DOI: <https://doi.org/10.15407/techned2020.06.005>

MATHEMATICAL MODEL OF WAVE PROCESSES IN TWO-WINDING TRANSFORMERS

Journal	Tekhnichna elektrodynamika
Publisher	Institute of Electrodynamics National Academy of Science of Ukraine
ISSN	1607-7970 (print), 2218-1903 (online)
Issue	No 6, 2020 (November/December)
Pages	5 - 14

Authors

M.S. Sehed^{*}, **Ye.V. Cheremnykh**^{**}, **P.F. Gogolyuk**^{***}, **T.A. Mazur**^{****}, **Y.V. Blyznak**^{*****}

Lviv Polytechnic National University,

12, S. Bandera Str., Lviv, 79013, Ukraine,

e-mail: mseheda@ukr.net, petro.f.hoholiuk@lpnu.ua, mazyr@ukr.net,

blyznakyura@gmail.com

* ORCID ID : <https://orcid.org/0000-0001-8459-5758>

** ORCID ID : <https://orcid.org/0000-0002-4621-2426>

*** ORCID ID : <https://orcid.org/0000-0003-0002-4638>

**** ORCID ID : <https://orcid.org/0000-0001-5021-4013>

***** ORCID ID : <https://orcid.org/0000-0002-4914-2283>

Abstract

A mathematical model has been developed to study the wave processes of two-winding transformers, taking into account the electromagnetic connections between the turns of the winding and between the windings. To solve differential-integral equations in partial derivatives, a method of separation of variables is proposed. References 12, figures 2.

Key words: transformer winding, mathematical modeling, partial derivatives, distributed parameters, impulse wave, wave processes.

Received: 02.08.2019

Accepted: 29.07.2020

Published: 21.10.2020

References

1. Kyrylenko O.V., Seheda M.S., Butkevych O.F., Mazur T.A. Mathematical Modeling in Electric Power Engineering. Lviv: Lviv Polytechnic National University, 2013. 608 p. (Ukr)
2. Isaev Y.N., Startseva E.V., Schekotuev A.V. Investigation of wave processes of transformer windings as electric circuit with distributed parameters. *Izvestiya Tomskogo Politehnicheskogo universiteta. Inzhiniering energoresursov*. 2015. Vol. 326. No 8. Pp. 29-35. (Rus)
3. Lavrinovich V.A., Isaev Y.N., Mytnikov A.V. Advanced control state technology of transformer. *International Journal on Technical and Physical Problems of Engineering*. 2013. Vol. 5. Iss. 17. No 4. Pp. 94-98.
4. Mikulovic J. C., Sekara T. B. The Numerical Method of Inverse Laplace Transform for Calculation of Overvoltages in Power Transformers and Test Results. *Serbian Journal of Electrical Engineering*. 2014. Vol. 11. No 2. Pp. 243-256.
DOI:
<https://doi.org/10.2298/SJEE131123020M>
5. Bontidean S. G., Badic M., Iordache M., Galan N. Simulations and experimental tests on the distribution of overvoltage within transformer windings. *U.P.B. Sci. Bull. Series C*. 2015. Vol. 77. Iss. 3.
6. de Azevedo A.C., Rezende I., Delaiba A.C., Oliveira C., de Carvalho B.C., de Bronzeado H.S. Investigation of transformer electromagnetic forces caused by external faults using FEM. / *IEEE PES Transmission and Distribution Conference and Exposition*. Venezuela, Latin America, 2006. Pp. 1-6.
DOI:
<https://doi.org/10.1109/TDCLA.2006.311522>
7. Seheda M.S., Cheremnykh Y.V., Mazur T.A. Mathematical modeling of free voltage oscillations on transformer windings into account winds mutual induction under surge overvoltages. *Scientific Bulletin of National Mining University*. 2013. No 1 (133). Pp. 68-76. (Ukr)
8. Seheda M.S., Cheremnykh Y.V., Chimjk I.V., Mazur T.A., Kurylyshyn O.M. Mathematical modelling of stress distribution along the winding transformers under impulse surges. *Tekhnichn a Elektrodynamika*. 2015. No 6. Pp. 8-11. (Ukr)
9. Hoholyuk O., Byczkowska-Lipinska L. Mathematical models of transformers for electromagnetic transient process simulation. *Przegląd Electrotechniczny*. 2008. No 6. Pp. 278-280.
10. Seheda M.S., Mazur T.A., Kurylyshyn O.M. Mathematical model for investigation of wave

processes in high-voltage double winding transformers. *16th International Conference on Computational Problems of Electrical Engineering* (CPEE). Lviv, Ukraine, September 2–5, 2015. Pp. 165-167.

DOI:

<https://doi.org/10.1109/CPEE.2015.7333366>

11. Electrical Transient Interaction between Transformers and the Power System. Cigre. April, 2014.

12. Bewley L.B. Traveling waves on transmission systems. Moskwa-Leningrad: ONTI, 1938. 288 p.

[PDF](#)

This work is licensed under a [Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License](https://creativecommons.org/licenses/by-nc-nd/4.0/)