

J. Paulo Davim *Editor*

Machining of Hard Materials

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Preface

Hard machining is a recent technology that can be defined as the machining operation of a workpiece that has a hardness value typically in the 45–70 HRC range, using directly tools with geometrically defined cutting edges. This operation always presents the challenge of selecting a cutting-tool insert that facilitates tool life and high-precision machining of the component. Hard machining presents several advantages when compared with the traditional methodology based on finish-grinding operations after heat treatment of workpieces. Also this technology presents a great contribution to sustainable manufacturing.

The hard-materials group comprises hardened steels, high-speed steels, heat-treatable steels, tool steels, bearing steels and chilled/white cast irons. Also, Inconel, Hastelloy, cobalt alloys for biomedical applications and other special materials are classified as hard materials. These materials are in constant use by the automotive industry for bearing production and for machining of moulds and dies as well as other components for advanced industries.

Chapter 1 of the book provides the definitions and industrial applications of machining of hard materials. Chapter 2 is dedicated to advanced cutting tools. Chapter 3 describes the mechanics of cutting and chip formation. Chapter 4 contains information on surface integrity. Chapter 5 is dedicated to finite-element modelling and simulation. Finally, Chapter 6 is dedicated to computational methods and optimization.

This book can be used as a textbook for final undergraduate engineering courses or as a topic on manufacturing at the postgraduate level. It can also serve as a useful reference for academics, manufacturing researchers, manufacturing, materials and mechanical engineers, and professionals in machining and related industries. The scientific interest of this book is evident for many important centres of research, and laboratories and universities throughout the world. Therefore, it is hoped this book will inspire and enthuse other researchers in this field of machining science and technology.

I am grateful to Springer for this opportunity and for their enthusiastic and professional support. Finally, I would like to thank all the Chapter authors for their contributions to this work.

University of Aveiro, Portugal, April 2010

J. Paulo Davim

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