

# Numerical Analysis of Heat Generation in Ball End Magnetorheological Finishing

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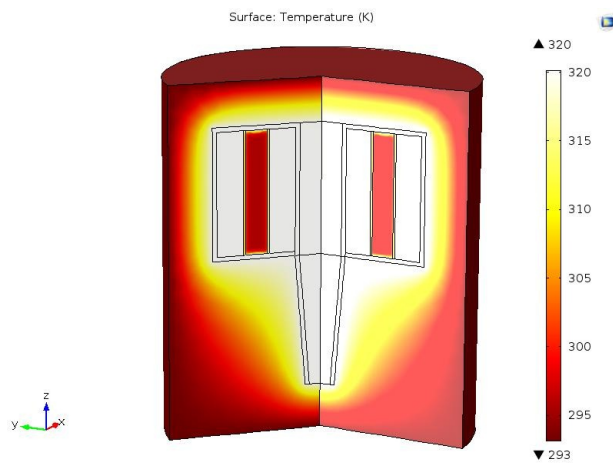
## Abstract

Magneto rheological finishing (MRF) is the ultra precision surface finishing operation; MRF fluid utilizes the smart and adaptive behavior of fluid under magnetic field for polishing. In the presence of the magnetic fluid becomes stiff due to magnetic dipole alignment and forming chain like structure. In the ball end magneto rheological finishing, due to heat generation by thermal agitation the effect of MRF finishing reduces and this ultimately hampers the process of the precision finishing, Due to heating effect of coils the density of MR fluid also changes which therefore results in instability of MR fluid. Heat generation in the polishing tool occurs because of the magnetic losses and the current losses. In the proposed work, heating due to current and its variation has been numerically analyzed using transformer oil as coolant. It was concluded that without use of coolant fluid, the temperature of the polishing tool reaches to 318K and with use of the coolant it is 295K.

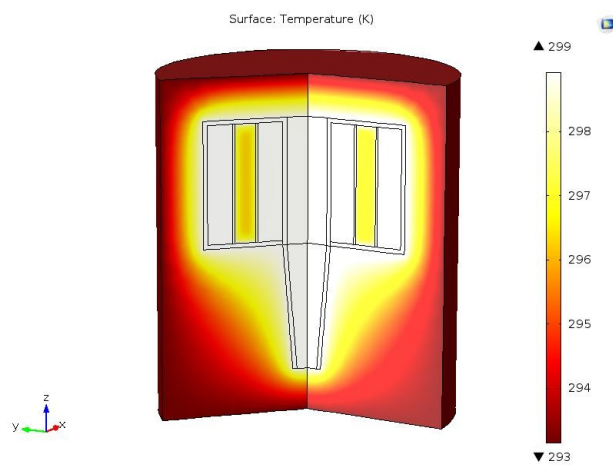
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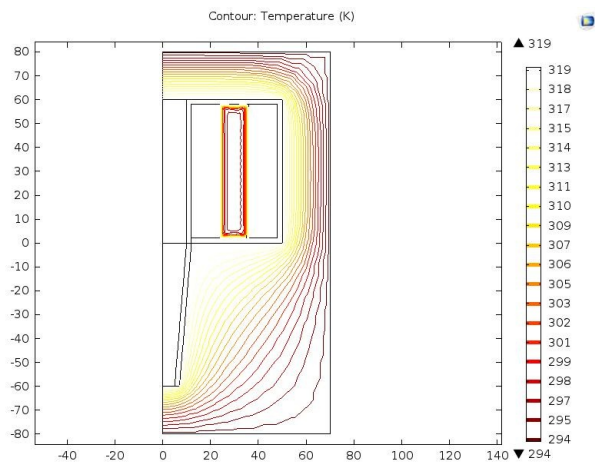
## Figures used in the abstract



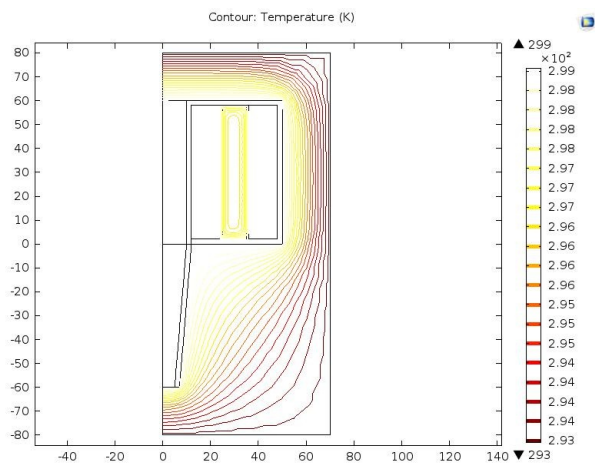
**Figure 1:** Temperature profile in system without coolant.



**Figure 2:** Temperature profile in system with coolant.



**Figure 3:** Temperature contour generated by coil.



**Figure 4:** Temperature contour generated between coil and coolant.