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TRANSIENT DYNAMIC BEHAVIOR OF TWO PHASE MAGNETO-ELECTRO-ELASTIC SENSORS BONDED TO ELASTIC RECTANGULAR PLATES

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Abstract- Transient dynamic behavior of Magneto-electro-elastic (MEE) sensors bonded to a mild steel plate using 3D magnetic vector potential approach is presented. The electric field induced by time varying magnetic field is non-conservative and can be described by electric scalar potential and magnetic vector potentials. The aim of the study is to find how different volume fractions of the

MEE composite behave in sensor applications at various locations on the plate subjected to different boundary conditions. The 3D plate and the sensor are modeled using eight nodded brick element with sufficient numbers of elements across the thickness direction to capture the bending behavior of the plate correctly. The four boundary conditions chosen are one symmetric boundary condition (CCCC), one free edge (CCFC), two adjacent free edges (CFFC) and two opposite free edges (FCFC). It is seen that the electric response is maximum when volume fraction v_f=0.2 for all sensor locations with different boundary conditions. The boundary conditions significantly influence the magnetic response; volume fraction v_f=0.4 gives noticeably higher values of magnetic potential in almost all the cases except for CFFC boundary condition with sensor near the edge and FCFC boundary condition with sensor at an off set distance from the edge.

Index terms*:* Magneto-electro-elastic, sensor, magnetic vector potential, transient response, finite element