

IRON CORE LOSS FREQUENCY DEPENDANCE REPRESENTATION
IN ELECTROMAGNETIC TRANSIENT PROGRAMS

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Transient overvoltages impressed Power Systems are greatly affected by the behaviour of the transformer core. Although linearised flux-current relationships are mostly used [1,2] in such representations, it has been shown [3] that the non-linear magnetisation curve can be accurately modelled, and that the non-linear core losses can also be included in a self generative manner [4].

However, the frequency dependance of the losses, when used in an electromagnetic transient program, have hitherto not been represented fully. This is due to the necessity of having complex look up tables to account for frequency variations and saturation.

The present work has thus eliminated look up tables by determining the core-loss as a function of both frequency and saturation. The frequency dependance obtained from the simulation under various saturation conditions are presented and are seen to agree very well with manufacture's data [5].

- References: [1] Copeland, N.A. and Slemon, G.R., "Analysis of hysteresis motor", IEEE Trans, 1963, PAS 82, pp 34-42.
[2] O'Kelly, D., "Hysteresis and Eddy current losses in steel plates with non-linear magnetisation characteristics", characteristics, Proc. IEE, 1972, Vol. 119, No.11, pp 1675-1676.
[3] Lucas, J.R., "Representation of Magnetisation curves over a wide region using a non-integer power series", IJEEE, vol 25, No 4, Oct. 1988, pp 335-340.
[4] Lucas, J.R., and McLaren, P.G., "Simulation of B-H excursions for transient studies", 33rd Mid-West Symposium on Circuits & Systems", Calgary, Aug. 1990, No MPR7-1450, pp 1-4.
[5] "Oriented silicon Steels: Silectron & Silector", Data Sheets, Allegheny Ludlum Steel Corporation. 1970.