Behaviour of Synchronous Generators with Rotor Eccentricity Evaluated by the Polarization Fixed Point Method

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***Abstract*—To analyze the effects of small variations of the electric machine airgap due to rotor eccentricity it is necessary to compute the magnetic field highly accurately. An efficient iterative integral technique is proposed, where the material nonlinearity is treated by the polarization method, with the magnetic field determined at each iteration by superposing the contributions of the given electric currents and of the polarization. This computation technique has great advantages over the finite element based procedures, namely, the change in the rotor position does not require the construction of a new discretization mesh, very small airgaps can be taken into consideration without increasing the amount of computation, and the calculated magnetic field in the air is divergenceless and curlless, thus eliminating the introduction of spurious forces. As well, the phase voltages and the magnetic forces are easily calculated from the magnetic field quantities.**

Index Terms—Nonlinear magnetic field computation, rotor eccentricity, synchronous machine.