



Oil Hole Crack of Crankshaft During Induction Hardening

DANTE Solutions, Inc.

Problem Statement:

Cracking at oil holes on pin and main bearing sections of crankshafts during induction hardening occurs due to thermal stress during spray quenching. The problem arises due to the angle of the hole and the nonuniform mass distribution.

Process Description:

The nonuniform heating condition from an induction heating model is mapped into DANTE. Spray quenching and resultant thermal stresses and phase changes are then predicted. The process cycle and spray application were changed to reduce in-process stresses.

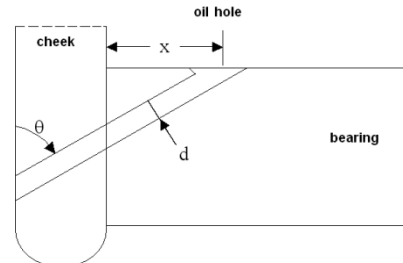
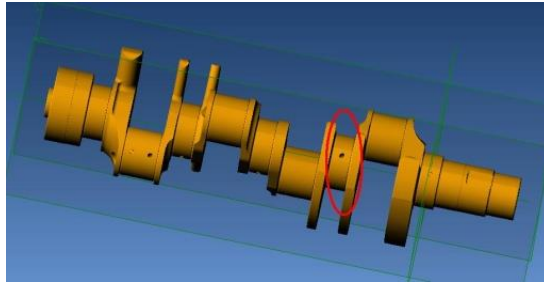
Benefits:

Thanks to modeling, a process change solved the cracking problem that trial-and-error tests had not been able to do!

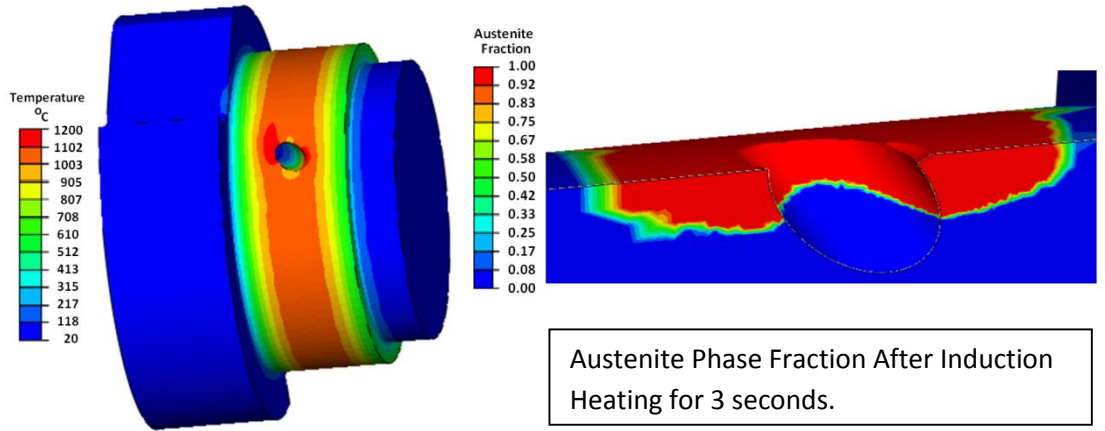
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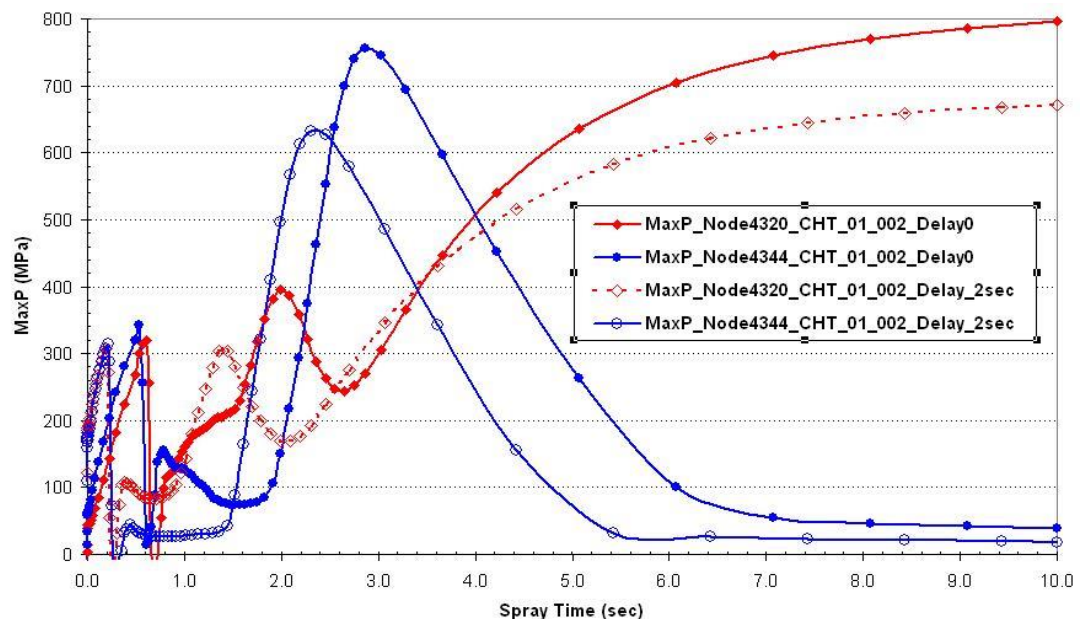


CAD Model Shows the Location of Oil Hole. Schematic Plot Shows the Hole Angle to Bearing Section Surface. During Induction Heating, the Power Density Around the Hole is Nonuniform.



Temperature Distribution Showing Nonuniform Temperature Around Oil Hole.

Austenite Phase Fraction After Induction Heating for 3 seconds.



Comparison of Maximum Principal Stress at Two Locations Showing the Benefit of Quench Delay.