

INNOVATIVE MESSENGER WIRE OF OVERHEAD CONTACT LINE SYSTEM

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Introduction

The indicator of efficiency of electric energy use unambiguously is the level of technical losses at its transportation and use, and decrease in losses and increase of efficiency is a task of the today's society and business. The main elements and methods of dropper the overhead contact line system of railways presented in figure 1.

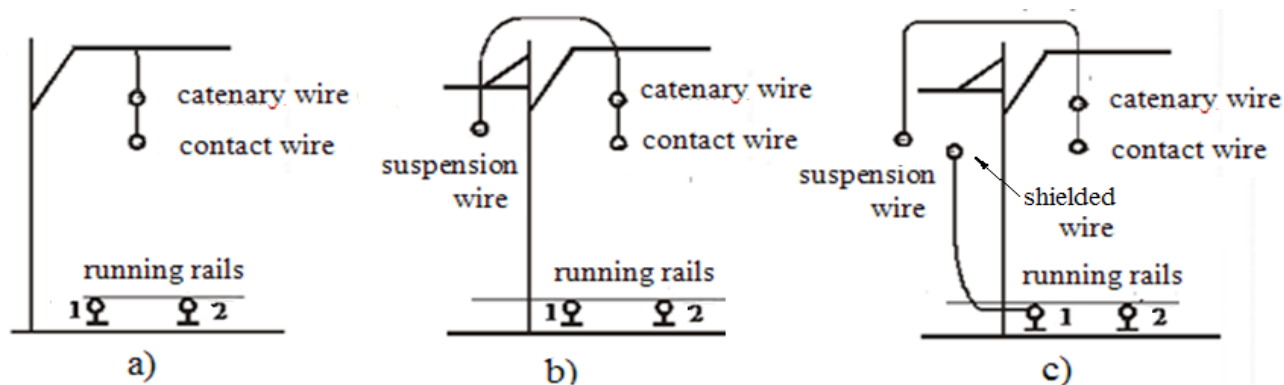


Fig. 1. Description of overhead contact line system of railways

- The catenary (messenger) wire, the contact wire, running rails;
- The same but with the reinforcing wire;
- Catenary wire, the contact wire, the reinforcing wire - (reverse) wire, connected in parallel with the rails.

The catenary wire is not a less important element of the overhead catenary system of railways than the contact wire, both from the point of view of reliability, and from the point of view of energy efficiency.

Innovative messenger wire

The Russian developers have created the products having at the same time high mechanical durability, slightly changing length at fluctuations of temperature, resistance to corrosion, electric conductivity of copper, the having best aerodynamic characteristics, standard diameters rather technological by a mass production. At the same time products are compatible to standard fittings. The compacted, plastically deformed bearing MK brand cables, are capable to carry out functions not only the bearing cable, but also the strengthening wires, electric connectors of a contact suspension bracket and wires of feeding lines.

Essentially a new copper wire of bigger durability without use of the alloys increasing losses possesses a number of advantages: reduces an amplitude and intensity of jumping; reduces the probability of break when drawing to a cable of damages to result of external influences; reduces the level of fatigue of metal in a cable; increases life cycle due to self-clearing of fluctuations; reduces sticking of snow and formation of frost at the expense of a unique design; has high mechanical durability; has slightly changing length at fluctuations of temperature; it is steady against corrosion; has sufficient electric conductivity; has the best aero-

dynamic characteristics; has standard diameters; it is rather technological by a mass production, at the same time without considerable rise in price of the final product.

As an example we will consider the copper compacted wire CC-120 brand. It consists of 36 condensed copper wires of various diameters and has at the same time the bigger section, the increased explosive effort and lower specific resistance. The section of messenger wires standard round wires C-120 and compacted CC-120 are presented in figure 2. Comparative characteristics of some of the catenary wires used in the Russian Federation presented in table 1.

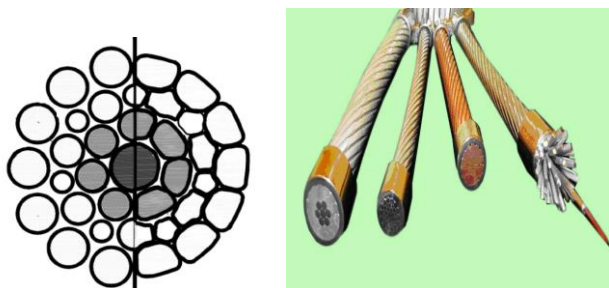


Fig. 2. Types of catenary wires a) Round b) Compacted

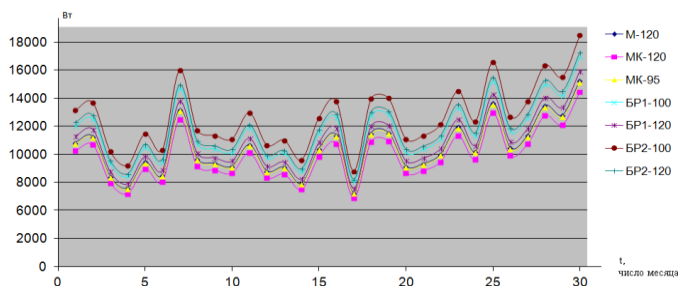


Fig. 3. The dependence of diurnal

variation loss of electrical power at different variants of messenger wire at billing period

Table 1

Comparative characteristics of some of the catenary wires used in the Russian Federation

Indicator	Catenary wires		
	M-120	M-150	MK-120
Nominal diameter, mm	14,0	15,8	14,0
Nomenal cross section, mm ²	120	150	120
Counted squire of the cross section of all the wires in the cable, mm ²	117,0	148,0	140,06
counted weight of 1 000 m cable, kg	1 045	1 321	1 251
Specific electric resistance at 20°C, Om/km	0,1580	0,1238	0,1383

The estimated analytical studies and evaluation of the effectiveness of innovative messenger wire

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Were conducted analytical studies of the technical losses of electric energy in contact lines and determined the economical efficiency of the messenger wires brand CC. The performed calculations of power losses and energy for summer and winter month for standard round and compacted wires. The results of calculated are presented in tables 2 и 3.

Table 2

The average calculated values loss of electrical energy and power

brand of messenger wire	C-120	CC-120
loss of electrical power, kWh	62,49	59,25
loss of electrical energy, kW.h/month	46 496,66	44 085,72
loss of electrical energy, kW.h/year	557 959,92	529 028,7

Table 3

The calculated values loss of electrical energy and power

Indicator		brand of messenger wire	
		C-120	CC-120
The average for August of 2014, the value of power losses, kW		62,518	59,27
The average for January of 2015, the value of power losses, kW		62,47	59,23
loss of electrical energy за август 2014 года	kWh	46 513,46	44 101,652
	%	0,88	0,83
loss of electrical energy за январь 2015 года	kWh	46 479,86	44 069,798
	%	0,88	0,84

Similar calculations were made for different brands of messenger wires марок несущего троса. The results are shown the graph in figure 3.

In accordance with the task of the Russian Railways, was developed modifications plastically deformed catenary wires in the version with a steel core with zinc or copper-plated for high-speed Railways.

Application prospects of the innovative messenger wires for overhead contact line / catenary systems MK brand

On the 79-th General assembly of the International Electrotechnical Commission (IEC) in Minsk in 2015 at a meeting of TC-9 committee "Electric equipment and systems for the railroads" the Russian delegation has provided the information on the existing international standards "Railroad carrier cables of contact network GOST 32697-2014" including data on the compacted wires, and it is also offered to initiate the development of the IEC new standard on the messenger wires for overhead contact line/catenary systems of the railroads. In addition in 2016 was received a German patent for the construction and production technology plastically deformed steel wires and cables from different materials. Patent № DE-102014101833.

Conclusion

The replacement of the messenger wires of various brands by the innovative plastically deformed MK brand wire according to settlement and analytical researches for the considered sites of a catenary systems provides economy from decrease in losses of electric energy within 6-22% depending on extent and load of a traction catenary systems of the railroads. The replacement of the messenger wires on sites of a catenary systems with high expenses of electric energy and intensity of train service is the most effective.

At the reconstruction and the construction of new sites of railroads contact line for lack of the strengthening wires application of the innovative plastically deformed (compacted) wire MK brand is expedient. The compacted wires possess the best characteristics on specific electric resistance due to bigger amount of copper with an identical diameter and the bigger capacity and durability.

The AHG-14 working group of created by TC-9 committee continues an active work on the analysis of national standards of wires of the countries of IEC and in October, 2016 will submit at the scheduled meeting of TC-9 committee final offers on contents of the new standard taking into account consensus of all experts.

The detailed information on the website <http://www.energoservise.com>.