

14th CIRP Conference on Modelling of Machining Operations

(CIRP CMMO 2013)

Procedia CIRP Volume 8

**Turin, Italy
13-14 June 2013**

Editors:

Luca Settineri

ISBN: 978-1-62993-595-9

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© by Elsevier B.V.
All rights reserved.

Printed by Curran Associates, Inc. (2014)

For permission requests, please contact Elsevier B.V.
at the address below.

Elsevier B.V.
Radarweg 29
Amsterdam 1043 NX
The Netherlands

Phone: +31 20 485 3911
Fax: +31 20 485 2457

<http://www.elsevierpublishingsolutions.com/contact.asp>

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

Preface	1
FEM-Based Modelling of the Influence of Thermophysical Properties of Work and Cutting Tool Materials on the Process Performance	3
<i>Piotr Nieslony, Wit Grzesik, Piotr Laskowski, Witold Habrat</i>	
Collision Avoidance Smoothing: A Viscous-Elastic Model	9
<i>F. Bandini, R. Parigi</i>	
Prediction of Shape Deviations in Face Milling of Steel	15
<i>M. Gulpak, J. Sölter, E. Brinksmeier</i>	
Modeling of Surface Zone Influences in Generating Gear Grinding	21
<i>Fritz Klocke, Markus Brumm, Jan Reimann</i>	
Simulation of Roughness and Surface Texture Evolution at Macroscopic Scale During Cylinder Honing Process	27
<i>B. Goedel, M. El Mansori, D. Dumur</i>	
3D-FE-Modelling of the Drilling Process – Prediction of Phase Transformations at the Surface Layer	33
<i>V. Schulze, F. Zanger, J. Michna, F. Lang</i>	
Modeling Deformations of the Workpiece and Removal of Material when Turning	39
<i>S. Schindler, M. Zimmermann, J. C. Aurich, P. Steinmann</i>	
Simulation of Distortion Due to Machining of Thin-walled Components	45
<i>V. Schulze, P. Arrazola, F. Zanger, J. Osterried</i>	
A Gear Cutting Predictive Model Using the Finite Element Method	51
<i>W. Liu, D. Ren, S. Usui, J. Wadell, T. D. Marusich</i>	
A High Performance Computing Cloud Computing Environment for Machining Simulations	57
<i>X. Man, S. Usui, S. Jayanti, L. Teo, T. D. Marusich</i>	
Finite Element-based Modeling of Machining-induced Residual Stresses in Ti-6Al-4V under Finish Turning Conditions	63
<i>E. Abboud, B. Shi, H. Attia, V. Thomson, Y. Mebrahtu</i>	
Modeling a Thermomechanical NC-Simulation	69
<i>B. Denkena, A. Schmidt, J. Henjes, D. Niederwestberg, C. Niebuhr</i>	
3D Simulation and Process Optimization of Laser Assisted Milling of Ti6Al4V	75
<i>Hassan Zamani, Jan-Patrick Hermani, Bernhard Sonderegger, Christof Sommitsch</i>	
Machining of Difficult-to-Cut-Alloys Using Rotary Turning Tools	81
<i>Utku Olgun, Erhan Budak</i>	
Modeling and Simulation of Heat Input in Deep-hole Drilling with Twist Drills and MQL	88
<i>Dirk Biermann, Ivan Iovkov</i>	
Microstructure-based 3D Finite Element Model for Micro Drilling Carbon Steels	94
<i>M. Abouridouane, F. Klocke, D. Lung</i>	
A Method to Simulate Structural Properties of Cellular Materials for Machining Processes	100
<i>U. Teicher, A. Nestler</i>	
A Sensibility Analysis to Geometric and Cutting Conditions Using the Particle Finite Element Method (PFEM)	105
<i>J. Rodríguez, P. Arrazola, J. Cante, A. Kortabarria, J. Oliver</i>	
Multi Revolution Finite Element Model to Predict Machining Induced Residual Stresses in Inconel 718	111
<i>A. Kortabarria, P. J. Arrazola, K. Ostolaza</i>	
Analysis of the Cutting Mechanics Under the Influence of Worn Tool Geometry	117
<i>Keyvan Hosseinkhani, E. Ng</i>	
On Quantifying the Strain Rate During Chip Formation When Machining Aerospace Alloy Ti-5553	123
<i>D. P. Yan, T. Hilditch, H. A. Kishawy, G. Littlefair</i>	
High Performance Turning of Austempered Ductile Iron (ADI) with Adapted Cutting Inserts	129
<i>M. Arft, F. Klocke</i>	
Integrated Geometric Error Compensation of Machining Processes on CNC Machine Tool	135
<i>Xiaoyan Zuo, Beizhi Li, Jianguo Yang, Xiaohui Jiang</i>	
A Finite Element Model of Ultrasonically Assisted Drilling in Carbon/Epoxy Composites	141
<i>Vaibhav A. Phadnis, Anish Roy, Vadim V. Silberschmidt</i>	
Machining Forces and Tool Deflections in Micro Milling	147
<i>Ali Mamedov, S. Ehsan Layegh, Ismail Lazoglu</i>	

On the SPH Orthogonal Cutting Simulation of A2024-T351 Alloy	152
<i>Martin Madaj, Miroslav Piška</i>	
Investigations on Mechanisms of Tool Wear in Machining of Ti-6Al-4V Using FEM Simulation	158
<i>F. Zanger, V. Schulze</i>	
Super-Nickel Orthogonal Turning Operations Optimization	164
<i>A. Del Prete, T. Primo, R. Franchi</i>	
Study of the Influences of Laser Parameters on Laser Assisted Machining Processes	170
<i>Flaviana Tagliaferri, Giacomo Leopardi, Ulrich Semmler, Michael Kuhl, Biagio Palumbo</i>	
Modeling of Workpiece Shape Deviations in face Milling of Parallel Workpiece Compounds.....	176
<i>B. Denkena, J. Köhler, E. Hasselberg</i>	
Cutting Force Model in Drilling of Multi-layered Materials	182
<i>Takashi Matsumura, Shoichi Tamura</i>	
Wear Mechanism of CBN Inserts During Machining of Bimetal Aluminum-Grey Cast Iron Engine Block	188
<i>Amir Malakizadi, Ibrahim Sadik, Lars Nyborg</i>	
Modeling and Experimental Investigation of Edge Hone and Flank Contact Effects in Metal Cutting.....	194
<i>Ceren Çelebi, E. Özlü, Erhan Budak</i>	
Sintering and Model of Thermal Residual Stress for Getting Cutting Tools from Functionally Gradient Materials	200
<i>Marcelo Bertolete Carneiro, Izabel Fernanda Machado</i>	
Improvement of Cutting Forces Modeling Based on Oriented Cutting Tests	206
<i>Sébastien Campocasso, Jean-Philippe Costes, Guillaume Fromentin, Stéphanie Bissey-Breton, Gérard Poulachon</i>	
Inverse Identification of the Constitutive Equation of Inconel 718 and AISI 1045 from FE Machining Simulations	212
<i>F. Klocke, D. Lung, S. Buchkremer</i>	
Analytical Models for Tool Wear Prediction During AISI 1045 Turning Operations.....	218
<i>Aldo Attanasio, Elisabetta Ceretti, Claudio Giardini</i>	
The Link Between Plasticity Parameters and Process Parameters in Orthogonal Cutting.....	224
<i>Mathias Agmell, Aylin Ahadi, Jan-Eric Ståhl</i>	
Reduction of Flexible Workpiece Vibrations with Dynamic Support Realized as Tuned Mass Damper.....	230
<i>S. Bolsunovsky, V. Vermel, G. Gubanov, A. Leontiev</i>	
Cutting Forces Calculation and Experimental Measurement for 5-axis Ball End Milling.....	235
<i>S. Bolsunovsky, V. Vermel, G. Gubanov</i>	
FEM-Modelling of the Thermal Workpiece Deformation in Dry Turning.....	240
<i>F. Klocke, D. Lung, H. Puls</i>	
Numerical Investigations on Changes of the Main Shear Plane while Broaching.....	246
<i>V. Schulze, F. Zanger, N. Boev</i>	
Simulation Approach for the Prediction of Surface Deviations Caused by Process-Machine-Interaction During Broaching	252
<i>V. Schulze, F. Zanger, M. Krauß, N. Boev</i>	
Numerical Modelling of Turning to Find Residual Stresses	258
<i>N. Stenberg, J. Proudian</i>	
Modeling and Simulation of the Electrochemical Machining (ECM) Material Removal Process for the Manufacture of Aero Engine Components.....	265
<i>F. Klocke, M. Zeis, S. Harst, A. Klink, D. Veselovac, M. Baumgärtner</i>	
Computational Fluid Dynamic Analysis of Coolant Flow in Turning.....	271
<i>Toshiyuki Obikawa, Masashi Yamaguchi</i>	
Thin-Walled Part Machining Process Parameters Optimization based on Finite-Element Modeling of Workpiece Vibrations	276
<i>S. Bolsunovskiy, V. Vermel, G. Gubanov, I. Kacharava, A. Kudryashov</i>	
An Industrial Workflow to Minimise Part Distortion for Machining of Large Monolithic Components in Aerospace Industry	281
<i>D. Chantzis, S. Van-Der-Veen, J. Zettler, W. M. Sim</i>	
Empirical Estimation of Grinding Specific Forces and Energy Based on a Modified Werner Grinding Model.....	287
<i>Vijay Kumar Mishra, Konstantinos Salonitis</i>	
Thermal Analysis of the Chip Formation in Austenitic Stainless Steel.....	293
<i>G. M. P. Chagas, P. A. Barbosa, C. A. Barbosa, I. F. Machado</i>	
Numerical Study of Residual Stress Induced by Multi-steps Orthogonal Cutting.....	299
<i>H. Dehmani, F. Salvatore, H. Hamdi</i>	
Modeling and Simulation of Tool Wear During the Cutting Process.....	305
<i>F. Salvatore, S. Saad, H. Hamdi</i>	

Modeling of Surface Dynamic Recrystallisation During the Finish Turning of the 15-5PH Steel	311
<i>A. Mondelin, F. Valiorgue, J. Rech, M. Coret, E. Feulvarch</i>	
Local Approach of Wear in Drilling Ti6Al4V/CFRP for Stack Modelling	316
<i>Antoine Poutord, Frederic Rossi, Gerard Poulachon, Rachid M'Saoubi, Guillaume Abrivard</i>	
Simulation of Hexa-Octahedral Diamond Grain Cutting Tests Using the SPH Method	322
<i>N. Rüttimann, M. Roethlin, S. Buhl, K. Wegener</i>	
Investigation on Machining Performance of Amplitude Control Sculpturing Method in Elliptical Vibration Cutting	328
<i>J. Zhang, N. Suzuki, E. Shamoto</i>	
Modeling Effect of Surface Roughness on Nanoindentation Tests	334
<i>Ling Chen, Aylin Ahadi, Jinming Zhou, Jan-Eric Ståhl</i>	
Studies in Predicting Chip Formation in Contour Milling Using FEA Analysis	340
<i>Stephen M. George, Christoph Gey</i>	
Modeling of Micro-machining Single-crystal F.C.C. Metals	346
<i>S. A. Zahedi, A. Roy, V. V. Silberschmidt</i>	
Development of a Material Model for Visco-elastic Abrasive Medium in Abrasive Flow Machining	351
<i>E. Uhlmann, M. Doits, C. Schmiedel</i>	
The Effects of Depth of Cut and Pre-cooling on Surface Porosity in Cryogenic Machining of Porous Tungsten	357
<i>J. Schoop, M. Effgen, T. J. Balk, I. S. Jawahir</i>	
A Novel Design Method of Variable Helix Cutters to Attain Robust Regeneration Suppression	363
<i>Kojima Takuya, Norikazu Suzuki, Rei Hino, Eiji Shamoto</i>	
Hard Turning of Sintered Cemented Carbide Parts: A Shop Floor Experience	368
<i>N. L. Coppini, A. E. Diniz, M. Bonandi, E. M. De Souza, E. A. Baptista</i>	
Abrasion Monitoring and Automatic Chatter Detection in Cylindrical Plunge Grinding	374
<i>M. Ahrens, R. Fischer, M. Dagen, B. Denkena, T. Ortmaier</i>	
Influence of the Material Behavior Law and Damage Value on the Results of an Orthogonal Cutting Finite Element Model of Ti6Al4V	379
<i>F. Ducobu, E. Rivière-Lorphèvre, E. Filippi</i>	
Micro-FEM Orthogonal Cutting Model for Bone Using Microscope Images Enhanced Via Artificial Intelligence	385
<i>Ilige S. Hage, Ramsey F. Hamade</i>	
Cutting Simulation with the Meshfree Finite Pointset Method	391
<i>Eckart Uhlmann, Robert Gerstenberger, Jörg Kuhnert</i>	
Reliability Assessment of Cutting Tools Life based on Advanced Approximation Methods	397
<i>Konstantinos Salonitis, Athanasios Kolios</i>	
Validation of a Heat Input Model for the Prediction of Thermomechanical Deformations during NC Milling	403
<i>R. Joliet, A. Byfut, P. Kersting, A. Schröder, A. Zabel</i>	
Modelling of Process Forces in Broaching Inconel 718	409
<i>P. Vogtel, F. Klocke, H. Puls, S. Buchkremer, D. Lung</i>	
On the Estimation of Tool-wear for Milling Operations based on Multi- Sensorial Data	415
<i>C. Doukas, P. Stavropoulos, A. Papacharalampopoulos, P. Foteinopoulos, E. Vasiliadis, G. Chryssolouris</i>	
Monitoring and Control of Manufacturing Processes: A Review	421
<i>P. Stavropoulos, D. Chantzis, C. Doukas, A. Papacharalampopoulos, G. Chryssolouris</i>	
Acoustic Emission Signal Through Turning Tools: A Computational Study	426
<i>A. Papacharalampopoulos, P. Stavropoulos, C. Doukas, P. Foteinopoulos, G. Chryssolouris</i>	
Image Denoising and Quality Inspection of Micro Components Using Perona-Malik Diffusion	432
<i>Iwona Piotrowska-Kurczewski, J. W. Schlasche, D. Weimer, B. Scholz-Reiter, P. Maass</i>	
Cutter Workpiece Engagement Calculations for Five-axis Milling Using Composite Adaptively Sampled Distance Fields	438
<i>Huseyin Erdim, Alan Sullivan</i>	
Modeling of Delamination During Milling of Unidirectional CFRP	444
<i>Wolfgang Hintze, Dirk Hartmann</i>	
Milled Surface Generation Model for Chip Thickness Detection in Peripheral Milling	450
<i>Antonio Scippa, Niccolò Grossi, Gianni Campatelli</i>	
Heat Flux and Temperature Distribution in Gear Hobbing Operations	456
<i>S. Stark, M. Beutner, F. Lorenz, S. Uhlmann, B. Karpuschewski, T. Halle</i>	
Effects of Targeted Minimum Quantity Fluid (MQF) Application on Surface Integrity	462
<i>C. S. Rakurty, P. I. Varela, A. K. Balaji</i>	
Multisensory Chatter Detection in Band Sawing	469
<i>Primož Potocnik, Tilen Thaler, Edvard Govekar</i>	

Surface Integrity of High Speed Milling of Al/SiC/65p Aluminum Matrix Composites	475
<i>T. Wang, L. J. Xie, X. B. Wang, L. Jiao, J. W. Shen, H. Xu, F. M. Nie</i>	
A DoE Approach to Hole Quality Evaluation in Drilling of an Electron Beam Melted Titanium Aluminide	481
<i>Paolo Claudio Priarone, Suela Ruffa, Joel Souza Bedolla, Luca Settineri</i>	
Process Mechanics and Surface Integrity Induced by Dry and Cryogenic Machining of AZ31B-O Magnesium Alloy	487
<i>J. C. Outeiro, F. Rossi, G. Fromentin, G. Poulachon, G. Germain, A. C. Batista</i>	
Cyclic Variation of Residual Stress Induced by Tool Vibration in Machining Operations	493
<i>J. C. Outeiro, J.-P. Costes, J. R. Kornmeier</i>	
Analysis of Tool-wear and Cutting Force Components in Dry, Preheated, and Cryogenic Machining of NiTi Shape Memory Alloys	498
<i>Y. Kaynak, H. E. Karaca, R. D. Noebe, I. S. Jawahir</i>	
Molecular Dynamics Modeling of Nanoscale Machining of Silicon	504
<i>O. A. Olufayo, K. Abou-El-Hossein</i>	
Finite Element Modelling of Conventional and Hybrid Oblique Turning Processes of Titanium Alloy	510
<i>Riaz Muhammad, Anish Roy, Vadim V. Silberschmidt</i>	
Towards a Physical FE Modelling of a Dry Cutting Operation: Influence of Dynamic Recrystallization When Machining AISI 1045	516
<i>C. Courbon, T. Mabrouki, J. Rech, D. Mazuyer, F. Perrard, E. D'Eramo</i>	
Constitutive Modelling of AZ31B-O Magnesium Alloy for Cryogenic Machining	522
<i>E. Giraud, F. Rossi, G. Germain, J. C. Outeiro</i>	
Experimental Investigations for the Prediction of Wear Zones on the Rake Face of Tungsten Carbide Inserts Under dry Machining Conditions	528
<i>C. L. V. R. S. V. Prasad, S. V. Ramana, P. L. Pavani, K. Ramji</i>	
SOM based Methodology for Evaluating Shrinkage Parameter of the Chip Developed in Titanium Dry Turning Process	534
<i>M. Batista, J. Salguero, A. Gomez-Parra, S. Fernández-Vidal, M. Marcos</i>	
Numerical Simulation of Machining Nickel-Based Alloys	540
<i>Antonio Del Prete, Luigino Filice, Domenico Umbrello</i>	
Analytic Mechanistic Cutting Force Model for Thread Milling Operations	546
<i>S. W. Lee, A. Kasten, A. Nestler</i>	
FVM based Methodology for Evaluating Adhesion Wear of Cutting Tools	552
<i>J. M. Mainé, M. Batista, D. García-Jurado, L. Shaw, M. Marcos</i>	
Microcutting Force Prediction by Means of a Slip-line Field Force Model	558
<i>M. Annoni, G. Biella, L. Rebaioli, Q. Semeraro</i>	
Modeling Static and Dynamic Cutting Forces and Vibrations for Inserted Ceramic Milling Tools	564
<i>I. G. Euan, E. Ozturk, N. D. Sims</i>	
Optimization of Serrated End Mills for Reduced Cutting Energy and Higher Stability	570
<i>R. Koca, E. Budak</i>	
Meta-modeling Optimization of the Cutting Process During Turning Titanium Metal Matrix Composites (Ti-MMCs)	576
<i>M. Aramesh, B. Shi, A. O. Nassef, H. Attia, M. Balazinski, H. A. Kishawy</i>	
Robust Engineering of Deep Drilling Process by Surface State Optimization	582
<i>Laurentiu-Aurel Mihail</i>	
An FEM Analysis with Experimental Validation to Study the Hardness of In-Process Cryogenically Cooled Drilled Holes in Mg AZ31b	588
<i>A. H. Kheireddine, A. H. Ammouri, T. Lu, I. S. Jawahir, R. F. Hamade</i>	
Author Index	