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Inverse Modeling of Magnetorheological Dampers: Bingham and Hershel-Bulkley Models[1] DENNIS SIGINER, Petroleum Institute, MARIO LETELIER, Universidad de Santiago de Chile — Magnetorheological fluids (MR) are increasingly used in damper design when a given response is critical for desired performance. MR fluids flow through narrow passages in dampers subject to a magnetic field applied across the passages. The inverse problem of the determination of the required constitutive properties of the MR fluid together with the corresponding flow pattern for the efficient damping of a given load is solved when the required performance is specified a priori. The fluid is modeled either as a Bingham plastic or is assumed to obey Herschel-Buckley constitutive structure both with time-varying yield-stress. Flow is governed by the continuously adjustable constitutive parameters of the MR fluid which are determined to generate variable resistance to flow to dampen the selected load efficiently. The method developed leads to the determination of the magnetic field variation required to achieve a predetermined displacement of the piston in the damper. The governing equations are solved for any time history of the dimensionless yield stress of the fluid. Relationships that correlate damping load and magnetic field time variations are obtained.

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