

Modernisation and innovative development projects

The innovative activities of Russian Railways focus on meeting the Group's strategic development priorities and are described by the draft Comprehensive Innovative Development Programme of the Russian Railways Group for the Period of 2016-2020 (hereinafter the CIDP-2020).

The Group's priority development areas envisaged by the CIDP-2020 are specified as both government policy documents as well as the policy documents of Russian Railways, including the Scientific and Technical Development Strategy of the Russian Railways Group for the period until 2020 and 2025 ('White

Book') as well as other strategic policy documents.

The draft CIDP-2020 contains information about the results of the Company's innovative development and priority long-term areas, including improving the reliability of the main technological

processes, energy efficiency and workforce productivity, the development of intelligent control systems for the transportation process and information technologies in all spheres of transportation activities and the introduction of innovative diagnostics and geoinformation technology systems.

Introduction of innovations in infrastructure

As part of the 'Digital Railway' comprehensive innovative project, which provides for the improved efficiency of the core activities of the Russian Railways Group through the development and introduction of innovative projects in the management of the transportation process, a number of global-level innovative technical systems were developed and introduced in 2016, including:

- a trackless circuit interval regulation system was established on the Bolshevo-Fryazino section of the Moscow Railway (analogous systems are currently being developed in Germany, Austria and England) and is slated to be introduced on the Baltiysk-Shipovka section of Kaliningrad Railway in 2017;
- intelligent automated train operation systems were introduced on 160 locomotives with distributed traction, making it possible to save 3-5% of electricity;

- a shunting automatic locomotive signalling system was introduced at the Bekasovo station of Moscow Railway (8 such stations are equipped with such systems).

As part of strategic cooperation between two companies – Russian Railways and Siemens – the multiple unit depot of the Podmoskovnaya station launched a Data Analysis and Processing Engineering Centre, which makes it possible to forecast the condition of train units and increase the readiness of rolling stock and infrastructure for operation while optimising operating costs and gradually transitioning to the 'maintenance based on condition' standard.

The Luzhskaya station of the Ust-Luga transport hub introduced 14 systems that automate production processes, including locomotive control, fasten rolling stock without a worker, manage station processes and the centralised control of

switches and signals. Hump locomotive operations to split trains are performed without a driver 90.6% of the time. The introduction of innovative technologies has made it possible to reduce the number of personnel from other enterprises involved by 246 people and resulted in payroll savings of RUB 148.3 mln.

160 locomotives

equipped with an intelligent automated driving system

In order to establish combined passenger and freight transportation on the Moscow Little Ring Railway, Russian Railways is implementing the world's first combined interval regulation system with mobile block sections based on an automatic block system with voice-frequency track circuits and microprocessor-based on-board units. Specialists from leading foreign companies say the system and its individual components have great export potential.

The MCR has introduced a control system for ES2G Lastochka (Desiro RUS) electric trains. The functional development of this system as regards the control of stationary devices in 'Auto-dispatcher' mode and rolling stock in the 'Auto-driver' system will make it possible in the future to switch to the full automation of train operations with safe remote monitoring in 'Driver-less' mode.

In an effort to establish the continuous monitoring of the condition of MCR infrastructure without any additional burden on the transportation process, work is currently being performed to integrate information and measurement

systems in the Lastochka (Desiro RUS) electric train that are designed to ensure the automated diagnostics of infrastructure components, including ultrasonic rail flaw detection. The efficiency of the infrastructure diagnostics process is to be enhanced using these systems for the first time in world practice by eliminating the standard scheme for using laboratory cars (flaw detector, track gauge and railcar laboratory for contact network testing).

Anti-cyberattack protection devices have been developed to increase the cybersecurity of computer-based interlockings installed on the MCR.

The breakthrough technologies being used as part of the reconstruction of the Moscow Little Ring Railway are intellectual property results. Individual technical solutions were awarded at international exhibitions and listed among list 100 best inventions in Russia.

Projects envisaged by the 'Lean Manufacturing at Russian Railways' programme have generated a real

economic effect in the amount of RUB 668 mln that was incorporated into the budgets of production divisions for the first time and introduced a new mechanism to motivate employees through lean manufacturing projects: an economic incentive fund totalling RUB 92 mln was formed for 2017 from the money saved, and individual lean manufacturing projects valued at RUB 20 mln were implemented based on leadership principles.

In accordance with the Quality Management Strategy at the Russian Railways Group, which envisages enhancing customer and passenger satisfaction levels with the Company's services by improving their quality, optimising technological processes, increasing efficiency and reliability, and ensuring traffic safety based on the quality control of technological and business processes, Russian Railways has expanded the IRIS standard among railway equipment suppliers. The Company also continuously improves and develops its quality management system.

RUB 668 mln

economic effect from lean manufacturing projects

RUB 92 mln

size of economic incentive fund for 2017 from the money saved in 2016

Import substitution

Order No. 98-r of the Government of the Russian Federation dated 27 January 2015 approved a priority action plan to ensure the sustainable development of the economy and social stability, which envisages a number of measures to reduce the dependency of Russian economic sectors on imports and ensure import substitution for strategic groups of supplies.

The Russian Railways Holding is one of Russia's main consumers of railway rolling stock, railway automation and telemechanic equipment, engineering and technological equipment as well as communications and power supply equipment for which imported components are used in manufacturing. An analysis of the import dependency of the Russian Railways Group's suppliers revealed that the Company has a critical need for the development of the domestic industry and the establishment of competitive internal markets for railway products.

The Company has approved and is implementing an Import Substitution Programme for the products it purchases, which describes the objectives and areas of activities that require import substitution, identifies the main indicators and presents the key projects and measures.

Lists of priority import-containing products purchased by the Russian Railways Group's business entities have been proposed

to industrial enterprises located in Russia and countries of the Customs Union for production and have been made publicly available on the official Russian Railways website (the 'Import substitution' sub-section of the 'Tenders' section).

The purchase of import-containing products decreased by RUB 2,435.24 mln over the 12 months of 2016 due to the following components:

- localisation of the production of rolling stock as well as its components and assemblies, track machinery as well as devices of traction power supply systems, signalling, centralisation and blocking equipment and communications equipment (for which the decrease totalled RUB 2,008.69 mln);
- the purchase of Russian-made analogues of imported products (for which the decrease totalled RUB 426.55 mln).

As part of work to reduce the level of imported components in the purchased products and also to implement the Import Substitution Programme, a standard method was updated and introduced to determine the level of localisation for the manufacturing of products purchased for the needs of the Russian Railways Group (Russian Railways Order No. 721-r dated 21 April 2016).

Key projects to reduce the level of imported components in the products purchased by the Company include projects to localise the manufacturing of rolling stock.

RUB 2,435.24 mln

decrease in purchases of import-containing products in 2016

Work with small- and medium-sized enterprises

The Russian Railways partnership programme with small- and medium-sized enterprises (SME) was developed in accordance with the action plan (road map) 'Expansion of the Access of Small- and Medium-sized Enterprises to the Procurements of Infrastructural Monopolies and Companies with State Participation', which was approved by Order No. 867-r of the Government of the Russian Federation dated 29 May 2013. This programme was drafted taking into account the methodological guidelines of the Russian Ministry of Economic Development and is publicly available on the Russian Railways website in the 'Tenders' section ('Information for SME' sub-section). The partnership programme aims to search for partners among SME and create a list of such partners that manufacture and sell high-tech and innovative products and engage in research, development and technological work. At present, the register of Russian Railways partners includes information about 68 SME.

In accordance with the directives approved by the Prime Minister of the Russian Federation dated 24 October 2013 as No. 6362p-P13, the Company has formed a Russian Railways advisory body that is responsible for auditing the effectiveness of the procurements it conducts, which is a permanent

consultative and advisory body. The advisory body includes representatives of industry-based scientific and educational institutions and technological platforms, representatives of the public organisations Opora Rossii small business association, Delovaya Rossiya, Agency for Strategic Initiatives to Promote New Projects and the Institute of Natural Monopolies Research, the non-profit partnerships Club of Leaders for the Promotion of Business Initiatives and the Guild of Forwarders as well as members of the Chamber of Commerce and Industry of the Russian Federation and the Public Chamber of the Russian Federation.

The Group has organised a joint working group with the SME Corporation to ensure SME have access to the procurements of Russian Railways.

Russian Railways and the All-Russian Public Organisation of Small- and Medium-sized Enterprises Opora Rossii have concluded a cooperation agreement to support SME, which envisages the creation of favourable conditions for small- and medium-sized companies to have access to procurements of goods, work and services provided by the Russian Railways Group.

In order to further expand interaction with SME in matters of scientific, technical and innovative development,

the Company in 2015 established the 'SME One-Stop Shop' system, which allows for performing the initial classification of the proposals it receives, compile a register of proposals and process the proposals to make decisions on procurements or to reject the proposals. For external users, a data entry form is available that allows for completing the registration procedure as well as a form for collecting information about the proposal.

The Company plans to expand the number of system users and provide responsible specialists of its divisions in the relevant areas of activities (scope of application) with the opportunity to organise automated notifications and operational reporting. Similarly, decisions are to be made about expanding the range of external users of this system (in particular with respect to applicants that are not SME). At the same time, the Company provides the ability to integrate this resource and other functional automated systems at Russian Railways with the measures that are being implemented, in particular as part of the investment programme, informatisation programme, scientific and technical development plan and procurement plan.

Resource conservation and energy efficiency

Russian Railways remains a leader among global railway companies in terms of the energy efficiency and eco-friendliness of freight and passenger transportation, as evidenced by information from the annual 'Energy Consumption and CO₂ Emissions' handbook of the UIC and IEA for 2016.

Russian Railways achieved the following results in 2016 through improvements to the management system for the energy conservation activities of its production processes and the implementation of measures contained in the Energy Conservation and Improved Energy Efficiency Programme:

- a decrease in the specific consumption of fuel and energy resources for the traction of trains running on electric and diesel traction by 0.2% and 1.8%, respectively;
- a 2.8% increase in the energy recovery rate of return;
- a decrease in the consumption of fuel and energy resources for the heating of locomotives awaiting work totalling 10.7% in electric traction and 5.7% in diesel traction.

The Company decreased the energy intensity of its production activities by 1.5% in 2016 compared with 2015 and increased the energy efficiency of its manufacturing activities by 1.5%.

Total savings of fuel and energy resources from the Russian Railways Energy Conservation and Improved Energy Efficiency Programme for 2016-2018 amounted to 8,419.7 TJ in 2016 (+21.8% versus the plan) valued at RUB 4.989 bln, which is one of the best results in the history of the Company's energy conservation activities.

The investment project 'Introduction of Resource Conservation Technologies on Railway Transportation' remains one of the main investment tools in the implementation of the Russian Railways Energy Strategy for the Period until 2020 and Long-Term until 2030, which was updated in 2016. The measures in this project along with the programmes for rolling stock renovation and railway infrastructure modernisation, above all stationary energy, form the basis for the Russian Railways Energy Conservation and Improved Energy Efficiency Programme.

In 2016, 3,700 units of resource and energy conservation equipment worth a total of RUB 2,493.8 mln were introduced as part of the resource conservation programme.

The operation of the technical equipment introduced as part of the investment project 'Introduction of Resource Conservation Technologies on Railway Transportation' in 2016 will enable the Company's branches to reduce operating costs by RUB 483.7 mln in 2017, including cutting the consumption of fuel and energy resources by RUB 345.8 mln.

+1.5%

increase in the energy efficiency
of manufacturing activities vs. 2015

3,700

units
of resource-saving equipment introduced
in 2016

