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THE CURRENT STATE AND PROSPECTS FOR THE DEVELOPMENT OF THE RUSSIAN MACHINE-BUILDING COMPLEX INTRODUCTION

Abstract. This article is dedicated to the problem of engineering industry development in 2010-2012. Machine building crisis of 90s is addressed. The dynamics of the machine-building complex is shown. The main focus is made on the branches of engineering - heavy machinery and machine tools building. Statistics on heavy engineering and machine tool building is analyzed. The production of equipment for the light industry is named as an important branch of national economy. Functioning sectors of machinery building is divided on transport engineering and automotive industry. It is stressed that manufacture of railway equipment in Russia in 2010-2012 has been stabilized. Among the tendencies of engineering industry development, several important factors are mentioned. Production of electronic equipment will approach soon the level of 1990. Production of trucks is expected to increase to 450-500 thousand cars per year. The overall results of the development of Russian machine-building complex is going to increase in the recent years.

Keywords: machine-building complex, heavy engineering, manufacturing of the railway equipment.

Mechanical engineering is a major industry of economics. It creates a material basis for the progressive development of industry and entire economy. After 1990 machine-building complex of Russia entered a period of deep crisis. The crisis effects on industry of machine tools, production of mining equipment, locomotive, the production of trucks and agricultural machinery.

In this article, we will explore the development of machine-building complex in 2010–2012. Consequences of the crisis have not been overcome yet.

Let us consider how mechanical engineering being the most important branch of the national economy and industry and the branch, which has been staggered by the crisis of 90-es most deeply, was developing during years 2010-2012. The dynamics of machine-building production is reflected¹ in Table 1.

Mechanical engineering plays an exceptional role not only in industrial development but in the development of all other sectors of the economy as well by providing them with capital assets and supplying the population of the country with consumer durables. The core (bearing) branches of mechanical engineering are heavy engineering and machine-tool construction. Heavy engineering statistics indicates that the production of power engineering equipment is consistently increasing, the maximum decline in its production fell on 2000, when the turbines production rate equaled to 2.1 million kilowatts, however in 2010 it was already 9.2 million kilowatts, which is 4.38 times more. The branch of heavy engineering, within which the mining equipment is manufactured, is running down as heading machines production is constantly decreasing. Within the period from 1990 to 2010 manufacturing of the heading machines was reduced by 7.52 times. Let us consider the machine-tool construction development. The machine-tool construction suffered heavy losses during the years of economic reforms. Production of the lathes and the forging machines dropped ten times (!). During years 2010-2012 a trend towards stabilization of production at the machine-tools enterprises appeared and the metal-cutting lathes production increased during years 2010-2012 by 70%. Gradually the numerically controlled lathes production is also growing, while it was 130 lathes produced in 2010 in 2012 it was already 166. The forging machines² production became almost stable in the amount of 2.2–2.1 thousand units, it is certainly not enough for the Russian economy, but stabilization of the production should make us a little more optimistic.

A full-scale presentation of the construction and road machinery production statistics is displayed by the table. It is possible to state that after 1991 the industry experienced a significant decline in production

¹ Russia in Figures of 2012. *Statistical Collection. The Russian State Statistics Committee*. Moscow, 2014.

² Tsvetkov, K.L. (2013). *The Russian Productive Forces Development (Problems and Prospects of the Russian Economy)*. Moscow, "Sputnik +" publishing house.

Tab. 1

Production of main types of machinery and equipment

Product name	Measuring unit	1990	1995	2000	2005	2010	2012
Turbines							
Turbines	million kilowatts	12.5	5.1	2.1	5.0	9.2	7.9
Heading machines	piece	406	128	93	80	54	-
Metal-cutting lathes	thousand pieces	74.2	18.0	8.9	4.9	2.0	3.4
Including numerically controlled lathes	thousand pieces	16.7	0.28	0.18	0.28	0.13	0.166
Forging machines	thousand pieces	27.3	2.2	1.2	1.5	2.2	2.1
Electric overhead cranes (including special ones)	piece	2943	370	638	729	2500	3000
Wheel-mounted cranes	thousand pieces	14.0	3.7	2.4	4.7	2.9	4.8
Tower cranes with 5 tons and above carrying capacity	piece	2526	130	36	286	62	152
Excavators	thousand pieces	23.1	5.2	3.4	3.6	2.1	1.9
Bulldozers	thousand pieces	14.1	2.4	3.0	1.8	0.91	1.37
Motor graders	thousand pieces	4.8	1.2	1.7	1.0	0.94	0.86
Wheeled tractors	thousand pieces	92.6	10.8	6.9	4.5	6.9	13.6
Tractor-mounted sowers	thousand pieces	51.1	1.6	5.2	6.5	1.8	2.3
Tractor-drawn cultivators	thousand pieces	101	2.0	4.7	8.8	25.6	24.2
Grain combine harvesters	thousand pieces	65.7	6.2	5.2	7.5	4.3	5.8
Forage combine harvesters	thousand pieces	10.1	0.5	0.5	0.7	0.3	0.9
Feed grinders	thousand pieces	0.4	1.1	2.3	3.2	81.1	89.1
Milking machines	thousand pieces	30.7	0.53	0.39	0.33	8.0	3.6
Crawler-mounted tractors	thousand pieces	121	10.4	12.4	4.1	0.8	1.23
Spinning machines	thousand pieces	1.51	0.13	0.008	0.02	-	-
Weaving looms	thousand pieces	18.34	1.89	0.095	0.095	0.003	0.064

but the situation has stabilized by 2010-2012, thus the overhead cranes production increased by 12% for that period, the wheel-mounted cranes manufacturing rose by 65.5% (but still was behind the level of 1990), and the production of bulldozers increased by 50.5%. In 2010-2012 the restoration of manufacturing of the tower cranes, which are the most important construction units, was set in. Their production increased by 2.45 times during years 2010-2012. At the same time the decline in the production of excavators (9.6%) and motor graders (8.6%) continued. Basing on the statistics one can conclude the following:

– Production within the branch in point is most closely connected with the situation in the Russian construction industry because a vast scale of house building [including cottage one] as well as road construction in our country is being conducted, and then the production of the equipment essential for these types of activities is mostly demanded.

– There is a need to improve the quality, to increase the specific capacity, reliability, maintainability and the ability to work in severe frosts and the ergonomics of the machinery produced at the machine-building enterprises.

Next the production of the agricultural machinery and equipment is going to be analyzed. The stabilization of production is characteristic of that branch of the machine-building complex. For instance, production of the grain combine harvesters increased by 34.88% within 2010-2012 [but in relation to 1990 it fell by 11.3 times in 2012]. Tractors production also increased. The output increased by 97.1% regarding the wheeled tractors and by 53.8% regarding the crawler-mounted tractors during 2010-2012 [however, this does not compensate for the decline in production after 1990³]. Production of the feed grinders is being stepped up successfully while production of the tractor-drawn cultivators and the tractor-mounted sowers is being restored. It is impossible to revive the machine-building sector without the grain combine harvesters and tractors production being restored. In our opinion, manufacturing should be increased to 20-30 thousand pieces of the grain harvesters and to 5-8 thousand pieces of the forage harvesters, it is also necessary to restore the production of the potato harvesters and to extend the output of the wheeled tractors to 35-40 thousand pieces and to 20-24 thousand pieces of the crawler-mounted tractors.

Production of the equipment for the light industry is the next step of our observation. There is extremely scarce information about this sector in a statistical collection of the State Statistics Committee, however the depiction of manufacturing during 2010-2012 can be based even on these data. It gives facts about the spinning machines only for 2005 when 20 spinning machines were produced; manufacturing of the weaving looms quickened in 2012 and amounted to 64 pieces produced. It is an indisputable progress comparing to 3 pieces produced in 2010, but does not meet the demand of the Russian textile industry.

The table below represents the production within the transport engineering and the automobile industry in 2010-2012⁴.

Tab. 2

The railway equipment manufacturing

Product name	Measuring unit	1990	1995	2000	2005	2010	2012
Electric locomotives production							
unit	unit	46	12	21	45	33	42
thousand horsepower	thousand horsepower	-	48	84	-	-	-
Diesel locomotives production							
piece	piece	-	15	19	-	-	-
thousand horsepower	thousand horsepower	-	102	114	-	-	-
Main-line freight cars	thousand pieces	25.1	7.1	4.0	35.2	50.5	71.7
Main-line passenger cars	piece	1225	489	802	1221	1200	880
Including electric train cars	piece	-	211	398	-	-	-
Tram-cars	piece	-	293	72	-	-	-
Underground railway car	piece	307	202	32	262	-	-

³ Tsvetkov, K.L. (2013). *The Russian Productive Forces Development (Problems and Prospects of the Russian Economy)*. Moscow, "Sputnik +" publishing house.

⁴ Russia in Figures of 2012. *Statistical Collection. The Russian State Statistics Committee*. Moscow, 2014.

Tab. 3

The automobile industry output

Product name	Measuring unit	1990	1995	2000	2005	2010	2012
Trolley buses	piece	2308	340	498	812	397	390
Trucks	thousand pieces	665	142	184	205	156	212
Passenger cars	thousand pieces	1103	835	969	1069	1210	1964
Buses	thousand pieces	51.9	39.8	54.0	78.2	40.9	58.0
Motorcycles and motor-scooters	thousand pieces	765	70.3	29.1	10.2	10.7	26.8

Manufacturing of the railway equipment in Russia became stable in 2010-2012. Production of electric locomotives came close to the level of 1990. There are no data on diesel locomotives production in the table, but the literary sources provide some information about the stabilization of the diesel locomotives production. Production of the passenger cars is successfully developing and, even there was a decline in production by 26.7% in 2010-2012, production capacities created allow the Russian companies to produce 1200-1250 cars in a year, which covers the needs of passenger transportation and exports. Manufacturing of the freight cars is growing rapidly; there is a high export quota in this product segment for years 2010-2012.

Let us examine the development of the automobile industry in 2010-2012. During that period production of the passenger cars, buses, motorcycles and scooters was growing up. Thus manufacturing increased by 62.3% regarding the passenger cars, by 41.8% regarding the buses and by 150.5% regarding the motorcycles and scooters. Production of the passenger cars and the buses is developing successfully. The level of the motorcycles and scooters production of 2010 is a "crouch start" and, accordingly, the production of this machinery is expected to increase greatly. Production of trucks is to be considered next. Since 1995, when production of the trucks decreased by 78.7% [compared to the rate of 1990], it has stabilized at that level, and though it periodically grew up to 200 thousand pieces, production of the trucks cannot be ascertained as stable. We are of the opinion that production of the freight vehicles should be increased up to 450-500 thousand pieces per year along with corresponding improvement in their quality.

Conclusions.

To sum up everything written about the Russian machine-building complex development let us formulate the following proposals for its revival⁵.

Mechanical engineering as a branch of industry has suffered the greatest losses under the economic reforms. The production for the majority of industries within the machine-building complex has significantly decreased and has not been restored so far; manufacturing has decreased by 2-20 times and even more. The most intensive production decline is observed in the industries which determine the technological progress - the program-controlled equipment production has been reduced by tens times, the production of the automated lines for mechanical engineering has been cut down by hundreds times, the technical restructuring of production under the transition to the market economy has turned into the machine-building complex technical degradation.

The machinery production cutback has had the most negative impact on the fixed assets renewal both in mechanical engineering and in the other sectors of the economy. A number of technological disasters clearly shows that the degree of the industrial, transport, agricultural and public services fixed assets depreciation is growing.

The production curtailment in mechanical engineering has resulted in the personnel potential degradation in the highly technical industries, in the reinforcement of the raw material orientation of the Russian economy.

The machine-building complex restoration should become a priority national program including the personnel potential recovery and carrying out agreements with the leading machine-building companies of the world on technical reconstruction of the mechanical engineering enterprises and production of the up-to-day equipment at them.

The Ministry of Education, the Ministry of Industry, Science and Technology are to increase the number of qualified personnel they prepare at all the levels including higher, secondary and secondary vocational

⁵ Tsvetkov, K.L. (2013). *The Russian Productive Forces Development (Problems and Prospects of the Russian Economy)*. Moscow, "Sputnik +" publishing house.

education, with the special attention paid to the training of design and research personnel as well as of highly-skilled workers.

The primary task faced by the Ministry of Industry, Science and Technology is the revival of the Russian machine-tool construction (and of the other industries producing formative units). It is also needed to set up the Federal center of machine-tool construction on the basis of Experimental Research Institute of Metal-cutting Machine Tools.

The Ministry of Industry, Science and Technology and the machine-building companies are to carry out technical reconstruction of the industry and to master manufacturing of the new products, especially of the following types of machines and equipment:

- Drilling equipment, including those for underwater oil and gas extraction at high latitudes⁶.
- Equipment for coal mining, that is winning and stopping equipment.
- All types of the metal-cutting machines which meet the modern quality requirements, the machining centers, the numerically controlled lathes, the up-to-date forging and foundry machines, the automated lines for mechanical engineering, the modern welding equipment.
- The locomotives (diesel and electric), including high-power ones, and the electric locomotives for high-speed passenger trains carrying; the container cars integrated with the road transport.
- The river and ocean vessels of various types, including the high-power barges; the river-marine vessels; reinforced hull crafts for use in high latitudes; the shallow draft icebreakers for operating at the shelf zone of the Arctic Ocean and in the northern rivers estuaries; rescue and fire-fighting tugs, including the icebreakers designed for the fire suppression at the offshore platforms located in the Arctic Ocean seas.
- The high-performance diesel engines for the trucks and the passenger cars, the high-power trucks, the truck-tractors, the light trucks, including ones for countryside usage.
- The tractors and combines, including ones adapted to work in farms; the forage-making machines, the up-to-date elevator equipment, the equipment for vegetable storage, the reclamative engineering equipment.

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⁶ Karpova, N.S. (2014). *International Gas Projects in Russia: The European Alliance and Strategic Alternatives*. Moscow, "Nauka" publishing house.