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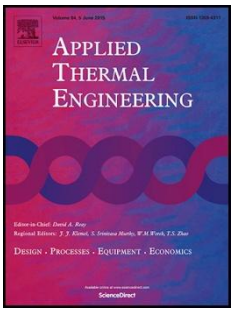

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PII: S1359-4311(15)01391-5
DOI: http://dx.doi.org/doi: 10.1016/j.applthermaleng.2015.11.128
Reference: ATE 7425

To appear in: *Applied Thermal Engineering*

Received date: 16-7-2015
Accepted date: 29-11-2015

Please cite this article as: Satyajit R. Patil, Kanhaiya P. Powar, Suresh M. Sawant, Thermal analysis of magnetorheological brake for automotive application, *Applied Thermal Engineering* (2015), http://dx.doi.org/doi: 10.1016/j.applthermaleng.2015.11.128.

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THERMAL ANALYSIS OF MAGNETORHEOLOGICAL BRAKE FOR AUTOMOTIVE APPLICATION

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Highlights

- Thermal studies on MR brake envisaged for a two wheeler application are presented.
- Mesh quality check of CAD model has been made.
- Transient analysis shows temperature rise within acceptable limit.
- Simulation based on drive cycle has yielded encouraging results.
- The analysis is supported with experimental results of temperature rise.

ABSTRACT

Researchers are exploring potential of magnetorheological (MR) brakes for automotive applications. These are superior to conventional hydraulic brakes in terms of response time. However, the technology has not yet matured. This article presents thermal analysis of MR brake (MRB) proposed for an e-bicycle in order to estimate the temperature rise of MR fluid on account of braking manoeuvre. The temperature of MR fluid in the brake is required to be within the operating range of the same. Details of FEA model of proposed MRB and analysis methodology have been presented. The transient analysis is based on IS brake fade test for two wheelers as well as real world cycle typifying Indian urban conditions. The analysis shows that the temperature of MRB remains within operating range of MR fluid and hence the brake satisfies the thermal requirements. The analysis findings have also been supported with experimental results.

Keywords: Magnetorheological fluid; Magnetorheological brake; thermal analysis; FEA model

1. INTRODUCTION AND LITERATURE REVIEW

Magnetorheological fluids (MRFs) belong to the family of smart materials and change their viscosity in response to change in strength of magnetic field when subjected to the same. MRFs have been researched extensively recently and their industrial applications have been explored as well. Few of them like MR dampers and elastomers have been commercialized

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