Problems of the electric power system of the municipal electric transport of Novorossiysk

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Abstract. A developed public transport system, in which the types of municipal electric transport (trams, trolleybuses, etc.) are of paramount importance, ensures a reduction in the load on the environment – this pattern is one of the principles of such a scientific direction as sustainable development. However, for the functioning of any structure, the use of energy resources is necessary – in the case of a trolleybus transport complex, the electric power system acts as a resource. This information provided is a description of the principles of operation of the Novorossiysk enterprise, on which the maintenance of trolleybus rolling stock and elements of the electric power infrastructure are based. In addition, the publication discusses the problems faced by the municipal electric transport system.

1 Introduction

To date, in addition to 38 passenger trolleybuses of five modifications, there are 37 buses of five modifications of the middle class (capacity), suitable for operation on urban and suburban routes, on the balance of the trolleybus fleet of Novorossiysk. In total, the capacity of municipal passenger rolling stock on the Novorossiysk road network can reach 75 units.

For September 2023 the route network of Novorossiysk represents the operation of 8 trolleybus routes, 5 of which have the main purpose, 2 – special (auxiliary), 1 – service (peak). The electric power system of the Municipal Unitary Enterprise "MPTN" is represented by 65.0 km of air-cable (contact) network (of which 61.0 km are lines involved in the passenger route direction, 4.0 km are service sections) and the operation of 8 traction substations (No. 1, 3-5, 7-10).

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2 Materials and methods

Trolleybus is an environmentally friendly type of urban public transport that operates on electric traction. Trolleybuses, like any other type of equipment, are subject to various problematic moments, the cause of which is the voltage in the contact network. In turn, the voltage parameters in the network may depend on a malfunction of electrical equipment, violation of the requirements of the rules of technical operation of a trolleybus (TOR), etc.
Non-compliance with the standards of technical characteristics is the most common reason for the load on the trolleybus air-cable network. Modifications of trolleybuses in relation to each other may have different parameters used during their operation in the electric power system, such as voltage, power. Safe and efficient management of the trolleybus transport system requires certain relevant characteristics. Ignoring this issue, as a rule, leads to such an effect as the line voltage.

The voltage of the trolleybus contact network entails serious consequences: overload of the power grid system, decrease in the performance parameters of trolleybus transport. Voltage is a common cause of technical malfunction of trolleybuses, which in turn affects the regularity of movement and the level of trust of passengers in trolleybus transport. Trolleybus fleet requires close attention to achieve the effective operation of this type of transport. It is necessary to carry out proper diagnostics and comprehensive maintenance of electrical equipment of rolling stock and infrastructure of the energy management service in accordance with the established current norms of technological processes [3, 6].

Malfunctions in the power grid system are most often represented by the following types of events:

- Network overload due to high consumption of electrical energy – most often observed during peak load periods on the passenger line.
- Damage and wear of electrical wires of the contact network.
- Technical malfunctions of electrical equipment of traction substations.

A decrease in the quality of power supply is the reason for finding the equipment of traction substations in an unsatisfactory condition. The electric power system of urban electric transport has a complex character: the malfunction of one traction substation equals the overload of the entire power system, the equipment of traction substations becomes unusable and there is a lack of power to ensure the uninterrupted operation of trolleybuses on other sections of the route network [1].

3 Results

Most often, the reason for the low efficiency of trolleybus enterprises is problems with the technical potential of rolling stock, elements of the electric power system. This is due to the following:

- Low (insufficient) qualification of maintenance personnel of the repair base and energy service. Incorrect diagnosis leads to poor-quality repairs and, as a result, the disabling of trolleybuses and equipment. The other side of the issue may be the lack of proper control of management representatives over the performance of their direct duties by representatives of the repair base and the energy service.
- The lack of a system of regular timely technical diagnostics and maintenance. At trolleybus enterprises, this happens primarily due to a lack of material and financial resources.
- Outdated electrical equipment. Many trolleybus cities today require concession agreements on the complete renovation of the trolleybus fleet. For example, buying 100 new trolleybuses will not solve the problem of low efficiency of this type of transport. For high reliability and efficiency, it is necessary to maintain the repair base and the electric power system at a high level.
4 Discussion

It is possible to solve the problem of low passenger confidence in trolleybuses only by systematizing and dispatching all processes involved in the operation of trolleybus transport.

At the enterprises of urban electric transport, there should be an increase and confirmation of the qualifications of specialists involved in the maintenance and repair of trolleybuses and elements of the energy company [7].

Timely maintenance and repair of equipment according to the established schedule of inspections and diagnostics is an important moment in achieving highly efficient operation of trolleybus transport.

Like all other spheres of life, trolleybus management should not ignore the issues of technical progress – new equipment is more efficient than the old one, which has already exhausted its full technological capabilities not only by technical characteristics, but also by time standards [5].

5 Conclusion

Electric-powered vehicles have great prospects. In addition to the environmental component, buses are significantly concede to trolleybus and tram cars as urban transport – the repair of 1 trolleybus/tram costs several times cheaper than a bus for a transport company. In relation to such a parameter of the physical environment as noise exposure, bus transport concedes to trolleybuses and autobuses as well.

Now trolleybuses and trams are modern types of transport. In those states where in the last century the urban electric transport was abandoned, now the picture is different – the heads of municipalities are hastily returning trolleybus and tram systems to the streets of their cities, because this is the key to the sustainable development of urban space [2, 4].

Opinions that reflect the point of view that "trolleybuses and trams are the last century transport" are fundamentally wrong. In Russian society, such an opinion was formed only for the reason that after the collapse of the USSR, the enterprises of the urban electric transport began to save significantly, which considerably affected the level of transport services for the population. the city Novorossiysk in the Krasnodar Territory is no exception.

No human life activity system can exist efficiently if it is blocked by a "breath of fresh air" in the form of prospects and development. Now the Novorossiysk urban electric transport system is going through hard times – the exhausted electric power system prevents to achieve stable operation of trolleybuses and to minimize technical malfunctions in the working process on the line. The contact network is in an unsatisfactory condition, regular maintenance of both the overhead cable network and traction substations is not carried out, technical malfunctions of Novorossiysk trolleybuses arise mainly due to issues related to power supplies - the resulting voltage of the lines affects the electrical equipment of trolleybuses. But in turn, this voltage of the line arises not just like that, but because of non–compliance with the rules of technical operation by drivers - violation of the minimum distance when moving trolleybuses one after another.

The contact network is a "conductor" of stable high revenue and economic efficiency. Without a high-quality air-cable network, trolleybuses are starting to get into "downtime" more and more often due to breaks in the contact network and subsequent damage to its elements.

Sustainable development of urban space is real and achievable. The development of mountain electric transport and the urban transport system as a whole is the first "key" to achieving a balance in the functioning of urban institutions.
References


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