

**B2 - Overhead lines**  
**PS 2 Enhancing overhead line performance**

**Research of steel - aluminium plastically compacted conductors for overhead power lines**

**V. KURYANOV<sup>1\*</sup>, L. GYREVICH<sup>2</sup>, L. TIMASHOVA<sup>3</sup>, V. FOKIN<sup>4</sup>**  
**NRU "MPEI"<sup>1</sup>, Volgograd State Technical University<sup>2</sup>,**  
**JSC "R&D Center "FGC UES"<sup>3</sup>, LLC "Energoservis"<sup>4</sup>**  
**Russia**  
**Vek077@yandex.ru**

The mass invention and introduction of new types of wires since the 1980-s showed that one of the promising areas of development is the compaction of the wire. Compaction is carried out to increase the percentage of filling of the internal cross section of the wire, increase strength, and increase current carrying capacity at similar diameters with classic wires. Taking into account changing the geometry of the single wires of wire arising questions of researching properties of such wire by flexural and torsional stiffness, sustainability to vibration, the dance of wires and thermal cycling, sustainability to short-circuit currents, direct lightning strikes and sustainability to corona formation, determining the inflection point, determining of drawing speed wires and others.

In the present article viewing questions of compaction of wires by plastically compacted. This production technology makes it possible to apply compaction not only to the conductive aluminium part of the wire, but also to the core of wire, which potentially increases the efficiency of the compaction itself. The article discusses the applicability of fasteners with such wires, resistance to the formation of «swelling», specific methods of installation of such wires and methods of monitoring the condition of wires after installation.

This article also presents the parameters of optimization of power losses in high voltage power grids, which are due to the long period of operation requires accelerated implementation of the following activities:

- reconstruction of power grid equipment and introduction of new energy-saving technologies;
- carrying out research, design and development work related to the calculation, analysis, regulation and reduction of power losses in power grids.

The article presents information on the known cases of usage of plastically compaction wires on power grids 110-220 kV. It is shown that the use of such wires in some cases can increase the length of spans up to 140% compared to the classic wires. in some cases, it became possible to reduce wind and ice loads while maintaining the size and capacity of power lines.

The research was carried out in two independent research laboratories, which showed the following results:

- An effective solution is the use of plastically deformed wires in the power grid complex (data on limit loads, reduction of heat and magnetization of conductors during operation);
- Conductors plastically compressed have corona discharge voltage higher than conductors classic with the same diameter;
- the relative decrease in the magnetization of conductors plastically deformed compared with conductors of classical structures is 3-10%.

The article describes the technology used in plastic deformation of conductors, which provides a number of technical advantages:

- increase the filling factor of the conductor to 92-97%;
- reduction in aerodynamic loading (20-35%) and samarasena hesitation;
- reduction of icing (25-40%) and reducing the tension of the conductor several times.

The article presents the design features of plastically compressed conductors reduce the load on all elements of overhead power lines when replacing conductors on existing power line supports. The construction of new overhead power lines is necessary, given that the existing power lines have been in operation for more than 25-40 years and are becoming obsolete.

The article shows that using a comprehensive proper use of plastically compacted wire in combination with greatroom in new construction and reconstruction of high voltage power transmission lines 35-750 kV can significantly increase their reliability when exposed to the entire range of climatic loads, increase throughput, reduce capital and operating costs.

This article also discusses the problems associated with the use of new types of wires and questions which unsolved in now days such as unification of the methods of installation, the methodology of checking the status of the wire in the process of operation, standardization of methods of calculation of the slack of wires and other.