DOI: https://doi.org/10.30932/1992-3252-2021-19-1-156-173

International Transportation of Heavy and Oversized Cargo: Example of Haulage of Components of Wind Power Plant



Tatiana N. PASHKOVA **Nadezhda A. FILIPPOVA** **Anastasia N. POZDNYAK**

Pashkova, Tatiana N., *General Survey Company LLC, Scientific and Research Institute of Motor Transport, Moscow, Russia.*
Filippova, Nadezhda A., *Moscow Automobile and Road Construction State Technical University, Moscow, Russia.*
Pozdnyak, Anastasia N., *Russian Presidential Academy of National Economy and Public Administration, Moscow, Russia *.*

ABSTRACT

Heavy and oversized transportation requires solving a whole range of tasks, such as choosing a suitable method of customs clearance and of a customs post, determining the optimal route, correctly selecting vehicles, ensuring safety of related infrastructure, and road traffic, such as the width of the carriageway, height and width of bridges, tunnels, power lines, ordering permits for travel on certain road segments, ordering heavy and oversized cargo escorting service, providing the special labour regime and working conditions for drivers.

The objective of the study was to provide options for solving the listed issues and offer choice of best modes of transport, routes of delivery of heavy and oversized cargo.

This article based on the example of multimodal supply of components of wind power plant through the Russian national and foreign territory analyses issues of choosing a mode of transport for multimodal transportation of heavy and oversized cargo; of individuality of routes for movement of goods with non-standard weight and size characteristics; of developing a survey route, and of preliminary preparing transportation of heavy and oversized cargo. Identification of difficulties faced by participants in similar projects, helped to reveal preliminary solutions which might increase the efficiency of any individual transportation. Described features of transportation of this kind of cargo in Russia focused particularly on customs regulations governing crossing of the border of the Russian Federation by multicomponent goods. Since about 70 % of total «door-to-door» transportation, comprising haulage of heavy and oversized cargo, are performed by road transport, the article highlights the road transportation segment.

The conclusion suggests that the main task when developing a route is to ensure safety of cargo transportation. The identified phases comprise choosing and calculating the route, the coordination of obtaining permits for transportation of heavy and oversized cargo with various organisations on different segments of the route. Solutions for import customs clearance of multicomponent disassembled cargo, particularly in case of non-simultaneous delivery, are examined.

Keywords: transport, heavy and oversized cargo, road transport, multimodal transportation, transportation, wind power plant, survey, survey route, survey companies.

*Information about the authors:
Pashkova, Tatiana N. – director of Moscow branch of General Survey Company LLC, Ph.D. student of JSC Scientific and Research Institute of Motor Transport (JSC NIIAT), Moscow, Russia, t_pashkova@mail.ru.
Filippova, Nadezhda A. – D.Sc. (Eng), Associate Professor at the Department of Road Transportation of Moscow Automobile and Road Construction State Technical University (MADI), Moscow, Russia, ✉ madizp@mail.ru.
Pozdnyak, Anastasia N. – Master's student at the faculty of Higher Corporate Governance and Management of Russian Presidential Academy of National Economy and Public Administration, Moscow, Russia, pozdnyak1104@mail.ru.

Article received 24.09.2020, revised 17.12.2020, accepted 26.02.2021.

For the original Russian text of the article please see p. 156.

INTRODUCTION

It is commonly accepted that oversized cargo transportation refers to moving overweight and bulky loads that exceed the authorized weight limits and dimensions from a point of origin to a desired destination[1] or, in other words, in a specific region via which transportation of cargo takes place[2].

Before changes in situation following Coronavirus pandemics the global oversized cargo transportation market, according to ResearchAndMarkets, stood at around $ 233 billion in 2018 and was projected to cross $ 315 billion by 2024 on account of increasing global trade[1].

Rapid industrialisation and increasing environmental issues, as well as increase in trade policies across the globe and expansion of the construction industry were expected to accelerate the oversized cargo transportation market. Major factors driving the growth of the market for oversized cargo transportation in the road transportation category comprise the cost-effectiveness, high loading capacity, technological advancements in logistics industry and improved connectivity of road transportation because of development of trade routes[1].

Restraining factors comprise higher capital investments and maintenance of overall oversized cargo transportation since it requires special equipment, machinery, escort, cargo space, advance agreements, permits, and knowledge[2].

Many research publications have been recently dedicated to different aspects of heavy and oversized transportation. The topics have referred to safety provisions, obtaining special permits, penalty for violations [1–2], transportation through road-and-street network [3], optimal choice of modes of transport, transportation mode [4], and selection of routes [5–7].

Regionally, the global oversized cargo transportation market is categorised into Asia-Pacific, Europe, North America, Middle East & Africa and South America[1].

The study is dedicated to the features of organisation of heavy and oversized cargo in Russia.

Until March 2020, there was a steady growth in transportation of heavy and oversized cargo in domestic and international traffic. Cargo owners from various industries had long-term contracts for supply of innovative equipment for modernisation of production or for supply of equipment for mining and oil industries, etc. This was determined by economic growth rates. Russian industrial production, energy, mining, and manufacturing industries were increasing yearly by more than 2–4 %. For example, in 2018, industrial production increased by 2,9 %, mining industry – by 4,1 %, and manufacturing – by 2,6 %. In 2019, the positive dynamics of industrial production growth continued (2,6 % in annual terms). The increase in the output of the mining industry was 4,0 %, and the manufacturing industry – 1,9 %[3]. Accordingly, the volume of supplied machinery and specialised equipment for servicing new capacities in these industries was increasing resulted in a steady growth and demand for integrated logistics services for supply of construction and special equipment, industrial machinery, and other heavy and oversized cargo.

The coronavirus pandemic in 2020 changed the situation. Some Russian enterprises either suspended their work during the pandemic or worked at minimum capacity. Transportation of goods in international traffic was severely restrained, while tariffs on transportation in some directions increased significantly. Some contracts in foreign traffic were suspended due to force majeure. The logistics market also suffered greatly, significantly reorienting freight haulage to transport general cargo, reducing the volume of heavy and oversized transportation.

Nevertheless, after the termination of the impact of pandemic factors the trend towards the growth of heavy and oversized transportation is expected to resume.

Hence, it is relevant to continue studying features of heavy and oversized transportation related not only to the use of specialised

---

[1] [Electronic resource]: https://www.researchandmarkets.com/reports/4804151/global-oversized-cargo-transportation-market-by. November 2019. Last accessed 24.09.2020.

[2] [Electronic resource]: https://www.transparencymarketresearch.com/oversized-cargo-transportation-market.html. Last accessed 24.09.2020.

[3] Dynamics of industrial production in Russia: outstripping growth in the mining sector [*Dinamika promyshlennogo proizvodstva v Rossii: operezhayushchiu rost dobyvayushchego sektora*]. Bulletin on current trends in the Russian economy. [Electronic resource]: https://ac.gov.ru/archive/files/publication/a/23445.pdf. Last accessed 24.09.2020.

vehicles but also based on the necessity to consider many other aspects allowing prompt and safe supply of cargo to destination comprising training of employees (e.g., [8–9]), updating methods and relevant recommendations [10].

The objective of the study was to present options for solving the listed issues and offer choice of best modes of transport, routes of delivery of heavy and oversized cargo considering both global trends and Russian conditions.

Important condition is that dynamically developing road transport occupies about 70 % of the total market of «door-to-door» transportation, comprising haulage of heavy and oversized cargo[4]. So, regardless of the total length of the route its main inland part is performed by trucks. Based on that, most issues will regard different aspects of road transportation of heavy and oversized cargo. To consider practical aspects the study used an example of performed transportation of heavy and oversized cargo.

RESULTS

Initial data and customs issues

Let us consider the project of transportation of components of a Wind Power Plant (WPP) in international transportation from Germany to Russia as an example of transportation of abnormal cargo.

Initial data of the project at the time of signing the contract of freight forwarding services (FFS) provided for supply in 2019 of:

1. 60 sets of WPP disassembled.
2. Two supplier factories (the cities of Aurich and Magdeburg, Germany).
3. Single destination (Republic of Adygea, Shovgen district, Zarevo settlement).
4. Shipment was carried out in accordance with the approved weekly schedule of cargo readiness.
5. Optimal terms for delivery of goods from the supplier to the client were established.

The logistics operator, according to FFS contract, had the following tasks:

• Organisation of multimodal and direct transportation along the route Germany–Russia.

• Observance of the optimal transit time for delivery to the destination.

• Compliance with the agreed contract cost of transportation.

• Timely obtaining of permits for transportation of oversized and heavy cargo[5].

• Organisation of loading and unloading operations at all stages of transportation.

• Provision of covering material and protection of cargoes from precipitation along the entire route.

• Providing a surveyor report at each phase of loading and unloading operations along the route, including the place of destination.

• Daily monitoring of location positioning of goods [11].

• Cargo insurance along the entire route [12].

• Supply of vehicles to the place of loading within the agreed time frame.

The wind power plant is a complex of interconnected equipment and structures, which is designed to convert wind energy into electricity, heat, etc. This approach to power production is environmentally friendly and low cost, which has recently become very important.

The main components of an industrial wind plant:

1. Foundation.
2. Tower footing equipment block.
3. Tower.
4. Ladder.
5. Swivel mechanism.
6. Nacelle.
7. Electric generator.
8. Wind monitoring system.
9. Brake.
10. Transmission.
11. Hub.
12. Blades.
13. Pitch control system.
14. Fairing.

The set of WPP components supplied in accordance with FFS contract comprised:

1. Electric generator – 46 pcs.
2. Nacelle– 60 pcs.
3. Hub – 60 pcs.

[4] Overview of the freight industry in Russia in 2019. [Electronic resource]: https://www.ey.com/ru_ru/automotive-transportation/ey-transportation-services-2019. Last accessed 24.09.2020.

[5] Instructions for transportation of heavy and oversized cargo by road on the roads of the Russian Federation, approved by the Ministry of Transport of Russia and agreed with the Ministry of Internal Affairs of the Russian Federation [*Instruktsiya po perevozke KTG avtomobilnym transportom po dorogam RF, utverzhdennaya Mintransom Rossii i soglasovannaya s MVD RF*]. Moscow, 1996.

4. Block of equipment to be situated at the tower foundation – 60 pcs.

Each part of WPP has its own features, so both the route and method of delivery from Germany to Russia were individual for each component due to the different weight and size characteristics of cargo [13].

Production of equipment of this scale requires a certain amount of time and is delivered, in most cases as soon as it is ready. Hence, this results in a complexity of customs clearance while importing in the Russian Federation of a batch (set) using a single commodity code [as by commodity nomenclature of foreign economic activity of Eurasian Economic Union], and not separate codes of commodity items in each batch. This issue, which often causes difficulty for some carriers and importers, is resolved by obtaining a classification decision (hereinafter – CD). CD is a document issued by Federal Customs Service, allowing import of disassembled or unassembled equipment, as well as a part of complete batch, or a part of continued supply, using a single commodity code, which makes it possible to significantly facilitate the process of customs clearance and eliminate the risks of unjustified additional charging of customs payments. The disadvantages of CD are associated with impossibility of customs clearance of import through different customs posts, which affects the route of transportation.

An application for a CD is submitted to the Commodity Nomenclature Department of the Federal Customs Service of Russia (FCS) only for identified groups of goods. Based on the provided description and documents for the goods, FCS may decide to assign a particular single code but if the applicant disagrees with the assigned code, it is only possible to put the cause before the court after importing goods under this CD.

Specifically, for this project, CD was received no later than 90 days from the date of filing an application with FCS, as required by law, and the assigned code coincided with the expectations of the importer and other experts of the applicant and of the manufacturer on classification of goods.

Features of the transportation of WPP elements

Let's consider the history of transportation of each element of WPP separately.

1. Electric generator

Dimensions (according to FFS contract): 4500 × 4500 × 2250 mm.

Weight (according to FFS contract): 56000 kg.

Weight and size characteristics of electric generators significantly exceeded the standard ones, so the main transportation was by sea. At the first phase, generators were transported by road, with a carrying capacity of 60 tons, along the route from Magdeburg to the port of Bremen (Germany). The generators were accumulated in the port to form a minimum batch of eight units.

Then a charter vessel was affreighted for the route Bremen–Novorossiysk. The generators were loaded and secured aboard the ship according to the developed schemes of the stevedoring company of the port of Bremen. At the request of the customer, sea transportation of generators was to be carried out only in the cargo hold (compartment) and with a spread awning.

After the generators were unloaded at Novorossiysk port, transit customs clearance was carried out. Then low-frame trawls with generators went to their destination with a mandatory stop at Prikubansky Customs post in the city of Belorechensk, Krasnodar region, to terminate the transit customs mode.

After completion of customs formalities, the power generators were sent to the place of delivery, where they were unloaded by the logistic operator (Pic. 1).

Import customs clearance was carried out on the territory of the temporary customs control zone (hereinafter – TCCZ).

Total length of the entire route was over 7 thousand kilometres. Transit time averaged 35 days.

As weight and dimensions of the generator exceeded the standards of general cargo, at each stage of road transportation (in Germany and in Russia), special permits were necessary[5]:

• On the section Magdeburg–Bremen port, 320 km long (permits were issued by the administration of the district of Osterholz. The permits were issued within 10–14 days after application).

• On the route the port of Novorossiysk–Belorechensk–Republic of Adygea, Shovgen district, Zarevo village (distance about 300 km).

Very often, logistics operators of transportation face the need to attract escort vehicles to ensure safety during transportation

of heavy and oversized cargo. It is necessary to apply for traffic police escort vehicles if the load exceeds 3,5 meters in width and/or 24 meters in length; if the width of the cargo exceeds 4 meters and/or length of a vehicle is 30 meters[6]. To apply for such permits and to obtain them, it is necessary to contact specialised agents or directly through the local branch of Rosavtodor [Russian Federal Road Agency] and the traffic police. It is worth noting that in the face of time constraints, obtaining the above permits on your own often does not bring financial benefits. Therefore, most carriers who do not regularly work with heavy and oversized cargo usually use the services of specialised agents. Agents can quickly obtain necessary approvals, troubleshoot issues and disputes, for example, get the latest information on road sections that are being repaired or closed. Permits were issued within 25–30 days.

2. Nacelle

Dimensions (according to FFS contract): 4886 × 3600 × 3635 mm.

Weight (according to FFS contract): 21 339 kg.

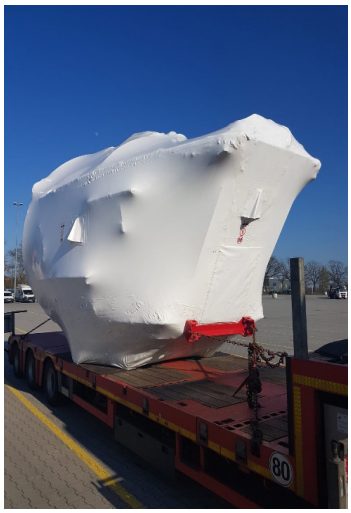
At the time of signing the contract, the logistics operator was planning to send gondolas along the route Aurich, Germany–Lubeck port, Germany–Bronka port, Russia–Zarevo village, Republic of Adygea, Russia/

Sea transportation was carried out by ferry service, two nacelles on one mafi (roll) trailer to the port of Bronka in St. Petersburg. After passing transit customs formalities, nacelles were loaded onto vehicles with a carrying capacity of 60 tons and departed to their destination in the Republic of Adygea.

This route made it possible to deliver nacelles to the unloading point in the shortest possible time. The total distance of the route is over 4000 km. Transit time was about 28 days.

After the first batch of gondolas was dispatched through the port of Bronka, the operator decided to transport nacelles through the port of Novorossiysk, since two nacelles in the first batch were damaged during loading and unloading operations in the Russian port. This solution further helped to optimise costs and minimise risks on the delivery route.

Pic. 1. Unloading the generator (provided by the authors).



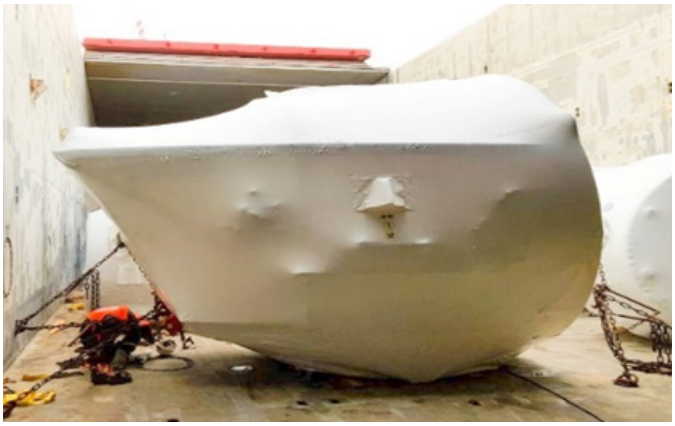
Pic. 2. Nacelle loading (provided by the authors).

The consequences of the change in the route led to urgent application for new permits in Germany and Russia.

The length of the new route was over 7000 km, and the transit period was about 35 days.

When implementing such projects, it is recommended to organise a surveyor control at each phase of loading and unloading operations. This approach helps to find in a short time a phase of business process where measures are needed to reduce the risk of damage to the cargo. And the risks, as it is known, are the highest part of the potential costs.

[6] Federal law «On state control over implementation of international road transportation and on liability for violation of the order of their implementation» of 24.07.1998 No. 127-FZ [*Federalniy zakon «O gosudarstvennom kontrole za osushchestvleniem mezhdunarodnykh avtomobilnykh perevozok i ob otvetstvennosti za narushenie poryadka ikh vypolneniya» ot om 24.07.1998 № 127-FZ*].



Pic. 3. Securing the nacelle on the vessel (provided by the authors).

There are a huge number of survey companies that professionally provide a service that is essential for heavy and oversized transportation. This is the so-called survey of the route of transportation and of other conditions related to the season of transportation, expected weather, repair or construction works on the route, safety and quality of the road, presence of possible obstacles such as power lines, bridges, crossings, sharp descents and climbs, sharp turns at an acute angle, etc.

Route survey is an integral part of any heavy and oversized transportation project, which saves a huge amount of money and reduces risks. The contract for the route survey provides for the transfer of the subrogation right from the carrier to the survey company, and this is one of the most important tactical manoeuvres to reduce risks. The survey company undertakes to work out the route, and, accordingly, assumes responsibility for reliability of this route. In case of an insured event on the route, the insurance company may send a claim not only to the final carrier but also to the survey company that compiled the route, if the insured event occurred due to poor-quality routing, and not, e.g., to errors of the driver who transported the cargo.

3. Hub

Dimensions (according to FFS contract): 3353 x 3326 x 3200 mm.

Weight (according to FFS contract): 24939 kg.

The hubs were delivered through two routes. The sea transportation with the first route passed from the port of Bremen to the port of Novorossiysk, while the second route passed from the port of Travemünde (Germany) to the port of Liepaja (Latvia). The hubs were loaded onto low-frame trawls in the city of Aurich and went to the port of Travemunde. Then trawls with cargo were loaded onto a ferry going to the port of Liepaja, where towing vehicles were coupled to trawls and went to Adygea.

The length of the entire route was about 3800 km, and delivery time was 20–25 days.

The second delivery method made it possible to minimise the risks of damage to cargo during loading and unloading operations in ports. And as the bulk of transportation was carried out by road transport, it became possible to significantly affect transit time, which was reduced by 10–15 days. In this regard, most of the hubs were transported to their destination using the second route.

4. Tower footing equipment block

Dimensions (according to FFS contract): 3580 x 2300 x 2120 mm.

Weight (according to FFS contract): 2 100 kg.

Weight and dimension characteristics of the tower footing equipment block were standard, therefore delivery of this cargo was carried out by eurotrucks with a carrying capacity of up to 20 tons. This transportation within the project was less labour-intensive, but during first deliveries a rational scheme of loading and securing cargo in a vehicle was developed to optimise the number of vehicles as well as to select high-quality cargo securing. The distribution of cargo in transport plays an important role for transportation, as it affects costs.

Pic. 4. Hubs loading-unloading operations (provided by the authors).

The distance is 3 400 km. Transit time was 7–8 days.

PROBLEM ASPECTS OF THE PROJECT

1. Deviation from weight and dimension characteristics of the goods declared in FFS contract

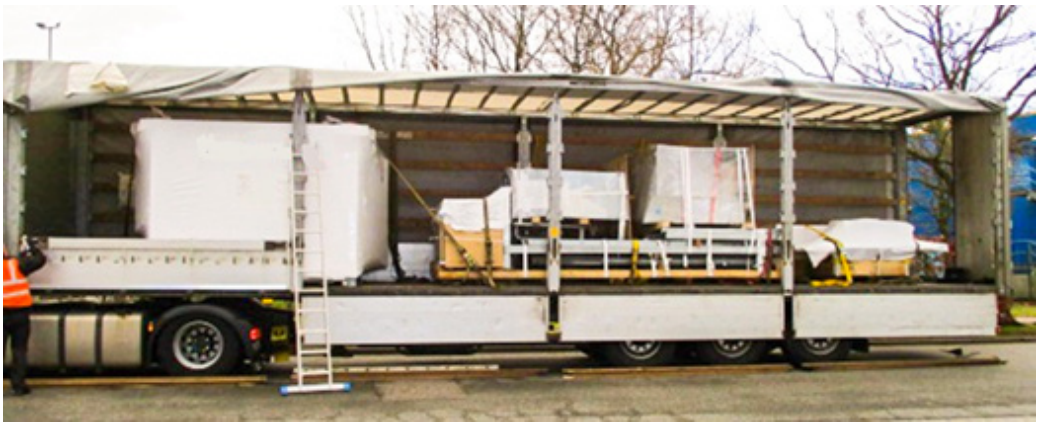
Some weight and dimension characteristics (Table 1) happened to deviate from those declared in FFS as it was found at the time of the first shipments of WPP parts. The compared numbers that changed to the higher side are highlighted in grey. This often happens with manufacturers engaged in producing unique, non-serial equipment. In this situation, the operator took prompt measures to adjust and update the permits considering new data, types and quantity of transport vehicles were also revised.

In this case, all information following additional analysis of new weight and dimensional parameters is transferred to the customer of the project, as well as all additional operations for organising transportation are agreed with the customer because of possible additional costs and an increase in transit time of delivery.

2. Failure to comply with the schedule of supply of WPP parts and their shipment

The signed schedule in FFS contract regarding readiness of WPP parts was not followed by the manufacturer, and instead of weekly shipments from the factories, the supplies were uneven and unpredictable. In this regard, the logistics operator promptly made decisions on withdrawal of WPP parts to additional storage sites after receiving information on sets manufacturing.

Due to untimely shipments from the factories, the project period increased by three months, which affected all business processes of WPP parts supply chain, and resulted consequently in additional costs. For example,



Pic. 5. Loading and securing the platform in the vehicle (provided by the authors).

Table 1

Weight and dimension characteristics of WPP parts (planned and actual)

Name of the component	Dimensions under FFS contract, mm (length × width × height)	Initial weight under FFS contract, kg	Actual dimensions, mm (length × width × height)	Actual weight, kg
Generator	**4500** x 4500 x **2250**	**56 000**	**4600** x 4480 x **2500**	**56 700**
Nacelle	4900 x 3600 x 3650	21 339	4900 x 3600 x 3650	20 500
Hub	**3353** x **3326** x 3200	24 939	**3424** x **3424** x 3200	20 500
Tower footing base	3580 x **2300** x **2120**	**2 100**	3450 x **2400** x **2200**	**2 500**

the operator had to additionally apply for permits for heavy and oversized transportation and to extend the period of obligations at the final destination in Zarevo village, regarding the crane operations.

3. Force majeure

During implementation of the project, there was an unplanned closure of a section of a road in Germany along the route from suppliers to the port of Bremen. To resolve this issue, it was necessary to obtain updated permits for an alternative route for the road transportation of heavy and oversized cargo [14]. It took about 14 additional days to settle these formalities. At this time, the goods were accumulated at the supplier's warehouse and then massively exported to the port of Bremen.

4. Insured event

During implementation of the project, a single insured event was recorded: two nacelles were damaged in the port of Bronka. To determine practical consequences (possibility of restoring the nacelles in Russia or returning the nacelles to the supplier in Germany), a survey inspection was organised with two invited independent companies. The result of the inspection showed that the hulls of the nacelles were damaged, and their repair is possible by Russian specialists at the site of the installation of the wind turbine. It is worth noting that due to the timely analysis of the damage to the cargo, it was not necessary to organise return of the nacelles to the plant in Germany and thereby it allowed to avoid additional customs procedures, losses of time for equipment restoration, significant additional costs, and, of course, delays in the installation of WPP.

5. Accompanying documents.

Since WPP parts passed customs clearance procedure under single CD per a set of wind turbines, all accompanying documents were agreed in accordance with the requirements of the Customs Code, and carefully checked before crossing the border of the Russian Federation. The logistics operator carefully monitored all the marks of the customs authorities during the registration of the internal customs transit mode and the application of stamps at the border of the Russian Federation. A temporary customs control zone was organized at the customer's construction site, where the incoming sets of WPP underwent import customs clearance in accordance with CD.

CONCLUSIONS

The example of the described project showed that a lot of preparatory work was carried out, and, despite the unforeseen arisen difficulties, all the goods were successfully delivered within the agreed conditions, according to the FFS contract.

Logistics operators execute most of heavy and oversized transportation projects following winning a tender, when it is impossible to agree or adjust the cost or terms of real delivery, as well as some other conditions on which reliability and speed of transportation depends [2].

Based on the above analysis of heavy and oversized transportation, it can be concluded that most of the problems that arise are of a systemic nature and predictability. But due to the uniqueness of each project, accumulation of the necessary information base for most logistics operators is slow, since the total number of heavy and oversized shipments is extremely small against the general background

of general cargo haulage. Therefore, companies specialised in heavy and oversized transportation have been working in this area for many years. The rest of the logistics companies rarely get such an opportunity, thereby preventing this service from seriously progressing within the company.

The core condition for successful implementation of any heavy and oversized transportation project, reducing risks and meeting deadlines supposed engaging third-party companies to perform highly specialised tasks, such as route surveys, obtaining permits, agreeing on the possibility and necessity of obtaining a CD, engaging specialists (surveyors) to control and create conditions for the conscientious work of terminal operators and services performing the functions of unloading, reloading, checking the condition of packaging and the cargo itself, etc.

It should be added that implementation of complex non-standard, abnormal transportations requires deep knowledge and expertise: analysis of the experience of transporting heavy and oversized cargo and existing vehicles used for transportation of oversized cargo; study of the influence of external and internal factors on the transportation process, analysis of regulations and possibilities to initiate amendments; development methods for choosing the most suitable vehicle for a specific cargo along the route considering the transport infrastructure; development of an algorithm for determining the dimension class. In the studied case, the project implementation resulted in options proposed for optimising multimodal heavy and oversized transportation in international traffic, development of a methodology for selecting contractors for organising multimodal heavy and oversized transportation, development of quality criteria for organising the transportation.

It should be noted as conclusion that transportation of heavy and oversized cargo is one of the most difficult fields of logistics in international traffic. It interacts very closely with many sectors of the economy, industry, trade. And those who have nevertheless decided to professionally engage in this difficult, but very important area, should be supported with a quote attributed to the great French politician Charles de Gaulle: «Always choose the most difficult way, there you will not meet competitors».

REFERENCES

1. Macioszek, E. Conditions of Oversize Cargo Transport. *Scientific Journal of Silesian University of Technology. Series Transport*, 2019, Vol. 102, pp. 109–117. ISSN: 0209-3324. DOI: https://doi.org/10.20858/sjsutst.2019.102.9. Last accessed 24.09.2020.

2. Macioszek, E. Oversize Cargo Transport in Road Transport – Problems and Issues. *Scientific Journal of Silesian University of Technology, Series Transport*, 2020, Vol. 108 (108), pp. 133–140. DOI:10.20858/sjsutst.2020.108.12. Last accessed 17.12.2020.

3. Wolnowska, A. E., Konicki, W. Multi-Criterial Analysis of Oversize Cargo Transport through the City, using the AHP Method. *Transportation Research Procedia*, 2019, Vol. 39, pp. 614–623. DOI: 10.1016/j.trpro.2019.06.063. Last accessed 24.09.2020.

4. Petraška A., Čižiūnienė, K., Prentkovskis, O., Jarašūnienė, A. Methodology of Selection of Heavy and Oversized Freight Transportation System. *Transport and Telecommunication*, 2018, Vol. 19, No. 1, pp. 45–58. DOI 10.2478/ttj-2018-0005. Last accessed 24.09.2020.

5. Bazaras, D., Batarliene, N., Palšaitis, R., Petraška, A. Optimal Road Selection Criteria System for Oversize Goods Transportation. *The Baltic Journal of Road and Bridge Engineering*, 2013, Vol. 8(1), pp. 19–24, DOI: 10.3846/bjrbe.2013.03. Last accessed 24.09.2020.

6. Zhou, Yan Mei; Zeng, Chuan Hua; Xian, Fei. Study on Highway Transportation Route Selection of Heavy and Oversize Cargo. *Applied Mechanics and Materials*, 2015, Vol. 730, pp. 25–28. DOI: https://doi.org/10.4028/www.scientific.net/AMM.730.25. Last accessed 24.09.2020.

7. Petraška, A., Čižiūnienė, K., Jarašūnienė, A., Maruschak, P., Prentkovskis, O. Algorithm for the Assessment of Heavyweight and Oversize Cargo Transportation Routes. *Journal of Business Economics and Management*, 2017, Vol. 18, Iss. 6, pp. 1098–1114. DOI: https://doi.org/10.3846/16111699.2017.1334229. Last accessed 24.09.2020.

8. Gudzhoyan, O. P., Troitskaya, N. A. Transportation of specific cargo. Textbook [*Perevozka spetsificheskikh gruzov. Uchebnik*]. Moscow, Transport publ., 2001, 160 p.

9. Troitskaya, N. A., Ponosov, Yu. K. Assessment of oversized and heavy cargo transportation systems. Study guide [*Otsenka sistem transportirovki krupnogabaritnykh tyazhelovesnykh gruzov: Ucheb. posobie*]. Moscow, MADI publ., 1988, 65 p.

10. Troitskaya, N. A. Methodical recommendations for transportation of oversized and heavy cargo in international traffic [*Metodicheskie rekomendatsii po perevozke krupnogabaritnykh tyzhelovesnykh gruzov v mezhdunarodnom soobshchenii*]. Moscow, ASMAP publ., 1997, 96 p.

11. Creation of an information search system (ISS) for transportation of oversized and heavy cargo (OSHC) and development of requirements for the parameters of specialized vehicles (SV) [*Sozdanie informatsionno-poiskovoi sistemy (IPS) po perevozkam krupnogabaritnykh tyazhelovesnykh gruzov (KTG) i vyrabotka trebovanii po parametram spetsializirovannogo podvizhnogo sostava (SPS)*]. Moscow, MADI publ., 1990, 21 p.

12. Smirnov, V. V. Insurance protection against risks in the sale of products following terms of delivery [*Strakhovaya zashchita ot riskov pri realizatsii produktsii po bazisam postavki*]. Moscow, Ankil publ., 1997, 340 p.

13. Stepanov, A. P., Vozlinsky, V. I. [*et al*]. Operation and safety of movement of road trains of heavy trucks [*Ekspluatatsiya i bezopasnost dvizheniya avtopoezdov tyazhelovozov*]. Moscow, Transport publ., 1998, 256 p.

14. Zibrov, I. A. Analysis of ATS adaptability to transportation of OSHC through bridge structures [*Analiz prosposoblennosti ATS k transportirovke KTG cherez mostovie sooruzheniya*]. *Actual problems of modern science*, 2002, Iss. 5, p. 28.