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Sheet Metal Forming Processes

Constitutive Modelling
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Taylan Altan,A. Erman Tekkaya



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Sheet Metal Forming Processes Dorel Banabic, 2010-06-21 The concept of virtual manufacturing has been developed in order to increase the industrial performances being one of the most efficient ways of reducing the manufacturing times and improving the quality of the products Numerical simulation of metal forming processes as a component of the virtual manufacturing process has a very important contribution to the reduction of the lead time The finite element method is currently the most widely used numerical procedure for simulating sheet metal forming processes The accuracy of the simulation programs used in industry is influenced by the constitutive models and the forming limit curves models incorporated in their structure From the above discussion we can distinguish a very strong connection between virtual manufacturing as a general concept finite element method as a numerical analysis instrument and constitutive laws as well as forming limit curves as a specificity of the sheet metal forming processes Consequently the material modeling is strategic when models of reality have to be built The book gives a synthetic presentation of the research performed in the field of sheet metal forming simulation during more than 20 years by the members of three international teams the Research Centre on Sheet Metal Forming CERTETA Technical University of Cluj Napoca Romania AutoForm Company from Zurich Switzerland and VOLVO automotive company from Sweden The first chapter presents an overview of different Finite Element FE formulations used for sheet metal forming simulation now and in the past

Modelling and Simulation of Sheet Metal Forming Processes Marta C. Oliveira, José Valdemar Fernandes, 2020-04-22 The numerical simulation of sheet metal forming processes has become an indispensable tool for the design of components and their forming processes This role was attained due to the huge impact in reducing time to market and the cost of developing new components in industries ranging from automotive to packing as well as enabling an improved understanding of the deformation mechanisms and their interaction with process parameters Despite being a consolidated tool its potential for application continues to be discovered with the continuous need to simulate more complex processes including the integration of the various processes involved in the production of a sheet metal component and the analysis of in service behavior The quest for more robust and sustainable processes has also changed its deterministic character into stochastic to be able to consider the scatter in mechanical properties induced by previous manufacturing processes Faced with these challenges this Special Issue presents scientific advances in the development of numerical tools that improve the prediction results for conventional forming process enable the development of new forming processes or contribute to the integration of several manufacturing processes highlighting the growing multidisciplinary characteristic of this field

Material Forming ESAFORM 2015 Aldo Ofenheimer, Cecilia Poletti, Daniela Schalk-Kitting, Christof Sommitsch, 2015-07-10 Selected peer reviewed papers from the 18th International ESAFORM Conference on Material Forming ESAFORM 2015 April 15-17 2015 Graz Austria

Metal Forming Chris V. Nielsen, Paulo A.F. Martins, 2021-02-12 Metal Forming Formability Simulation and Tool Design focuses on metal formability

finite element modeling and tool design providing readers with an integrated overview of the theory experimentation and practice of metal forming The book includes formability and finite element topics including insights on plastic instability necking nucleation and coalescence of voids Chapters discuss the finite element method including its accuracy reliability and validity and finite element flow formulation helping readers understand finite element formulations iterative solution methods friction and contact between objects and other factors The book s final sections discuss tool design for cold warm and hot forming processes Examples of tools design guidelines and information related to tool materials lubricants finishes and tool failure are included as well Provides fundamental integrated knowledge on metal formability finite element topics and tool design Outlines user perspectives on accuracy reliability and validity of finite element modeling Discusses examples of tools their design guidelines tool lubricants and tool failure Considers the role played by stress triaxiality and shear and introduces uncoupled ductile damage criteria Includes applications worked examples and detailed techniques

Advances in Mechanical Engineering Alexander N. Evgrafov, 2021-11-23 This book draws together the most interesting recent results to emerge in mechanical engineering in Russia providing a fascinating overview of the state of the art in the field in that country which will be of interest to a wide readership A broad range of topics and issues in modern engineering is discussed including dynamics of machines materials engineering structural strength and tribological behavior transport technologies machinery quality and innovations The book comprises selected papers presented at the 10th conference Modern Engineering Science and Education held at the Saint Petersburg State Polytechnic University in June 2021 with the support of the Russian Engineering Union The authors are experts in various fields of engineering and all of the papers have been carefully reviewed The book will be of interest to mechanical engineers lecturers in engineering disciplines and engineering graduates

Simulation of Material Processing: Theory, Methods and Application Ken-ichiro Mori, 2001-01-01 This volume contains about 180 papers including seven keynotes presented at the 7th NUMIFORM Conference It reflects the state of the art of simulation of industrial forming processes such as rolling forging sheet metal forming injection moulding and casting

Proceedings of the Summer School / Graduate School 1483, Process Chains in Production - Interaction, Modelling and Assessment of Process Zones (KIT Scientific Reports ; 7611) Rüdiger Pabst, Volker Schulze, 2012

Material Forming ESAFORM 2014 Jari Larkiola, 2014-05-23 Selected peer reviewed papers from the 17th Conference of the European Scientific Association on Material Forming ESAFORM 2014 May 7 9 2014 Espoo Finland

Advances in Material Forming and Joining R. Ganesh Narayanan, Uday Shanker Dixit, 2015-04-24 This edited book contains extended research papers from AIMTDR 2014 This includes recent research work in the fields of friction stir welding sheet forming joining and forming modeling and simulation efficient prediction strategies micro manufacturing sustainable and green manufacturing issues etc This will prove useful to students researchers and practitioners in the field of materials forming and manufacturing

Frattura ed Integrità Strutturale - Annals 2013 AA.VV., 2013-12-31 Frattura ed Integrità Strutturale

Fracture and Structural Integrity is the official Journal of the Italian Group of Fracture ISSN 1971 8993 It is an open access Journal published on line every three months July October January April Frattura ed Integrit Strutturale encompasses the broad topic of structural integrity which is based on the mechanics of fatigue and fracture and is concerned with the reliability and effectiveness of structural components The aim of the Journal is to promote works and researches on fracture phenomena as well as the development of new materials and new standards for structural integrity assessment The Journal is interdisciplinary and accepts contributions from engineers metallurgists materials scientists physicists chemists and mathematicians

Engineering Plasticity Z. R. Wang, Weilong Hu, S. J. Yuan, Xiaosong Wang, 2018-05-14 An all in one guide to the theory and applications of plasticity in metal forming featuring examples from the automobile and aerospace industries Provides a solid grounding in plasticity fundamentals and material properties Features models theorems and analysis of processes and relationships related to plasticity supported by extensive experimental data Offers a detailed discussion of recent advances and applications in metal forming

Multiscale Modelling in Sheet Metal Forming Dorel Banabic, 2016-10-20 This book gives a unified presentation of the research performed in the field of multiscale modelling in sheet metal forming over the course of more than thirty years by the members of six teams from internationally acclaimed universities The first chapter is devoted to the presentation of some recent phenomenological yield criteria BBC 2005 and BBC 2008 developed at the CERTETA center from the Technical University of Cluj Napoca An overview on the crystallographic texture and plastic anisotropy is presented in Chapter 2 Chapter 3 is dedicated to multiscale modelling of plastic anisotropy The authors describe a new hierarchical multi scale framework that allows taking into account the evolution of plastic anisotropy during sheet forming processes Chapter 4 is focused on modelling the evolution of voids in porous metals with applications to forming limit curves and ductile fracture The chapter details the steps needed for the development of dissipation functions and Gurson type models for non quadratic anisotropic plasticity criteria like BBC 2005 and those based on linear transformations Chapter 5 describes advanced models for the prediction of forming limit curves developed by the authors Chapter 6 is devoted to anisotropic damage in elasto plastic materials with structural defects Finally Chapter 7 deals with modelling of the Portevin Le Chatelier PLC effect This volume contains contributions from leading researchers from the Technical University of Cluj Napoca Romania the Catholic University of Leuven Belgium Clausthal University of Technology Germany Amirkabir University of Technology Iran the University of Bucharest Romania and the Institute of Mathematics of the Romanian Academy Romania It will prove useful to postgraduate students researchers and engineers who are interested in the mechanical modeling and numerical simulation of sheet metal forming processes

Advances in Material Forming Francisco Chinesta, Elias Cueto, 2007-10-27 This book groups the main advances in material forming considering different processes conventional and non conventional focusing in polymers composites and metals that are analyzed from the state of the art describing the most significant recent advances and identifying the present

challenges from the experimental modeling and numerical points of view Chapters include a large list of references and have been written by recognized specialists Special emphasis is devoted to the contributions of the European Scientific Association on Material Forming ESAFORM during the last 10 years 1998 2007 and in particular the ones coming from its annual international conference The first chapter includes an excellent introduction to the Esaform association please visit www.esaform.org for further information We hope that this book will be valuable for all the readers and it is specially addressed to young researchers trying to define the state of the art or identifying the open problems in the different areas covered by this book

Deformation-Based Processing of Materials Heng Li,Mingwang Fu,2019-03-11 Deformation Based Processing of Materials Behavior Performance Modeling and Control focuses on deformation based process behaviors and process performance in terms of the quality of the needed shape geometries and the requested properties of the deformed products In addition modelling and simulation is covered to create an in depth and epistemological understanding of the process Other topics discussed include ways to efficiently reduce or avoid defects and effectively improve the quality of deformed parts The book is ideal as a technical document but also serves as scientific literature for engineers scientists academics research students and management professionals involved in deformation based materials processing

Springback Assessment and Compensation of Tailor Welded Blanks Ab Abdullah,MF Jamaludin,2022-12-27 Focusing on techniques developed to evaluate the forming behaviour of tailor welded blanks TWBs in sheet metal manufacturing this edited collection details compensation methods suited to mitigating the effects of springback Making use of case studies and in depth accounts of industry experience this book gives a comprehensive overview of springback and provides essential solutions necessary to modern day automotive engineers Sheet metal forming is a major process within the automotive industry with advancement of the technology including utilization of non uniform sheet metal in order to produce light or strengthened body structures This is critical in the reduction of vehicle weight in order to match increased consumer demand for better driving performance and improved fuel efficiency Additionally increasingly stringent international regulations regarding exhaust emissions require manufacturers to seek to lighten vehicles as much as possible To aid engineers in optimizing lightweight designs this comprehensive book covers topics by a variety of industry experts including compensation by annealing low power welding punch profile radius and tool integrated springback measuring systems It ends by looking at the future trends within the industry and the potential for further innovation within the field This work will benefit car manufacturers and stamping plants that face springback issues within their production particularly in the implementation of TWB production into existing facilities It will also be of interest to students and researchers in automotive and aerospace engineering

The Current State-of-the-Art on Material Forming Ricardo Alves de Sousa,Robertt Angelo Fontes Valente,2013-06-13 Numerical and Experimental Approaches at Different Length Scales ESAFORM 2013 Selected peer reviewed papers from the 16th ESAFORM Conference on Material Forming April 22 24 2013 Aveiro Portugal

e-Design Kuang-Hua Chang,2015-03-17 e

Design is the first book to integrate discussion of computer design tools throughout the design process Through this book the reader will understand Basic design principles and all digital design paradigms CAD CAE CAM tools available for various design related tasks How to put an integrated system together to conduct All Digital Design ADD Industrial practices in employing ADD and tools for product development Provides a comprehensive and thorough coverage on essential elements for practicing all digital design ADD Covers CAD CAE methods throughout the design process including solid modelling performance simulation reliability manufacturing cost estimates and rapid prototyping Discusses CAD CAE CAM RP CNC tools and data integration for support of the all digital design process Reviews off the shelf tools for support of modelling simulations manufacturing and product data management Provides tutorial type projects using ProENGINEER and SolidWorks for readers to exercise design examples and gain hands on experience A series of running examples throughout the book illustrate the practical use of the ADD paradigm and tools

Mechanical and Industrial Engineering J. Paulo Davim, 2021-12-01 This book covers historical aspects and future directions of mechanical and industrial engineering Chapters of this book include applied mechanics and design tribology machining additive manufacturing and management of industrial technologies

Prediction of Defects in Material Processing M. Predeleanu, 2004 Taken from a September 2002 international conference 31 selected papers consider methods for predicting and avoiding the occurrence of defects in manufactured products Major topics include microstructural evolutions during processing induced properties in materials damage modeling and fracture criteria instability analysis characterization of formability predictive methods and numerical techniques and the influence of defects on the integrity of structures The volume covers metal alloys ceramics polymers and composites and both conventional and new materials are discussed Distributed in the U S by Stylus Publishing Annotation 2004 Book News Inc Portland OR booknews com

Sheet Metal Forming Taylan Altan, A. Erman Tekkaya, 2012 This practical and comprehensive reference gives the latest developments on the design of sheet forming operations equipment tooling and process modeling Individual chapters cover all major sheet forming processes such as blanking bending deep drawing and more Process modeling using finite element analysis is described in one chapter and discussed in all appropriate chapters Other chapters cover sensors and die materials which are critical for practical sheet forming applications Other topics include relatively new technologies such as warm forming of magnesium and aluminum alloys forming of advanced high strength steels AHSS and hot stamping Chapters also address special sheet forming operations like spinning incremental forming and mechanical joining and processes related to sheet forming such as sheet and tube hydroforming roll forming and high velocity forming

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