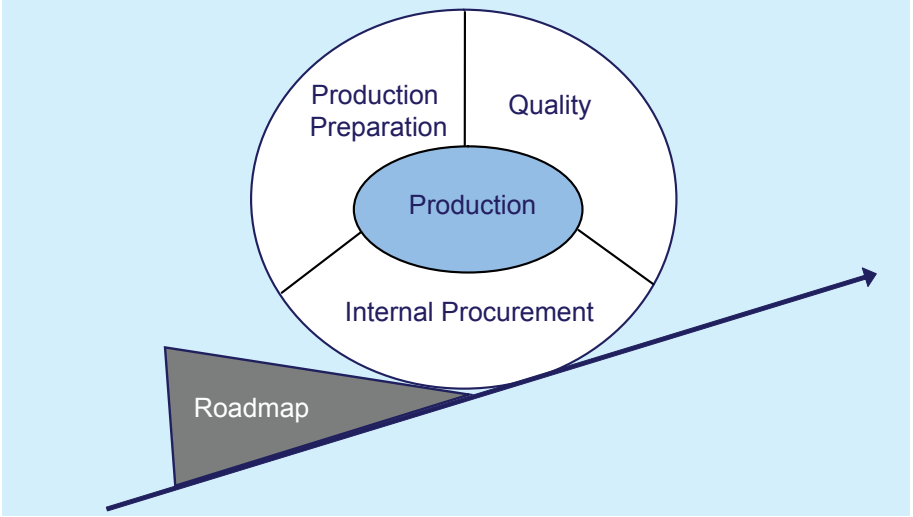


Alstom experience has been applied at the preparation and introduction of the lean production. Alstom production system has already been implemented at 29 company`s plants. TMH plan on the introduction of the lean manufacture consists of three milestones. At the first milestone it involves five enterprises — DMZ, MVM, BMZ, NEVZ, TVZ.

Currently Directorates for Plants` Restructuring with the support of the central team — TMH Directorate for Production System have selected the candidates for the lean production divisions, carried out seminars on the roadmap with the directorates of the enterprises, chose the pilots. Moreover, they managed to organize operation at the pilots, prepare and carry out self-audit and audits under the requirements of the roadmap, define the operation strategy and primary tools, which have been implemented or are being implemented at the production areas of the plants. At the initial stage of the implementation of the lean manufacture the method of work arrangement at the production area and the following tools have been applied: 5S, Value Stream Mapping (VSM), Standard Work in Process (SWIP), Total Productive Maintenance (TPM), PDCA (Plan-Do-Check-Act), key performance indicators, roadmap, visual management stand. One of the key objectives of the lean production is the improvement of the working conditions at the enterprises.

A roadmap has been developed for ensuring the efficient production operation →

Employees are the center of the TMH production system



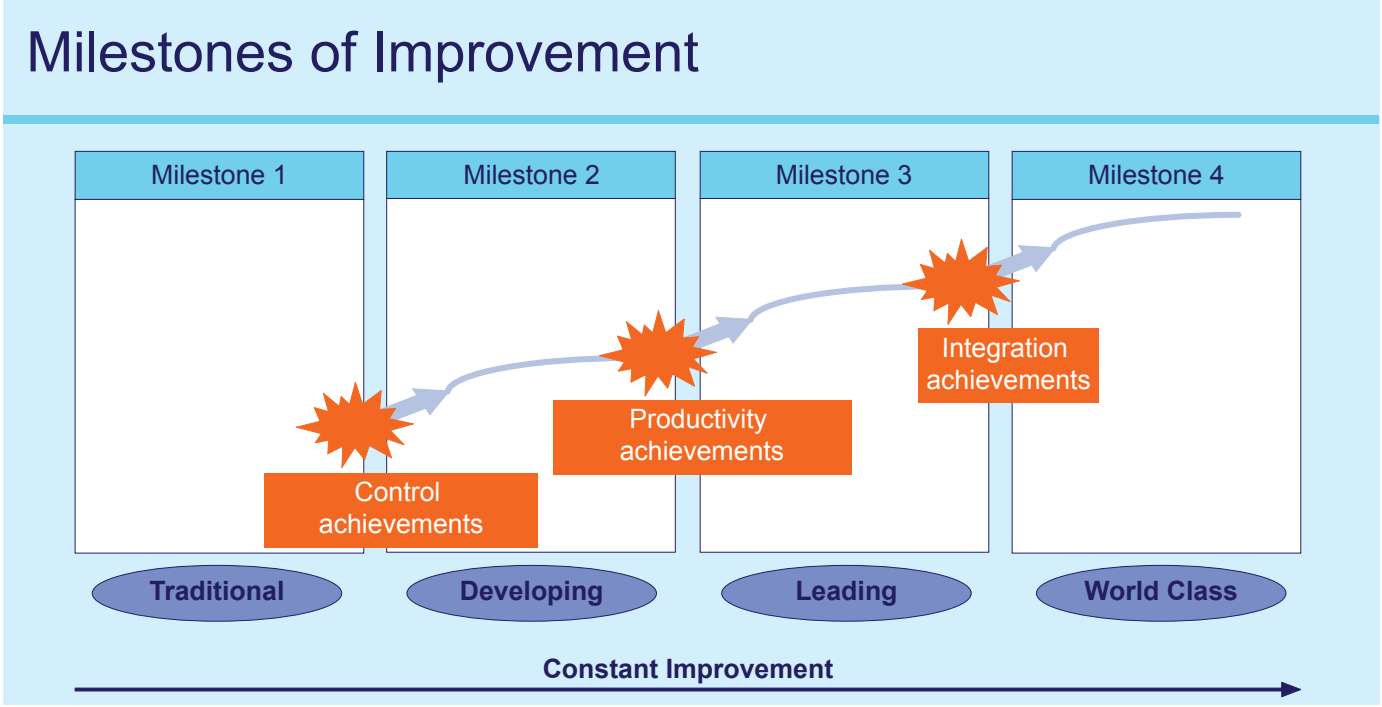
Pilots: First results

Standard report form	→	Prepared annually and timely
Reports with precise figures	→	Results approved by economists
Cutting of stock:-30%	→	Results from 19% to 85%
Productivity: +20%	→	Results from 12% to 28%
Quality improvement: +30%	→	Results from 1% to 60%
Cutting of production areas:-20%	→	Results from 3% to 30%

→ and it defines the requirements on the improvement of activities in such key spheres as production preparation, quality, internal procurement, production.

In May-June 2010 self-audits and audits were executed at five plants, degree of development on the main activities was defined and the scenario for their improvement was worked out. Main measures on the sections of the roadmap can be emphasized in solving the problems on the development of the activities. In «Management» section they are: involvement of directorate administration in the process of mapping of value streams and cutting of production cycles of product manufacture, training on methods and tools of lean production and arrangement of advanced experience exchange among the enterprises of the holding and other plants for its further implementation. In «Production preparation» — adjustment of assembly lines and preparation of the design documentation in accordance with the smooth production flow, optimization of production flows, workshops and work places layouts and also utilization of production and auxiliary equipment. In «Quality» sphere the emphasis is upon the upgrading of the production process internal control system, arrangement and control of the compliance of the end products with the set norms of the enterprises and

Work place arrangement: “Before” and “After”



method in the evaluation of the outer suppliers.

Activities in «Logistics» sphere are targeted at the elimination of stock of the work-in-progress and components from the outer suppliers, arrangement of timely parts and components supply to the assembly lines and in the necessary amount under the production plan requirements. The main events on the «Production» sphere are: implementation of 5S, SWIP, TPM, VSM, PDCA tools in the workshops. In February 2010 two pilots were chosen by the Directorates for Plants` Restructuring together with the TMH Directorate for Production System at each of the five enterprises for the implementation of methods and tools of lean production. The key criteria in the pilots` selection are — big stock of work-in-process, low output and big losses due to rejects. The key indexes have been defined by the TMH Directorate for Production System in the implementation of targets at the production areas and their values are specified in the table.

Visual management stands have been installed at the production areas with indicators showing the progress of the manufacturing plan fulfillment, the level of work-in-process, machine load, components supply, product quality, condition of labor safety, personnel composition, its qualification and work load and also improvement plans on these areas. Currently methods and tools of lean manufacture are applied at eight production areas at each of the five plants.

SUCCESSFUL FORMATION OF THE TMH LEAN COMMUNITY WILL BE SUPPORTED WITH THE TRAINING OF THE ENTERPRISES` SPECIALISTS SCHEDULED FOR 2011. THE TRAINING WILL BE FOCUSED ON THE APPLICATION OF THE STANDARDIZED METHODS AND TOOLS OF LEAN MANUFACTURE AND QUALITY.

Following the results of the audits carried out at the first milestone strong and weak points in the enterprises activity were defined and the leader among the five holding plants was chosen. In October 2010 in Novocherkassk at the Conference on the TMH Lean Production System Novocherkassk Electric Locomotive Plant –a leader in the implementation of the THM lean manufacture system was awarded a prize. The best plant`s results are on the section «Production Preparation» in the roadmap, in the arrangement of smooth work at the assembly lines and with applied design documentation and also in the arrangement and implementation of lean production methods and tools at the pilots. The experience, gained at the first milestone, will be improved and applied at the introduction of the TMH lean manufacture at the other enterprises of the holding.

Successful formation of the TMH lean community will be supported with the training of the enterprises` specialists scheduled for 2011. The training will be focused on the application of the standardized methods and tools of lean manufacture and quality and it will be conducted by the heads of Alstom production system in November-December 2010.

The TMH implementation of the lean production system at the enterprises is the priority objective — the basis of the creation of the modern holding production system. CJSC Transmashholding administration has approved the project of the implementation of lean manufacture at the Kolomna Plant, Oktyabrsky Electric Railway Car Repair Plant and KMT production company in the first quarter of 2011. ■

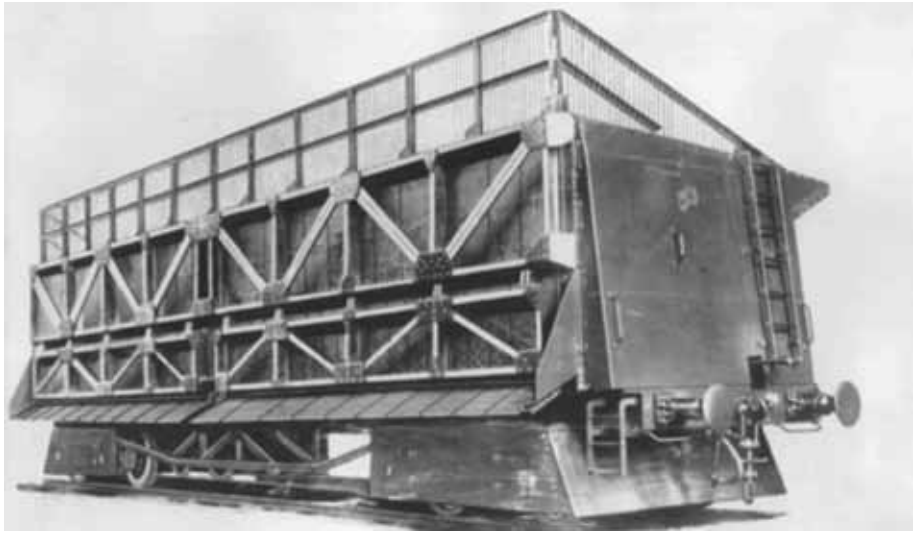
130th anniversary of the railway car building at BMZ

Car building is one of the most dynamically developing activities at the Bryansk Engineering Plant. For its whole history the enterprise has manufactured passenger cars, covered freight cars, high-capacity cars, refrigerator cars, tank-cars, refrigerator sections which were widely spread — from Moscow to the Central Asian republics.

The history of the BMZ car building started in 1880. Then the first two-axle cars and platforms were constructed firstly for the plant`s own needs and then for sale. At that time the car building products made 21% of the total production volume. Up to 3 thousand freight cars and over 100 passenger cars were manufactured annually.

In 1883 the Bryansk Plant constructed the first 300 two-axle kerosene-cars (that is how at that time the tanks for kerosene transportation were called) with 15,2 t capacity under the order of the Gryaze-Tsaritsinskaya railroad. The manufacture of the products which were new for the Russian industry was unfolded quickly maintaining, at that, quite a high for that time technical level of products. In 1895 Bryansk Plant produced 145 four- axle tank-cars with the capacity of 1500 puds of kerosene (24,6 tons) which no one in Russian constructed. Total of 10 thousand tank-cars were manufactured before the revolution of 1917. At Soviet times this type of product was returned to only in 1949. The enterprise`s team quickly increased the volumes of their manufacture and already 390 tanks were produced in 1950 , 985 in 1951, 1475 in 1958. In addition, a new technology of series production of tanks was developed with butt welding of all sheets.

100% of the high-capacity tanks, 38% of refrigerator cars, 29% of high-capacity cars and platforms of the total Soviet production volume were produced at the plant before the Great Patriotic War of 1941-1945. In the beginning of the 60s of the last century advanced equipment was introduced in the car building. — gantry spot welding machine and seam welding machine. Moreover, section assembly of the car floor was organized at the plant and electrogalvanic cleaning of the parts instead of sand cleaning was introduced.



Cars for the metallurgical industry and chemical-recovery industry were produced by the plant till 1962

In 1962 Bryansk Engineering Plant produced the prototype model of a five-car refrigerator section for the transportation of perishable cargo and refrigeration of fruit and vegetables. Since then this product became very popular, was constantly improved and was awarded the Quality mark.

In the 90s BMZ mastered production of the wide range of products: hopper cars series 19-3054 and 19-3116, designated for the transportation of grain and mineral fertilizers, cars for the transportation of cement model 19-3018 and cars for the transportation of rails, pipes, wood and coal.

The first batch of the hopper cars for the transportation of mineral fertilizers was fabricated in 1993. First hoppers were oriented on the grain transportation but the customers planned to adjust them for the transportation of mineral fertilizers and some modifications had to be introduced into the design. For example increase of carrying capacity, application of the lever mechanism for the unloading instead of screw — type mechanism, application of chemically resistant coatings. 19-3054-01-1 car is multifunctional it can be easily adjusted to the customer`s requirements that is why the specialists think that the hopper will be in demand for a long time.

In 2003 the engineering team of the Bryansk car builders developed original hopper design with the tear-drop shape body model 19-3116. By now about two thousand of such cars of four modifications have been produced. Over one thousand of cars model 19-3018 for cement transportation have been manufactured. This is the most popular product today, its monthly production is up to 200 units.

Bryansk Engineering Plant has manufactured 6 234 pieces of refrigerator sections for the whole period of their fabrication. Over 2 thousand of Kapel cars of the original plant design and 11 thousand of hoppers were produced. ■

TRANSMASHHOLDING | ALSTOM

Alstom – Transmashholding
An alliance of two giants

Alstom became a TMH shareholder on 1 March 2010

AN EQUAL PARTNERSHIP WITH A PROMISING FUTURE

- Alstom and Transmashholding are uniting their strengths – superior technological expertise and unparalleled knowledge of the Russian market – to modernize the biggest railway network in the world.
- Alstom and Transmashholding have already created a common engineering center (50/50) for the development of new rolling-stock models suited to the requirements of the Russian market and the CIS countries. The first product will be an electric locomotive based on the platform-concept principle.
- Alstom has become a shareholder in the TMH holding company and assists TMH in the development of new rolling stock, with a support team of Alstom specialists already working on-site with TMH engineers.

A PRAGMATIC APPROACH

- Alstom Transport will provide technological and methodological support for the modernization of TMH's manufacturing sites and processes.
- The Alstom-TMH common engineering center is in charge of creating Russian centers of excellence incorporating the expertise of both parties for the design of new products. The first center of excellence will be dedicated to locomotives and based in Novocherkassk.
- Alstom and TMH have also set up a joint component company (50/50) for the production of key components (such as traction systems and bogies) in Russia, based on the latest Alstom technological know-how.
- Technical cooperation between the two firms will rely on a partner system involving Alstom and TMH's competence centers.

FIRST JOINT PROJECTS

- In May 2010, Russian Railways ordered 200 EP20 passenger locomotives for the Sochi Winter Olympic Games in 2014. The EP20 will be the first Russian locomotive able to run at up to 200 kph.
- In June 2010, Alstom and TMH signed an agreement with Kazakh Railways for the creation of a joint company to manufacture freight and passenger electric locomotives in Kazakhstan.

KEY PARTNERSHIP DATES

- **13 December 2007:** An agreement is signed to establish joint ventures in Russia.
- **27 March 2008:** The two firms sign a technical support agreement, and an audit of three TMH plants is performed.
- **31 March 2009:** Both companies sign a strategic partnership agreement.
- **1 March 2010:** Alstom becomes a Transmashholding shareholder.

Signing ceremony for the strategic partnership agreement on 31 March 2009

Alstom Transport

- Alstom Transport develops and offers the most complete range of systems, equipment and services on the rail market
- No. 1 worldwide in very-high-speed trains (300 kph and above)
- No. 1 worldwide in high-speed tilting trains
- No. 2 worldwide in urban transport
- 5.8 billion euros in sales in 2009-2010
- 27,000 employees in more than 60 countries

Pendolino "Allegro" for the Helsinki-St. Petersburg line

Donchak locomotive

Transmashholding

- No. 1 manufacturer of rolling stock in the CIS countries
- Only manufacturer in Russia of rolling stock suited to arctic operating conditions
- Main stakeholder and customer: Russian Railways (RZD)
- 1.8 billion euros in sales (2009)
- 54,000 employees

TRANSMASHHOLDING

www.tmholding.ru

1. The largest rolling stock manufacturer and seller in the CIS
2. A top ten world manufacturer of railway equipment
3. The only Russian company with expertise in development and production of equipment for Arctic climate
4. Transmashholding-manufactured equipment is in service in all climate zones

PRODUCTS AND SERVICES PROVIDED BY THE COMPANY:

- Main line and industrial electric locomotives
- Main line and industrial diesel locomotives
- Freight cars and passenger coaches
- Electric train cars and metro cars
- Rail buses and diesel trains
- Car castings
- Diesel engines for diesel locomotives and marine vessels
- Diesel-generators and turbo chargers
- Components for transport
- Spare parts
- Repairs and maintenance

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