

Residual Stress in Induction-Hardened 4340 Steel Discs

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15 induction hardened discs with three initial hardness levels were used for distortion and hardening depth investigations. The results show that for the same initial hardness, the larger the energy input, the higher the distortion size as well as the hardening depth. For a given induction hardening recipe, the increase in initial hardness leads to a deeper hardening depth but a smaller distortion size. Triaxial residual stress measurement was performed by neutron diffraction on a selected disc sample. The results show that the

variation of ND-measured d_0 in the hardened layer affects the stress value in the same region up to ~ 200 MPa. The final residual stress distributions are calculated based on a combination of using ND-measured d_0 profile in the hardened layer and XRD-measured d_0 value in the core material. Over-tempered region is found in the hardness profile, suggesting that tempering effect occurs during the induction hardening treatment.

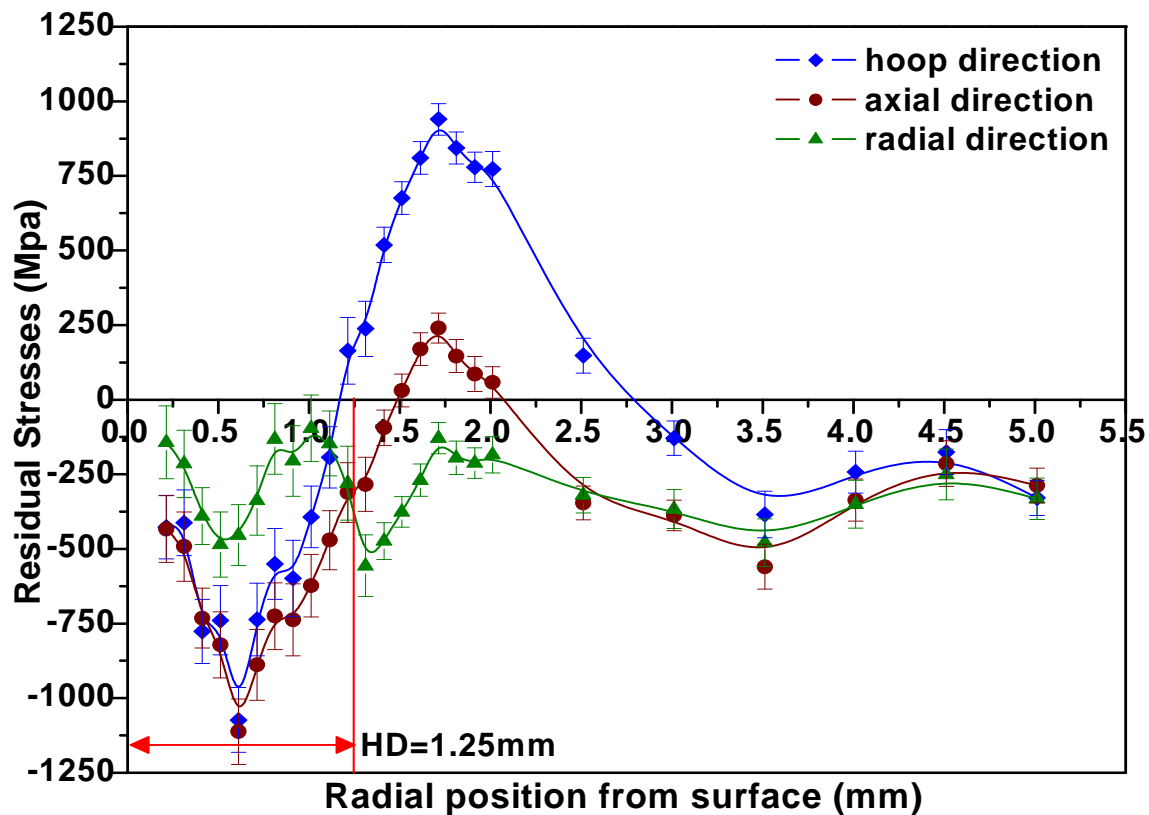


Fig. 1 Residual stress distribution in three directions calculated based on ND-measured d_0