Closure on "Series Expansions for Line Series Impedances Considering Different Specific Resistances, Magnetic Permeabilities, and Dielectric Permittivities of Conductors, Air, and Ground"

Lutz Hofmann

I thank the discusser Dr. Mariscotti for his comments and questions allowing some clarification [11].

1) There is only a small difference between the self and mutual resistances and inductances which arise due to the magnetic field in the ground for the same τ value. In the opinion of the author, there will be also small differences for a case where the conductors are closer to the ground than in the example given in the paper. These differences depend on the parameters r and ϑ. Despite the dependencies of r and ϑ on the height of and distances between the conductors the differences between the self and mutual resistances and inductances, which arise due to the magnetic field in the ground, will also be small. But a sensitivity analysis on these parameters was not calculated yet.

   There is a greater difference between the total self and mutual impedances which are the sum of the three and two impedance parts, respectively. These differences mainly arise due to the impedance parts given by the magnetic field in air [eq. (2)].
2) Special grounds in the open country have a relative ground permeability greater than 1 but relative ground permeabilities greater than 1 may also be due to the presence of buried metallic structures.
3) Up to now, measurement results or practical cases quantifying the improvement of the proposed expressions with respect to known simplified expressions came not to the author's knowledge.

References

[1] L. Hofmann, "Series expansions for line series impedances considering different specific resistances, magnetic permeabilities, and dielectric permittivities of conductors, air, and ground," *IEEE Trans. Power Delivery*, vol. 18, pp. 564–570, Apr. 2003.

Manuscript received July 6, 2000.

The author is with the Institute of Electrical Power Supply, the University of Hannover, Hannover 30060, Germany

Digital Object Identifier 10.1109/TPWRD.2003.817828

Discussion of "Reducing Losses in Distribution Transformers"

Xuzhu (Rick) Dong

The authors [1] should be appreciated for innovatively applying magnetic shielding techniques into distribution transformers, which is ever popular in transmission level. However, there are some concerns although the experiments show the potential loss reduction.

1) As authors indicated that the total aluminum cost is about 10% of the total transformer material cost, including the assembling cost, installation of magnetic shielding will be an expensive solution, and will be reluctant by manufacturers and customers. Authors should address the economic analysis of this application.
2) Equations (1) and (2) in section 2 are derived to evaluate stray loss and load loss of the regular distribution transformers. The authors are encouraged to obtain similar formulas considering magnetic shielding, not only just some tables. If so, it will be obvious to see the advantages of application of this shielding technique.

References

[1] J. C. Olivares, Y. Liu, J. M. Cañedo, R. Escarela-Pérez, J. Driesen, and P. Moreno, "Reducing Losses in Distribution Transformers," *IEEE Trans. Power Delivery*, vol. 18, pp. 821–826, July 2003.

Manuscript received June 2002.

The author is with the EPRIsolutions, Inc., Palo Alto, CA 94304 USA (e-mail: rdong@eprisolutions.com).

Digital Object Identifier 10.1109/TPWRD.2003.817766

Discussion of "Reducing Losses In Distribution Transformers"

S. V. Kulkarni

The authors [1] should be commended for their very interesting contribution to loss reduction in distribution transformers. I have following comments.

1) In table 1, percentages should add to 100%. Authors are requested to clarify.
2) In equation 1, should it not be $\Delta P_{\mathrm{stray}}$, since it is concerning reduction in stray losses?
3) Authors have given comparison of losses with 1.2-mm aluminum shield and 10-mm aluminum shield. The results are obvious. Not only is the 1.2-mm shield ineffective in reducing losses but also it could be dangerous. This is because when the thickness of electromagnetic shield is reduced below a certain thickness, there are excessive losses in the shield itself and it will get extremely overheated [2]–[4]. Hence, suitable comments should have been made in the paper that use of such a low thickness of aluminum shield is dangerous and is therefore discouraged.
4) It is said at the end of Section 2 that losses in aluminum are less because product $\sigma\mu_r$ is 500 times less. Can the authors explain it based on some governing equation for eddy loss?
5) Finally, can an extra loss of about 20 W in case of transformer with assembled core and windings (Table 4) be shown to occur by equation 4?

The authors' comments on the above issues will be greatly appreciated.

Manuscript received July 18, 2001.

The author is with the Department of Electrical Engineering, Indian Institute of Technology, Mumbai 400 076, India.

Digital Object Identifier 10.1109/TPWRD.2003.817822