THE PHASES OF DEVELOPMENT OF RAILWAYS

Review of the book: **Levin, D. Yu.** *The history of railway transport: Study guide [Istoriya zheleznodorozhnogo transporta: Ucheb. posobie]. Rostov-on-Don, Phoenix publ., 2018, 414 p.*

ABSTRACT OF THE BOOK

The reviewed tutorial contains information on precursors of the history, emergence, and development of railways; on evolution of the infrastructure, of the rolling stock, and of the IT of railways; on development of traffic control, structural changes, technical and commercial improvement of railways' operations. The tutorial is intended for the students of railway universities, attendees of the continious learning courses, experts and employees of different transport companies.

Keywords: *history, development, railways, private railways, public railways.*

The history of railways is a combination of development of nature, thinking and knowledge of people, technology and equipment, economics and politics. At first conditions developed for emergence of railway transport. Then – awareness of the need to build railways. And then the railway transport began to stimulate development of the economy, development of new territories, international relations, expansion of human needs.

The history of development of railway transport is an interesting, but very complex subject for research and study. Apparently, therefore, there are very few publications on this topic. But the study of history is necessary. Only well knowing the history of development of any transportation process, it is possible to correctly assess the situation in which we are today and, what is very important, outline the trends for further development of the railway network, rolling stock and technology. And this, in turn, will allow making right and informed decisions for the near future and for the future.

The story largely explains the current state. The history of railways is an introduction to all the subjects studied by the students, it is the memory of their predecessors, their heroic work, and bold ideas. What seems obvious today arose earlier in someone's imagination, then, as a rule, it went through a difficult struggle before it became everyday reality. From this point of view, it is very interesting to trace how the railways arose. And how much strength and energy it took to start building them, including in our country.

History teaches us to respect the pioneers, to appreciate what they have done. Even if the original idea has changed beyond recognition. But it stimulates further development.

In all countries of the world, railway transport developed at different rates, but, nevertheless, the book revealed general patterns. The five main stages of development of railways in the world are considered:

The first stage, from 1825 to 1860s, is the stage of initial development of railways, construction of railways covers all continents. This stage is characterized by insignificant development of the network (with the exception for the United States and Great Britain), the use of relatively simple technical means – small-capacity locomotives, two-axle cars (Russia and the United States used four-axle), simple signaling systems, telegraph communication, control of individual lines is local.

The second stage, from the 1860s to the First World War, is a stage of rapid development and creation of railway networks all over the world, creation of basic technical means, complication of control systems, and dispatching of train traffic control by sections. In 1910, the length of the global railway network exceeded 1 million km.

The third stage was the period between the First and Second World Wars, when the railways were the main type of land transport and accounted for the bulk of freight and passenger traffic. There was extremely weak competition of other modes of transport. Powerful steam locomotives and cars, powerful track structures are being introduced, electric and diesel traction are being developed. Railways are quickly equipped with more modern means of automation, remote control and communications, radio communications are being introduced.

The fourth stage was from 1945 to the 1980s. The outflow of goods and passengers for transportation by air, road and pipeline transport becomes characteristic in many developed countries. In the USSR, the volume of traffic on railways during this period grew rapidly.

The fifth, modern stage from the 1980s to the present is characterized by introduction of new equipment and technologies on railways, especially in the field of management. Large dispatch centers are being created, information and intellectual technologies are widely used for management. Efficient locomotives, heavy cars are being introduced, load on an axle of freight cars reaches 30 tons/axle, and a network of high-speed railways is being developed.

In the historical aspect, it is of interest to characterize the organizational structures of railway transport in different countries:

1st type. All railways in a country belong to the state and are managed by a single state body, usually a ministry. The network is divided into divisions – districts, railways, railway branches. The railways owned all the technical means – track, signaling and communication devices, locomotives, cars, station facilities. The car fleet belongs to the state railway, is in common use and is regulated from a single management body (ministry). Such a structure was, for example, in the USSR, in most European countries before the reforms in the 1980s. Today, this structure operates on the railways of China (PRC) and in several other countries. Technical and technological standards are being created for the entire managed network, as well as unified management principles for the entire vertical of operational management.

2nd type. The country's railways are owned by private companies (joint-stock companies), each of them independently manages its own railway (-s). And railway owners sign cooperation agreements. Each railway has both infrastructure and rolling stock.

With the development of information technologies, to increase the level of operational management, groups of private railways began to create associations having a common data bank (loading, unloading, condition and distribution of the car fleet, organization of car repairs, etc.). The association may include the railways of neighboring states. This is how the US railways, which have always been private, are organized. The Association of American Railways includes the Canadian and Mexican railways, and a single information bank has been created. A similar data bank has been created for railways of European countries.

3rd type. In one country, railways can be public (state-owned) or private. This is how the railways developed in Russia until 1918 (before nationalization), although the ratio between the number of public and private railways had been constantly changing.

4th type. The division of rail transport into its component parts (basic infrastructure, rolling stock, carrier companies) with elimination of railways as a single structure. In 1960–1970 the role of railways in European countries was steadily declining. One of the reasons for the decline in competitiveness of railways was recognized by the fact that, as compared with road transport, the railway tariff also includes infrastructure fees. On road transport, road maintenance is usually carried out at the expense of the state budget. In passenger transportation, the role of aviation grew rapidly, and in freight transportation, the role of road transport grew as well. In the 1970s–1980s, public railways began to be divided into component parts. On this issue, the EU has adopted an appropriate directive obliging states to implement this plan. To certain extent this approach is implemented in Russia as well. This principle of the structure of railways was adopted by several countries in South America, Africa and Asia.

The prehistory of emergence of railways is considered in the book with the use of track roads in Egypt, Ancient Greece and Ancient Rome. Progress in industry and transport at the end of 18th century was associated with emergence of the heat engine, which ensured conversion of water vapor energy into mechanical work and driving of machinery and mechanisms.

The project of the world's first continuous-state steam engine was developed in 1763 by the Russian heat engineer I. I. Polzunov, but he failed to implement this project. The universal dual action steam engine was created by the Englishman James Watt (1784). Such a machine was needed to create a self-propelled vehicle. The history of emergence and improvement of steam locomotives began.

On September 27, 1825, the first locomotive with a train weighing 90 tons, consisting of 34 freight and passenger carriages-cars, passed between Stockton and Darlington. This day is celebrated as the World Day of beginning of the railway traffic on public roads.

The appearance of rail transport in Russia is associated with the mining and smelting industry. In 1788, A. S. Yartsev built a cast-iron road at the Aleksandrovsky Cannon Plant in Petrozavodsk to transport goods between the workshops.

In 1809, engineer P. K. Frolov developed the project and built a horse-drawn railroad from the Zmeinogorsky mine to the Korbalikhinsky silver smelting plant

The first railroad in Russia with steam was built in 1834 at the Nizhny Tagil Metallurgical Plant of the Demidovs. It was the result of many years of creative work of talented serf masters, craftsmen: the father Efim Alexandrovich and the son Miron Efimovich Cherepanovs. But the Cherepanovs' railway is not considered to be the first in Russia, as it relates not to the main, but to industrial transport.

The official opening of Tsarskoye Selo railway, the first mainline railway, took place on October 30, 1837. The opening of St. Petersburg–Moscow main line took place on November 1, 1851.

The book lucidly and widely using the facts sets out: evolution of technical progress in railway transport, development of the transportation process management system, changes in organizational structures of railway transport, development of traffic flow management, improvement of train traffic management, development of traffic control dispatching.

The book adequately reflects the history of development of domestic and foreign railways and gives a complete and systematic presentation of the historical process of improving of all components of the operation of railway transport.

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