

## Introduction

A splined shaft is a shaft part with multiple longitudinal keyways on the exterior of the shaft. It is usually used in mechanical systems to transmit motion and torque between the shaft and the hub, and to form a splined coupling with a hub containing an internal spline structure. Spline couplings are widely used in the automotive, aerospace, machine tool, engineering machinery and marine industries because of their high load carrying capacity, good alignment and guidance, and high reliability. For automobiles, spline shafts play an indispensable role in achieving normal driving functions, and their manufacturing level will directly affect the working performance and reliability of the whole mechanical system. Plastic forming process has become the main production method of spline shaft parts due to its characteristics of good mechanical properties of formed parts, high material utilization rate, high production efficiency and light weight production requirements. Therefore, it is necessary to carry out the research of high efficiency and high-performance precision forming manufacturing process and equipment for spline shaft parts. This book is based on the author's several years of research on the axial advance roll forming process of spline shafts, and provides a systematic and comprehensive description of the axial advance roll forming process of spline shafts. The content of the book is organized from shallow to deep, step by step, focusing on the combination of simulation and experiment.

The contents of the book are divided into 6 chapters. Chapter 1 introduces spline shafts, classification of spline shafts and production process of spline shafts; Chapter 2 introduces warm forming temperature plastic deformation behavior of materials, new TDFM process and microstructure evolution; Chapter 3 introduces deformation mechanism and performance improvement of spline shaft with 42CrMo steel by axial-infeed incremental rolling process; Chapter 4 introduces process parameter determination of the axial-pushed incremental rolling process of spline shaft; Chapter 5 in-

roduces finite element modeling and analysis for the integration-rolling-extrusion process of spline shaft; Chapter 6 introduces experimental study on the axial-infeed incremental warm rolling process for spline shaft production.

This book was completed from outline to finished manuscript by the joint efforts of Yada Chi, Shilei Xiong, Chao Chen, Da-Wei Zhang, Yongyi Li and others, and we thank all those who contributed to the publication of this book.

This book can be used for the study of relevant scientific researchers in the field of axially advanced roll forming process research of spline shafts, and also as a reference book for undergraduate and graduate students of shaft forming, gear forming research, material microanalysis and other related majors.

Due to the limited ability of the author, there are inevitable shortcomings in this book, and we sincerely ask the readers to give criticism and correction.