

Preface

As the key component of aero-engine, turbine blades determine the performance, reliability and security of the aero-engine. Due to the high external dimensional accuracy, and complicated internal cooling channels of turbine blades, which make the fabrication of such blades more difficult. Hollow turbine blade manufacturing technology has become a major issue during the development of aero-engine. Currently, turbine blades are fabricated by using investment casting process and then supplement the necessary machining process. Among those processes, die cavity optimization, precision manufacturing, and rapid leading are the key points to ensure the accuracy, and shorten the manufacturing period for turbine blades.

The Key Laboratory of Contemporary Design and Integrated Manufacturing Technology, Ministry of Education in Northwestern Polytechnical University has carried out research on the design, analysis, and manufacturing technologies of investment casting die for complex hollow turbine blades. Funded by National High-tech R&D Program, National Key Technologies R&D Program, Aero-Science Foundation of China, the integrated design and manufacturing technologies of investment casting die were widely studied, and over 100 academic papers were published. Independently developed “turbine blade casting die CAD/CAM system” won the 1999 annual ministerial level scientific and technological progress award.

The theory and application achievements in the field of turbine blade casting die were summarized systematically in this book. The related materials have been mainly from the group of “Advanced manufacturing technologies for aero-engine” led by Prof. Dinghua Zhang since 1990s, including academic research papers, technical reports, and patent literature. The main contents include digital modeling of turbine blades, casting die design, cavity optimization, precision manufacturing of die and rapid leading, and detection and evaluation technology for turbine blade. This book aims to provide advanced digital casting die design theory, method and practical technical reference for engineering practice.

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This book was conceived by Prof. Dinghua Zhang, and checked by Prof. Wenhua Wang. This book consists of seven chapters, Chaps. 1 and 6 were written by Dinghua Zhang; Chap. 2 was written by Neng Wan; Chaps. 3 and 4 were written by Wenhua Wang and Ruisong Jiang; Chap. 5 was written by Kun Bu and Yunyong Cheng; and Chap. 7 was written by Yunyong Cheng and Kuidong Huang.

Because of the our limited knowledge, mistakes cannot be avoided in the book. Please feel free to contact us and point out the mistakes.

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