

# Magnetorheological Fluid Materials Properties, Rheological Behaviour and Device Design in Valve Application.

S. Aid<sup>1</sup>, I. Ismail<sup>1</sup>, S.A. Wahid<sup>1</sup>, M.S.A.Rahim<sup>1</sup>

<sup>1</sup>Faculty of Manufacturing Engineering, Universiti Malaysia Pahang  
26600 Pekan, Pahang, Malaysia

**Email:** [syadillaaid@gmail.com](mailto:syadillaaid@gmail.com)

**Abstract.** This paper presents a comprehensive review of magnetorheological (MR) fluid technology in valve mode or flow mode application. Special emphasises are put on the three major elements in MR valve applications namely the MR materials, rheological behaviour and the device design. In the duration of past ten years, the MR fluid materials and valve mode devices evolved from conceptual design to functional applications. Spiralling efforts is going on around the world contributes to this huge steps of development. The accomplishment of this technology is contributed by the good design of the valve mode device as well as the refined properties of MR fluid. Good MR fluid measured through its stability in sedimentation behaviour, the large ratio of  $\tau_{on}$  and  $\tau_{off}$  state viscosity and maximum effects of shear stress under induction of magnetic field. This paper first presents the material composition of MR fluid components for valve mode application. Then, the rheological behaviour of MR fluid in valve mode environment is discussed. Finally, this paper reviews the development of MR valve design and their applications in past ten years.

Keywords: Magnetorheological; Smart Materials; Valve Design