

## عنوان مقاله:

Experimental and Numerical Investigation on Laminar Pipe Flow of Magneto-Rheological Fluids under Applied External Magnetic Field

## محل انتشار:

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## خلاصه مقاله:

An experimental and numerical study of Magnetorheological (MR) fluids flow in circular pipes under the influence of uniform magnetic field is considered. In the experiments, an electromagnetic device was manufactured to generate the magnetic field. The experiments were performed using magnetic fields  $B=0, 0.01, 0.02, 0.03, 0.04, 0.05, 0.06, 0.07, 0.08, 0.09, 0.1, 0.12$  and  $0.15$  T. Numerical study was performed to show the accuracy of the results obtained from experimental study. In numerical study, Computational Fluid Dynamics (CFD) analysis was used. The ANSYS Fluent 14.0 code based on the finite volume method was used for the CFD analysis. In the experiments, the applied magnetic field decreased the flow rate of the fluids by increasing viscosity. In case of 10 mm pipe diameter, the flow velocity of the A, B and C fluids were obtained as 0.593, 0.749 and 0.938 m/s respectively in situation  $B=0$  T. When magnetic field was applied as  $B=0.15$  T, decreases have occurred in the velocity of A, B and C fluids as 95.27%, 90.24% and 85.6% respectively. Similarly, in case of 15 mm pipe diameter, 96.87%, 95.06% and 90.76% decreases have occurred in the flow velocity of A, B and C fluids having 0.301, 0.363 and 0.445 m/s flow velocity respectively. The results were compared for the magnetic field values  $B=0, 0.05, 0.10$  and  $0.15$  T. It was found that the differences between experimental and numerical study were found as 6.10% and 1.71% for the  $B=0$  T and  $B \neq 0$  T situations respectively when the pipe has 10 mm pipe diameter. In case of 15 mm pipe diameter, the differences were found as 2.31% and 0.89%. As a result, it was found that the results obtained from experimental and numerical study were qualitatively and quantitatively in good agreement.

## کلمات کلیدی:

Magnetorheological (MR) fluid, Laminar pipe flow, Magnetic field, CFD

## لینک ثابت مقاله در پایگاه سیویلیکا:

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