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SOLUTION OF DIRECT EDDY CURRENT TESTING PROBLEMS FOR MEDIA WITH AXISYMMETRIC CYLINDRICAL FLAWS

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Analytical solution of eddy current testing problems is usually constructed in the literature by the method of integral transforms and is applicable only to unbounded media in one or two spatial dimensions. It is assumed in such cases that the electromagnetic field approaches zero when the distance from the source of an alternating current tends to infinity. The number of problems that can be solved by means of analytical methods becomes larger under the assumption that the electromagnetic field is exactly zero at a fixed (sufficiently large) distance from the source. The corresponding direct eddy current testing problem can be solved by the method of separation of variables. This methos is known in the literature as the TREE method [1] (where the abbreviation means TRunctaed Eigenfunction Expansions).

In the present paper we present solutions of several eddy current testing problems with surface or subsurface cylindrical flaws. The axis of a coil carrying alternating current coincides with the axis of a flaw in the form of a circular cylinder of finite size. The problems considered in the paper include surface flaws in a conducting half-space or a plate, volumetric flaw in a conducting half-space and two surface flaws in a plate. All the problems are solved by means of the TREE method. The obtained solutions are quazi-analytical since numerical calculation of complex eigenvalues and solution of a system of linear equations are required in order to obtain the expansion coefficients. Numerical computations of the change in impedance of the coil are presented for different frequencies of the excitation current.

REFERENCES

[1] T. P. Theodoulidis and E.E. Kriezis. *Eddy Current Canonical Problems (with Applications to Nondestructive Testing)*. Tech Science, Duluth, 2006.