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Grind Hardening Process

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To my wife Ioanna
and my daughter Eftychia

Preface

Grinding is one of the most important processes in the manufacturing discipline. One of the key goals for successful grinding is controlling the heat transfer in order to ensure that the workpiece material does not undergo any metallurgical changes. However, this problem can also be considered as an opportunity. By controlling the amount of heat that is conducted in the workpiece material, it can result in its surface heat treatment. Grind-hardening process thus is a novel, non-conventional, machining process that can be used for the simultaneous surface hardening and grinding of metallic components.

Grind-hardening process can potentially substitute conventional heat treatment methods by integrating this process in the grinding phase. The key benefit of doing so is the elimination of the need for transportation of the work in progress and the minimization of additional set-ups. The process can be used for selective surface hardening of cylindrical and flat components such as shafts, rail-guides, etc.

The main objective of this book is to present the *Grind-Hardening Process* and the main studies published since it was introduced in the 1990s. Modelling of the various aspects of the process, such as the process forces, temperature profile developed, hardness profiles, residual stresses, etc., are presented in detail. The book is directed to the research community interested in the mathematical modelling and optimization of such a manufacturing process. It is intended to be employed mainly at the postgraduate level.

In the present book, the *Grind-Hardening Process* is introduced and analysed. Chapter 1 compares grind-hardening process to alternative surface modification processes. The state of the art of the grind-hardening process is reviewed and discussed in Chap. 2. The modelling of the process is presented in Chap. 3. In Chap. 4, the energy efficiency issues of the process and its environmental impact is analysed. Finally in Chap. 5, concluding remarks on the grind-hardening process are presented.

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