WINDOWS OF OPPORTUNITIES FOR TRANS-EURASIAN BELTS

Vacuum and levitation transport systems: scientific foundation, technology and outlook for railways: Collective monograph. Edited by B. M. Lapidus, S. B. Nesterov. Moscow, RAS publ., 2017, 192 p.

ABSTRACT

Collective monograph of the members and scientific partners of the Joint scientific council of the JSC Russian Railways is devoted to the issues of fundamental research in the field of magnetic levitation and vacuum levitation technology. The publication of the book is a timely and important step towards creation of national innovation and engineering consortium of universities, academic and corporate research institutes, design organizations, innovation and venture companies, who will be capable to promote public industrial, scientific, research and educational policy, aimed at creating new magnetic levitation and vacuum levitation transport systems.

Keywords: *transport, magnetic levitation, projects, vacuum levitation engineering, transcontinental transport system, future railways.*

Development of fundamentals and design decisions for the creation of super speed transport systems of the 21st century does not mean movement within the global trend only, but follows the advanced innovative streamline, that responds to the objectives of the transport strategy of Russia and to the transition of railways to a radically new technological level.

At the beginning of 2017 the Centre of strategic development, chaired by Alexey Kudrin, together with the Russian Ministry of economic development announced the start of a new project, called «Russia of the Future: 2017 → 2035». Citizens and expert community are looking within the framework of the project for the answers to topical questions and, regardless of multitude of opinions and forecasts, most participants agree that the success of national social and economic development should be determined by global competitive advantages of leading economic sectors, comprising transportation field. Transport in that case is not only a part of monetary base of the country, a driver of innovation and scientific and technological progress, but also a condition of connectivity of the huge territory of Russia, that guarantees sustainable development of its regions and national security.

Seen in that context national megaproject «Integral Eurasian transport system» (IETS), developed by the group of scientists under the leadership of the director of the Institute of social and political studies, member of the Russian academy of sciences G. V. Osipov, is undoubtedly of importance. The project suggests to integrate into the single network Eurasian transport routes and modern communications on the basis of speed complex multimode highway linking sea ports of Primorye [Ed. note: the name of Russian Far-Eastern region on the coast of Pacific, literally translated from Russian as seaside or coastland] and the western border of Belorussia. Long perspective can be seen as extension of the route via Chukotka, tunnel under Bering strait to Northern America. The route should include not only railway segment, but modern motorway and a fiber-optic communication line.

The idea of the construction of high-speed transport corridor from Pacific to Atlantic has provided the basis of the concept of solidary development of Eurasia within another infrastructure megaproject «Trans-Eurasian Belt Development» (TEPR).

The above mentioned concepts of creation of globally integrated transport systems of Russia correspond fully with the project of now discussed forecast of scientific and technological development of Russia till 2030. The forecast supposes development of transport corridors and implementation of transit capacity of the country to ensure intercountry exchanges of goods, to reduce costs of freight transportation, and to raise the political weight of the country on international scene. In long term window of opportunity will be opened for enhancement of technical parameters of transport vehicles to extend the conditions of their operation (simultaneously in air, on land, in water etc.); for development of national network of high-speed railways (500 km / h and faster) and for enlargement of rail network to separate freight and passenger traffic. To achieve those strategic goals it would be necessary to develop and implement innovative systems of speed and high speed (faster than 500 km / h) railway systems, vacuum trains with speeds up to 4000 km / h.

Almost 40 years ago (that is to say that we had a 30-years long break caused by perestroika,

crisis, development of market relations) Russian scientists, researchers, engineers, designers started, within cooperation of a large number of different organizations, universities, design institutes, to work at transport vehicles with magnetic levitation and linear electrical traction. The interest to the transport designed new technological principles has recently renewed. The emergence of high-voltage and high-current power semiconductors (IGBT-transistors), new magnetic materials (Nd-Fe-B), metal-ceramic high-temperature superconductors (Y-Ba-Cu-O) has contributed to the raise of the interest.

In our opinion fundamental scientific topics of the reviewed monograph (related to the problems of creation and maintaining of vacuum, heat evacuation during movement in air-free or evacuated environment, design of traction and elevation module, contactless movement, provisions for acceleration and braking of movable modules in vacuum environment, structure elements of vacuum tube transport system) allow today to start just now designing and testing of prototypes of new mode of transportation, destined to provide records of high speed transportation of freight and passengers, to achieve also minimum power consumption of transportation, its safety and environmental friendliness.

The authors of the monograph present the results of their researches and scientific data, put forward original ideas and arguments to substantiate optimum and investment-attractive method of implementation of the mentioned megaprojects.

Future integral transit, high-speed and super-speed transport systems will be built on the principles of reasonable intermodality, unifying if necessary all the existing mode of transportation, comprising also those which are now being developed, like «atmospheric» magnetic levitation, new amphibious (not requiring aerodromes), balloons, lighter-than-air airships, and other modes. And it becomes evident (the results of the researches of scientists prove it) that vacuum tube transportation technology based on magnetic levitation is unmatched in its power and transport effectiveness, environmental friendly features, weather «independence», and regarding long-term outlook could become core for transcontinental transport system.

*It is necessary to mention another important aspect of the topic. Internet sources, some reports at scientific conferences, publications associate technology of vacuum and levitation transport systems with so called «ET3 technology» (**E**vacuated **T**ube **T**ransportation **T**echnologies (E + 3 T)» and with Hyperloop project.*

Basing on ET3 technology Daryl Oster founded in 1997 in the United States an open consortium of licensees called «ET3 – Global Alliance». Alliance was organized to create global transport system using passenger capsules magnetically elevated, sized like a passenger car, and moving in vacuum tubes of 1,5 m (5 ft) diameter. In 2014 ET3 presented a set of new patents in the field of magnetic levitation based on high-temperature superconductivity. The official Web-site announced that by 2016 more than 380 licenses have been sold to 22 countries, comprising China.

As a matter of fact, main principles of the concept of the transport using magnetic levitation in artificially created evacuated vacuum environment within sealed tube or pipeline were formulated, developed and verified for the first time by Boris P. Veinberg, well known Russian geo-scientist, Professor of Tomsk institute of technology in 1914, in last century, more than 100 years ago.

Main causes of such phenomenon are not linked to the mentality of Russian scientists or to the lack of business spirit but rather to the Russian patent laws that stipulate that it is impossible to patent conceptual idea, e.g. basis of invention. So it is impossible to patent a concept in Russia, it is necessary to produce type model. Civil code of Russia (Federal Law No. 230, dated December 18, 2006, revised in 2014) maintained all the articles of previously acted Russian Patent law. The article 1350, p. 5 tells us that 1) discoveries, 2) scientific theory or mathematical methods... are not inventions.

I would like to hope that the collective monograph of Russian scientists will be of interest not only for researchers and inventors themselves but will contribute to development of renewed plans of researches in the Russian Academy of Sciences, Ministry of Transport, JSC Russian Railways, other leading companies, and universities, and probably will be an occasion to modify «unfair» patent laws.

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