

Quenching Control and Distortion

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Including the 4th International Distortion Engineering Conference

Editor

D. Scott MacKenzie



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PREFACE

Twenty years ago, on 22–25 September 1992, the First International Conference on Quenching and Control of Distortion was held in Chicago. As George Totten indicated in his preface for the first conference:

“The First International Conference on Quenching and Control of Distortion was held to obtain a global assessment of various aspects of current quenching technology. For the first time, an integrated view of quenching, distortion and residual stress was discussed in one forum to encourage an interdisciplinary approach to future technology development”

In the first conference proceedings, there were forty-five papers from fourteen different countries. In the proceedings for this conference, we have in excess of eighty papers from thirty-three different countries. This is truly a global event.

In the past twenty years, the technology changes have been staggering. In the first proceedings, the application of various computer codes to predict microstructure and distortion in simple geometries was discussed. These codes required the use of large mainframe computers or super computers. Now, these codes can be run on your desktop or lap top. Single, simple geometries in simple flow fields were simulated. Now much more complex parts and flow fields are being examined.

Twenty years ago, the application of Computational Fluid Dynamics (CFD) to heat treating was not discussed, as this field was reserved for specialized aerospace applications. The CFD codes required supercomputers to run, with difficult user interfaces and visualization software. With the speed of computers, and the improvements in software, CFD models are now applied to understanding flow issues during quenching, and resolving nonuniform agitation.

Other changes have also occurred. For the most part, we do not look at distortion as strictly a heat treating problem, but take a more unified system approach. We look at all the factors causing distortion, and optimize the entire manufacturing process to reduce residual stress and distortion. This has been the focus of the International Conference on Distortion Engineering (held prior to this event in Germany), now part of this event. —Distortion and control of residual stresses are still primary drivers for quality and performance.

While 20 years has shown a great deal of progress, more understanding is needed. The interaction of parts and flow-fields, with the resultant changes in heat transfer boundary conditions is of prime importance. The visualization of agitation uniformity to reduce distortion is being developed, and used to understand changes in boundary conditions. New steels (and some old ones) require more detailed constitutive equations. The issues of proprietary versus open sourced microstructure and heat transfer relationships are being discussed.

This event could not have happened without the tremendous effort, and organization by the ASM Staff, specifically Pamela Kleinman and DeAna Morgan. This event could not have occurred without the hard work of the entire Organizing Committee. This committee included:

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