

A METHOD PRESENTED BY MEASUREMENTS TO PREVENT HARMFUL EFFECTS OF ICING FORMING ON GROUND WIRES OF HIGH-VOLTAGE TRANSMISSION LINES

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1. Introduction

Due to global warming-up impacts of climate changes could be observed in the National Hungarian Electricity Network. [3]

Extreme weather conditions (glaciations, extreme squall) are more common and their impacts are more significant that is why they need to be taken into consideration as well.

It is also confirmed by interruptions in the transmission and distribution network in 2013 and 2014. Consequently The Hungarian Transmission System Operator Company Ltd. (hereunder MAVIR Ltd.) requires an emergency plan to find solutions to avoid and prevent similar equipment failures in future. (havaria) [2]

In order to elaborate the incurred ideas more accurately it was necessary to perform measurements under authentic circumstances.

After coordinating with MAVIR Ltd. transmission line THE-Sajószöged 400kV has been administered by choice as it has been out of service and Tiszai Thermal Power Plant was put of service.

2. Measurement tasks

2.1 Measurement of induced current in ground wire of THE-Sajószöged 400 kV transmission line in case of zero-rated supply

In the course of preparing measurement staff of MAVIR Ltd. grounded the phase conductors of tower Nr. 2 to the body of the tower, as well as they prepared the 0,4 kV power supply from substation Nr.2 which is required for measurements in field 3B of Sajószöged substation 400/200/120 kV. Moreover we were informed about the conditions of field, transmission line and isolators.

In order to perform measurements in a successful and safe way we established two measuring teams. The first team stayed at the substation to ensure proper contacts, release of power, as well as it informed the second team measuring at the transmission line – about the induced current intensity.

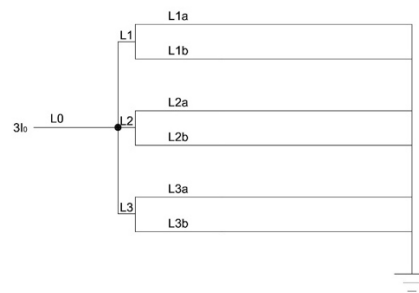


Fig. 1. 3F 0,4 kV power supply.

The transmission line team, according to previous agreement, established 3 measuring spots. One at the beginning of transmission line (between 2nd and 3rd tower); one in the middle of transmission line (between 11th and 12th tower); as well as at the end of transmission line (between 21st and 22nd tower)



Fig. 2. Measuring spots [1]

The purpose of the measurement is to prove our assumption which is the following: in case the transmission line is supplied with zero sequence current, approximately 50-60% of the value of I_0

supply power will be induced in the ground wire of the transmission line.

	I_{VV1} [A]	I_{VV2} [A]
Measured value	46,8 A	6,2 A
Measured value (I_0 [%])	159,7 %	21,1 %
Issued value ($3I_0$ [A])	88 A	

Tab. 1. Measurement results: bw. 2nd and 3rd tower [4]

	I_{VV1} [A]	I_{VV2} [A]
Measured value	19,9 A	16,6 A
Measured value (I_0 [%])	67,9 %	56,6 %
Issued value ($3I_0$ [A])	88 A	

Tab. 2. Measurement results: bw. 11th and 12th tower

	I_{VV1} [A]	I_{VV2} [A]
Measured value	15,1 A	13,9 A
Measured value (I_0 [%])	51,5 %	47,4 %
Issued value ($3I_0$ [A])	88 A	

Tab. 3. Measurement results: bw. 21st and 22nd tower

Measurements were performed with a clamp type MW 3500 with a measuring range of 2000 A using a platform provided by MAVIR Ltd.



Fig. 3. MW 3500



Fig. 4. Measuring spot



Fig. 5. Measuring spot

3. Summary

Based on the measurements it can be stated that according to previous assumptions – in case of 3I₀ supply (zero sequence) the amount of current induced in the protective conductor is about 50-60% of the I₀ supply power. Discrepancies could be measured only near the 2nd grounded tower. Furthermore, based on the measurements it can also be stated that in case of more ground wire the previously assumed current is induced in each ground wire of which values are approximately the same, symmetrical.

Acknowledgements

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References

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