

POWER CURVE REPRESENTATION OF B-H CHARACTERISTIC

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An accurate power series curve representation for the B-H characteristic is formulated. It is based on selected powers in B with positive coefficients giving a power series. The indices and the coefficients are evaluated by the repeated application of regression analysis for consecutive regions of the curve. The series is formulated such that both the magnetisation curve as well as the incremental permeability curve have smooth variations, and is valid over almost the complete range of the characteristic.

Although an exponential series representation in H gives good results over a wide region, it cannot be applied directly when H has to be evaluated for a

given B. While the commonly used polynomial representations in B and the rational fraction polynomial representations in μ permit evaluation of H given B, they present problems arising mainly from the negative coefficients causing the incremental permeability to be inaccurate.

The validity of the formulation is shown by comparing the results obtained from the power series curve representation with experimental data and with best fits obtained from the polynomial and rational fraction polynomial representations.

The present formulation is found to be especially useful in certain power transformer transient analysis programs where the non-smooth incremental permeability representations lead to instability of calculation.

References

1. Widger, G.F.T. (1969) Proc. IEE 116(1), 156
2. Macfadyen, W.K. et al, (1973) Proc. IEE 120(8) 902