



Resistance Welding: Fundamentals and Applications, Second Edition

By Hongyan Zhang, Jacek Senkara

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Resistance Welding: Fundamentals and Applications, Second Edition By Hongyan Zhang, Jacek Senkara

Drawing on state-of-the-art research results, **Resistance Welding: Fundamentals and Applications, Second Edition** systematically presents fundamental aspects of important processes in resistance welding and discusses their implications on real-world welding applications. This updated edition describes progress made in resistance welding research and practice since the publication of the first edition.

New to the Second Edition:

- Significant addition of the metallurgical aspects of materials involved in resistance welding, such as steels, aluminum and magnesium alloys, zinc, and copper
- Electric current waveforms commonly used in resistance welding, including single-phase AC, single-phase DC, three-phase DC, and MFDC
- Magnesium welding in terms of cracking and expulsion
- The effect of individual welding parameters
- 2-D and 3-D lobe diagrams
- New materials for the ultrasonic evaluation of welds, including A-scan, B-scan, and in-line A-scan

The book begins with chapters on the metallurgical processes in resistance spot welding, the basics of welding schedule selection, and cracking in the nugget and heat-affected zone of alloys. The next several chapters discuss commonly conducted mechanical tests, the monitoring and control of a welding process, and the destructive and nondestructive evaluation of weld quality. The authors then analyze the mechanisms of expulsion?a process largely responsible for defect formation and other unwanted features?and explore an often overlooked topic in resistance welding-related research: the influence of mechanical aspects of welding machines. The final chapters explain how to numerically simulate a resistance welding process and apply statistical design and analysis approaches to welding research.

To obtain a broad understanding of this area, readers previously had to scour large quantities of research on resistance welding and essential related subjects, such as statistical analysis. This book collects the necessary information in one source for students, researchers, and practitioners in the sheet metal industry. It thoroughly reviews state-of-the-art results in resistance welding research and gives you a solid foundation for solving practical problems in a scientific and systematic manner.

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Editorial Review

Review

"The second edition has made a great book even better. It remains a significant, practical aid to anyone interested in a better understanding of resistance welding science and it should be considered for their library."

?*Welding Journal*, February 2013

Praise for the First Edition:

"The chapters are easy to comprehend, and the topics are presented in a 'big picture' basis. ... General concepts are the highlight. ... There are 20 to 40 references at the end of each chapter, and most of the chapters begin with a good literature, which then allows this book to be used as an introduction to welding at the graduate level in an engineering discipline."

?*JOM Online*, March 2006

"[this book] will almost certainly find its way into the library of anyone who needs or wants to understand the physics behind resistance spot welding ... [It offers] a detailed analysis of the physics involved in the resistance welding process that is, for the most part, remarkably easy to understand. ... They [the authors] have also reinforced their methodical explanations with nearly 300 original graphics ... For both the student and process user, there is a lot of basic information presented in an easy-to-read fashion ... For theoretical studies or laboratory work, there is a bounty of information beyond the excellent compilation of reference materials. It might be too soon to proclaim this work as historically significant, but it seems a virtual certainty that it will be viewed as such. In any case, the authors have certainly done a great service to the resistance welding industry."

?David Beneteau, CenterLine Ltd., Windsor, Ontario, Canada

About the Author

Dr. Hongyan Zhang is an associate professor in the Department of Mechanical, Industrial, and Manufacturing Engineering at the University of Toledo. He has published over 70 peer-reviewed journal and conference papers and contributed to a number of American Welding Society Standards. His research interests include materials, forming, welding, and mechanical fastening; manufacturing process monitoring and control; failure analysis; structural optimization; and hybrid propulsion systems.

Dr. Jacek Senkara is a professor of the Production Engineering Faculty at Warsaw University of Technology. He has published roughly 100 scientific and technical papers in professional journals and conference proceedings and served as a principal investigator for a number of government, industry, and university-supported research projects. His research interests include materials aspects of welding and welding-related processes, along with the surface modification of materials.

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