Non-Newtonian Flows in Annular Shock-Absorbers

The seminar will be given in Hebrew

Viscous flows in annular configurations are commonly encountered in the context of dampers and shock absorbers. In many cases, such devices involve rapid actuation of a highly viscous fluid, yielding non-Newtonian fluidic response. This seminar will present an analytical study of a non-Newtonian ‘Carreau’ fluid in an annular configuration. The analysis is based on asymptotic expansions with regard to a small parameter representing the ratio between of non-Newtonian effects and Newtonian effects. The approximated solutions are verified via a series of CFD computations. The derived model is then used in the analysis of realistic dynamics of medium-sized shock-absorber, and the design of an optimal geometry. Based on analytical and numerical results, an experimental setup of a viscous-damper device with non-Newtonian fluid was constructed and tested. The experimental results agree with the numerical and analytical results.