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Title:
Development of a Magneto-Rheological Fluid Powertrain for Electric Vehicle Applications

Journal:
Advanced Structures Materials, Volume 148, 2021

Document Type:
Book Chapter

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Full text link:
https://www.springerprofessional.de/en/development-of-a-magneto-rheological-fluid-powertrain-for-electr/19151356

Scopus preview
https://www.scopus.com/inward/record.uri?eid=2-s2.0-85105627139&doi=10.1007%2f978-3-030-67750-3_3&partnerID=40&md5=a23cc86552dc387e16848a096d3cdc29

Citation:
Shaefe M.F., Zainun M.I.M., Zahelem M.N., Abu Bakar M.H.
Development of a Magneto-Rheological Fluid Powertrain for Electric Vehicle Applications
(2021) Advanced Structured Materials, 148, pp. 19 – 33
DOI: 10.1007/978-3-030-67750-3_3

Abstract:
The mechanical, rheological, and magnetic properties of magneto-rheological (MR) fluids were investigated for potential engineering applications. The typical modes of exploiting this technology were shown and discussed. An increasing number of industrial applications illustrate how the particular properties magneto-rheologic fluids may peculiar properties be used to provide optimal performance in torque transmitting devices. A torque transfer mechanism for electric vehicle transmissions that yields low losses, while still satisfying the conflicting requirements of compactness, quick response, high power density, and the most important is lightweight since the electric vehicle is running with a reduced total mass with no engine are explored in this contribution. Moreover, a systematic approach to MRF transmission design is proposed. The various design variants were chosen to serve two purposes, i.e., to demonstrate the foundation and to showcase approaches and solutions to specific problems that have a direct application in transmission design. The phenomenon of “spin loss” is well known in the automotive industry, which affects all transmissions. One energy sink identified in this regard lies in conventional wet clutches where it creates a drag on the transmission because of the oil churning around and between the rotating friction plates.