



Scanning Induction Hardening of Steel Coupler

DANTE Solutions, Inc.

Problem Statement:
Thick-walled coupler of 4130 steel suffered axial cracks along a bore fillet during spray quenching following scanning induction heating.

Process Description:
Inductor scans from bottom to top of bore to austenitize the bore surface. Attached spray head follows inductor to quench the bore to martensite using a polymer solution.

Benefits:
By changing the process to include a low temperature preheat step:

- the surface tensile stresses during quenching were reduced;
- the final residual compressive stress gave improved part performance; and
- cracking problems were eliminated.

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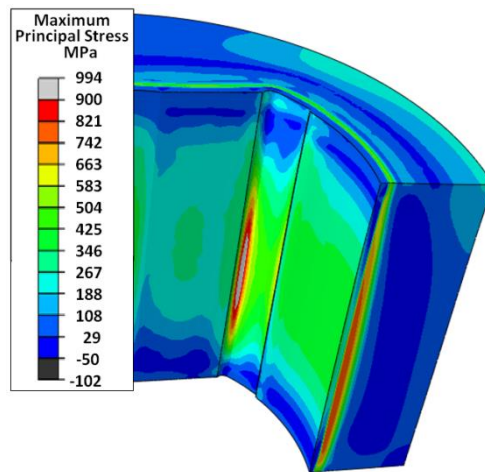
Coupler Body



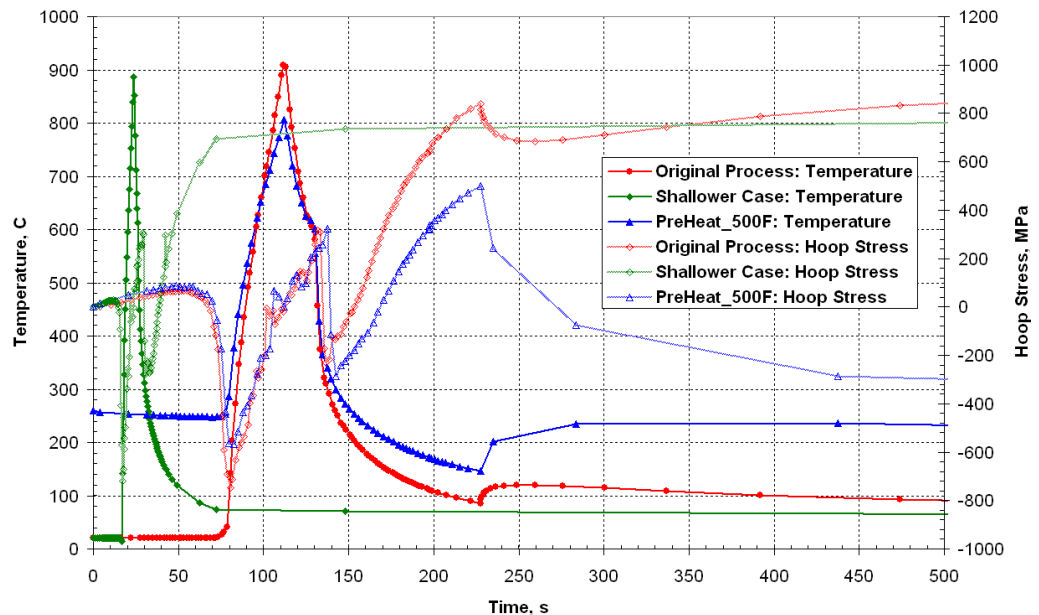
Inductor & Spray Head



Crack in Fillet



Maximum principal stress is highly tensile in the fillet corner where cracking occurs due to a high bending moment present as martensite forms during conventional process.



Time history plots comparing temperature and hoop stress for baseline process and process with initial preheat. Preheat decreases in-process hoop tension and leaves beneficial residual compressive hoop stress.