Contribution ID: **225** Type: **Poster**

TRANSIENT THERMAL EFFECTS AND RAIL DAMAGE IN ELECTROMAGNETIC LAUNCHING

Tuesday, 20 June 2017 13:30 (1h 30m)

When solid armature moves along rail at high speed, the thermal effect will destroy good contact between armature and rail in the process of electromagnetic rail propulsion. It has a lot of damage to rail, and which will affect launching's precision and efficiency. In this paper, the simulation, measurement and characteristic analysis of the contact surface temperature are carried out for the high speed sliding electrical contact between armature and rail. Based on the theory of electrical contact, it analyzed the temperature source of the armature and rail contact surface, established the temperature model, and studied the different effects of different contact temperature on the armature and rail.

The self-made device of electromagnetic rail launch was used as the test platform. Based on infrared radiation thermometry, measurement system measured contact temperature between rail and armature in the the device. The correctness of the simulation was verified by the data comparison of experiment and simulation. The analyzing experimental results obtained the influence of different parameters on the temperature characteristics of armature and rail's contact surface.

Comparison of the rail's damage under the different conditions, further analysis combined the temperature effect with the damage result. The simulation results showed that the temperature model could be obtained macroscopic characteristics, such as temperature, displacement, velocity, etc. The experimental results also reflected rail's damage with the temperature change of contact temperature between rail and armature in the electromagnetic rail propulsion. It is significance for the efficient launching of electromagnetic railgun, and provide an effective basis for the contact analysis of armature and rail.

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Session Classification: Poster session II - Pulsed Power Industrial and Bio-Medical Applications

Track Classification: Pulsed Power Industrial and Bio-Medical Applications