Full-Scale Tests for the Purpose of Verifying the Method for Determining the Boom of the Wire Sag by the Period of its own Oscillations

Danil YAROSLAVSKY[1]*, Marat SADYKOV[1], Mikhail GORYACHEV[1]

[1]Kazan State Power Engineering University

Motivation

The efficiency and reliability of energy transmission is determined by the state of the power supply networks. In this regard, a method was proposed for determining the conductor sag by the period of its own oscillations. To verify the developed method, full-scale tests were carried out on 110 kV overhead lines.

Approach

The overhead line sag is calculated by the formula:

$$f \approx 0.31T^2 \qquad (1)$$

where: f – conductor sag, m; T is the oscillation period in seconds.

Objects of investigation

Fig.1. Photo of the span with supports, date 05.03.2021

Experimental setup & test results

Fig. 2. Control device of the overhead line condition monitoring system installed on the conductor. This device measure conductor deviations and *T* parameter
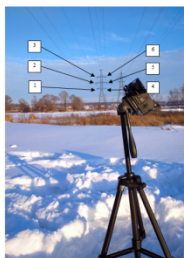

Fig. 3. Measuring installation for video recording of conductors position. The numbers 1-6 indicate the numbers of the investigated phase conductors
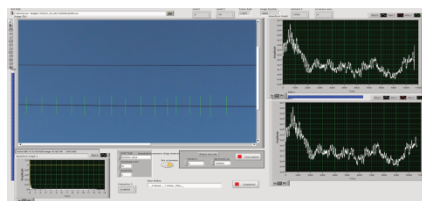

Fig. 4. The front panel of the program «Program for processing video recordings» (method 1 with the developed method)

Conductor sag, m					
Date	Cond. №1	Cond. №2	Cond. №3	Cond. №4	Cond. №5	Cond. №6
05 мар	9.478	9.633	9.432	9.946	10.237	11.488
06 мар	9.372	9.534	9.35	9.906	10.209	11.36
07 мар	9.287	9.448	9.254	9.722	10.129	11.243
09 мар	9.117	9.265	9.071	9.538	9.998	11.048
10 мар	8.868	9.025	8.83	9.293	9.766	10.862
17 мар	9.184	9.322	9.165	9.608	10.012	11.181
18 мар	9.418	9.563	9.371	9.835	10.178	11.367
05 апр	9.616	9.768	9.575	10.027	10.259	11.558
14 апр	10.35	10.51	10.394	10.844	11.087	11.908

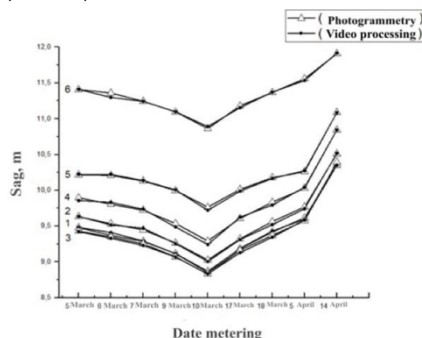Fig. 5. Conductor sag obtained by photogrammetry (method 2)

Fig. 6. Comparison of the results of calculating the sag in two different ways (method 1 and method 2). The numbers 1-6 indicate the conductor numbers.

Conclusion

The reliability of the developed method for determining the conductor sag by the period of own oscillations of the conductor is confirmed. The results can be applied in the previously developed system for monitoring the state of an overhead power transmission line.

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