**PROJECT APPROVAL FORM (Zeroth Review)**

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Programme of Study : BTech (Mechanical Engineering)

Project Title : Analytical Modeling of Electromagnetic Stirring of Liquid

Metals

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**Brief Abstract**

Electromagnetic Stirring (EMS) is a well know phenomena wherein Lorentz forces are used to create convection in the conducting fluids (liquid metals) without contaminating the fluid. EM forces are generated by passing phase displaced alternating currents through a set of fixed coils (stator). The traveling primary current field in the stator induces a magnetic field in the conductor (rotor) place in the annulus of the stator. The induced magnetic field sets up a secondary opposing current in the rotor. This combination of opposing current along with the primary magnetic field (in the stator) together produces a net force in the rotor known a Lorentz force.

If a liquid metal is placed in the annulus, the Lorentz forces cause the melt to convect. The convection in the melt alters the induced magnetic field in the rotor which has a net effect on the magnitude of Lorentz forces generated. Therefore a coupled solution of fluid flow magnetic field is necessary to capture the entire physics.

In the present work I will be using FLUENT to solve the above problem. A separate user defined module (UDF) will be written to solve for electromagnetic forces. The UDF will be coupled with the Navier Stokes equations to get input about the fluid velocities.

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