

Effect of magnetorheological grease's viscosity to the torque performance in magnetorheological brake

ABSTRACT

Recently, magnetorheological grease (MRG) has been utilized in magnetorheological (MR) brakes to generate a braking torque based on the current applied. However, the high initial viscosity of MRG has increased the off-state torque that led to the viscous drag of the brake. Therefore, in this study, the off-state viscosity of MRG can be reduced by the introduction of dilution oil as an additive. Three samples consist of pure MRG (MRG 1) and MRG with different types of dilution oil; hydraulic (MRG 2) and kerosene (MRG 3) were prepared by mixing grease and spherical carbonyl iron particles (CIP) using a mechanical stirrer. The rheological properties in the rotational mode were examined using a rheometer and the torque performances in MR brake were evaluated by changing the current of 0 A, 0.4 A, 0.8 A, and 1.2 A with fixed angular speed. The result shows that MRG 3 has the lowest viscosity which is almost 93% reduction while the viscosity of MRG 2 has lowered to 25%. However, the torque performances generated by MRG 3 were highest, 1.44 Nm, when 1.2 A of current was applied and followed by MRG 2 and MRG 1. This phenomenon indicated that the improvement of torque performances was dependent on the viscosity of MRG. By reducing the viscosity of MRG, the restriction on CIP to form chain formation has also decreased and strengthen the torque of MRG brake. Consequently, the utilization of dilution oil in MRG could be considered in MR brake in near future.