



2018 Paris Session

SC B2: OVERHEAD LINES

PS 2 – Experiences leading to Improvements of OHL

Protection of metal towers of overhead power lines from corrosion: non-destructive diagnostic methods and recommendations for additional secure

E. LYPUNOV, A. ELISEENKO

Russian Federation

Federal Grid Company of the Unified Energy System

In the country and abroad we have recorded numerous cases of falling of the single-column concrete poles and guyed towers because of soil corrosion: chemical, electrochemical and electrical (corrosion stray currents). Since the attachment points of the braces of the supports to the anchor plate, located at a depth of 2.5 - 3.0 m, they are inaccessible for inspection without digging. The situation when the responsible part of the supports is in an unknown state of corrosion, increases the risks of exploitation of power transmission lines, and requires a permit.

The paper analyzes the experience of application of remote method electrochemical testing (EHTM) underground part guyed towers for rust. The essence of the method consists in the measurement of corrosion currents by a special algorithm using precision instruments to a high degree of noise immunity. Developer of diagnostic equipment – Novosibirsk state technical University.

The accuracy of the estimates obtained by this method is 80% with no gaps emergency support, so there is some overestimation of the corrosion losses at supports with little corrosion.

The program of calculation of corrosion condition according to the measurement determines the membership of anchor support structures to one of three classes-loss of cross sectional area of the metallic elements: 0-10%; 10-20% more than 20%.

To date, the method EHTM in Russia and Kazakhstan surveyed about 14 thousands towers of overhead lines 220-1150 kV.

The paper also presents data visual inspection of the corrosion state of the hinge anchor plates and zinc anti-corrosion coatings. The inspection was conducted in 2015-2016 on overhead lines 220-500 kV through selective excavation and measure the current dimensions of the studied objects using vernier calliper. The

degree of corrosion damage was detected by the difference comparison with the normative value.

Examples of visual inspection of corrosion of the U-bolts and zinc anti-corrosion are displayed by photographs with high resolution.

The paper presents experimental data on the corrosion rate of zinc and steel in specific ground track. It is concluded that the greatest risk for corrosion is soil with a moisture content of 11-13%, whereas dry soil or soil with high humidity slows down the corrosion destruction. Also draws attention to the effect on the acceleration of corrosion have the temperature conditions. In the research literature it is written that at 50-60°C, the zinc hydroxide and zinc carbonate that occurs on the surface of galvanized steel sheet, is converted into zinc oxide which is a cathode relative to the iron. In case of damage of the zinc coating the steel substrate begins to rapidly corrode. This "underfilm corrosion" can destroy the zinc coating in a few days. The minimum corrosion rate of zinc is observed in slightly alkaline environments: if the pH is below 5 or above 12, there is excessive corrosion. The greatest resistance to corrosion are of intermediate layers of the zinc coating, that is, Fe—Zn layer, enriched in iron, and a layer enriched in zinc.

In the final part concludes with recommendations on measures for corrosion protection of metal parts of the supports by applying hot-dip galvanizing, bitumen insulation and so on. For supports of overhead lines and guyed, designed in aggressive soil and climatic conditions, it is recommended to make the attachment of the braces in the above-ground part on reinforced concrete piles.

Outside of work remained the problem of corrosion of the underground part of metal mast poles under the influence of the stray currents that are created as a result of working electric Railways, tram lines and other components eating electric power. The main reason is the lack of empirical material.