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Mon-Mo-Po1.10-04 [112]: Dynamic Characteristics in The Horizontal Direction for New Type SMB Using SC Bulk and SC Coil

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INTRODUCTION
Recently, magnetic levitation techniques have been developed for various fields such as energy storage flywheels and magnetically levitated vehicles. Thus, there are many reports about levitation techniques using high critical temperature (Tc) superconducting magnetic bearings (SMBs) composed of superconducting (SC) bulk and permanent magnet (PM). In this paper, new SMBs composed of SC bulk, SC coil and PM are discussed.
SC BEARING AND EXPERIMENTAL METHOD
In this paper, we propose a SC bearing composed of SC bulk, SC coil and PM. The levitation is performed using pinning force between SC bulk and PM. A neodymium (NdFeB) PM with a diameter of 27 mm and a thickness of 3.4 mm is used. The SC bulk (Dy1Ba2Cu3OX, Jc=3 ×108 A/m2 at 77 K and 1.0 T) measures 44 mm in diameter and 7.5 mm in thickness. The yttrium type SC coil (Ic=150A) measures 35mm in inner diameter, 38mm in outer diameter and 5mm in thickness with four turns. The SC bulk and the SC coil are field-cooled using liquid nitrogen.
EXPERIMENTAL RESULTS AND DISCUSSIONS
In the experiments, the SC bearing with SC coil is compared with the SC bearing without SC coil. The distance between SC bulk and PM is changed at 7mm, 8mm and 9mm. At each distance, impulse responses for the SC bearing without SC coil are performed. The result shows that the displacement amplitude for each distance decreases gradually as the time increases.
Impulse responses for the SC bearing with SC coil are performed. The displacement amplitude for each distance decreases rapidly. It is found that the damping for the SC bearing with SC coil is larger than that for the SC bearing without coil.
SUMMARY
The SC coil is effective on the damping for the SC bearings. From the experimental results, both stiffness and damping coefficient for the SC bearing with SC coil are improved compared with the SC bearing without SC coil.

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