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# Semianalytic integral method for the fast solution of circulating currents in power transformers

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**Abstract-**

** Power transformer design normally includes an optimization process which involves the assessment of a great number of design alternatives. This calculation process normally requires a high computation time and its reduction is always a desirable goal. Circulating currents in parallel connected conductors in transformer windings are a critical design aspect to be analyzed. This article presents a new methodology for the fast calculation of circulating currents for parallel connected conductors in power transformers. The formulation for solid conductor modeling has been developed using the same calculation strategy as in Semianalytic Integral Method (SAIM) [1], which allows a significant reduction of computational effort. A realistic case study of a 25 MVA transformer was used to validate the proposed methodology. As for the accuracy of the calculations, the comparison of the results obtained by the proposed methodology and those calculated using the Finite Element Method (FEM) shows an excellent agreement between both approaches. However, the computational performance of the new approach was found to be much higher than that of FEM. This makes the proposed method much more efficient for transformer design purposes.**

**Index Terms- Circulating currents, power transformers, integral methods, skin depth**



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