

# Simulation of Interaction of Flywheel Rings with Superconducting Bearing for Flywheel Energy Storage Systems

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Excess energy in machinery can be stored for reuse in forms of the kinetic energy of the flywheel, composed of a permanent magnetic ring. In the simulation of interaction of flywheel rings with superconducting bearing with COMSOL Multiphysics version 5.2 program, a Neodymium-Iron-Boron magnetic ring of 20 mm in inner radius, 80 mm in outer radius, and 23 mm in thickness has a remanent magnetic flux density of 1.3 T. An Yttrium Barium Copper Oxide superconducting ring is 20 mm in inner radius, 80 mm in outer radius, and 5 mm in thickness. It is found that the magnetic flux density along the radial direction measured from the center to the edge of the ring is not uniform for every simulation distance. While the magnetic flux density is almost uniform at 80 mm with an exception of the center in the angular direction when the distance from the ring surface increases. The higher values in the range of 0.14-0.34 T is obtained near distance of 5-20 mm. When the dimension of magnetic ring is changed, the repulsive force is reduced. This results indicates that the repulsive force useful for stable flywheel energy storage systems can be enhanced by increasing the dimension of magnetic ring or soft magnetic materials.

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