

Table of Contents

Preface, Committees and Acknowledgements

Chapter 1: Keynotes

A Novel Process for the Manufacture of Extended Laminar Flow Lipskins	3
A.G. Leacock	
Systematic Process Improvement of Stamping Processes	13
D. Ling, D. Williams, B. Carleer and M. Stippak	
Evolution of Yield Loci for Aluminum Alloy AA6016 and Deep Drawing Steel DC06 under the Influence of Non-Linear Strain Paths	21
M. Merklein and S. Suttner	

Chapter 2: Processes

Possibility of the Increase in Titanium Sheets' Drawability	31
J. Adamus and P. Lacki	
Comprehensive Material Characterization for an Intermediate Heat Treatment	39
M. Lechner, A. Kuppert and M. Merklein	
Process Limits of Stretch and Shrink Flanging by Incremental Sheet Metal Forming	45
H. Voswinckel, M. Bambach and G. Hirt	
Experimental Investigations of Different Tool Concepts for Rotary Peen Forming	53
C. Russig, M. Bambach and G. Hirt	
Tool Concepts and Materials for Incremental Sheet Metal Forming with Direct Resistance Heating	61
H. Meier, C. Magnus, B. Buff and J.H. Zhu	
Laser Forming of ERW Steel Square Tubes within Metallurgical Constraints	68
G. Sheikholeslami, J. Griffiths, S.P. Edwardson, K. Watkins and G. Dearden	
State of the Art: Prototyping of the Roll Bending Machine	76
J. Mäkkikangas, K. Kutuniva and K. Mäntyjärvi	
Surface Topography from Single Point Incremental Forming Using an Acetal Tool	84
M. Ham, B.M. Powers and J. Loiselle	
Effects of Draw-Bending Characteristics on Concave Wall Feature in Rectangular Deep-Drawn Parts	92
W. Phanitwong and S. Thipprakmas	
Effects of Part Geometry on Spring-Back/Spring-Go Feature in U-Bending Process	100
W. Phanitwong, A. Sontamino and S. Thipprakmas	
Modelling Kinetics of Phase Transformation for the Indirect Hot Stamping Process	108
P. Hippchen, M. Merklein, A. Lipp, M. Fleischer, H. Grass and C. Philipp	
Size Effects in Winding Roll Formed Profiles: A Study of Carcass Production for Flexible Pipes in Offshore Industry	117
P.S. Nielsen, M.S. Nielsen and N. Bay	
Method to Emboss Holograms into the Surface of Sheet Metals	125
B.A. Behrens, R. Krimm, J. Jocker, E. Reithmeier, B. Roth and M. Rahlfes	
Thermo-Mechanical Hardening of Ultra High-Strength Steels	133
W. Homberg and T. Rostek	
Tube Hydroforming (THF): Process Optimization of an Automotive Component	141
A. Attanasio, E. Ceretti and G. Maccarini	
Robot-Based Incremental Sheet Metal Forming – Increasing the Geometrical Complexity and Accuracy	149
B. Buff, C. Magnus, J.H. Zhu and H. Meier	
Improving Formability in SPIF Processes through High Speed Rotating Tool: Experimental and Numerical Analysis	156
G. Buffa, D. Campanella, R. Mirabile and L. Fratini	

Enhanced Formability of Age-Hardenable Aluminium Alloys by Incremental Forming of Solution-Treated Blanks	164
A. Mohammadi, H. Vanhove, A. van Bael and J.R. Duflou	
Numerical Modeling of Tube Hydropiercing Using Phenomenological and Micro-Mechanical Damage Criteria	172
A. Hassannejad and D.E. Green	
Numerical Simulation of a Pyramid Steel Sheet Formed by Single Point Incremental Forming Using Solid-Shell Finite Elements	180
L. Duchêne, C.F. Guzmán, A.K. Behera, J.R. Duflou and A.M. Habraken	
Optimization of Superplastic Forming Processes for High Volume Production in Aeronautics	189
A. Nick, J. Zettler and G. Hirt	
Blank Shape Optimization in Sheet Hydroforming Process	197
A. Del Prete, G. Papadia, T. Primo and S. Schipa	
Development of Accurate Numerical Models for Bending of Aluminum Tailored Blanks	205
A. Del Prete, G. Papadia, T. Primo and E. Mariano	
Profile Correction of a Stretch Formed Aluminium Alloy during Artificial Ageing	213
G. Volk, A.G. Leacock and D. Brown	

Chapter 3: Process and Production Planning

Manufacture of Accurate Titanium Crano-Facial Implants with High Forming Angle Using Single Point Incremental Forming	223
J.R. Duflou, A.K. Behera, H. Vanhove and L.S. Bertol	
Springback Simulation of the Process Chain Press Line Forming and Roller Hemming Processes	231
C. Kästle, M. Liewald and K. Roll	
A Knowledge Based System for Process Planning of Axisymmetric Deep Drawn Parts	239
V. Naranje and S. Kumar	
Optimization of the Blank Holder Force Using Genetic Algorithm Method in Case of a U - Shaped Part	247
A. Albut and V. Ciubotariu	

Chapter 4: Presses and Press Tools

Economic Drive Concept for Flexible Forming Presses	255
B.A. Behrens, R. Krimm and T. Nitschke	
Dynamic Strength Behaviour of Punch Connections in Shear Cutting Processes	262
J. Mair, R. Canti, R. Golle, W. Volk and H. Hoffmann	
Adjustable Tooling System for Air Bending	270
J.R. Duflou, H. Vanhove and W. de Coninck	
New Methods to Reduce the Vibrations of the Ram and the Press Body while Blanking of Sheet Metal	277
B.A. Behrens, R. Krimm and V. Salfeld	
A Low Cost Knowledge Based System Framework for Design of Bending Die	284
D. Panghal and S. Kumar	

Chapter 5: Materials and Testing

Study of a Formability Process Chain for a Copper-Free Al-Zn-Mg-Alloy by a Retrogression and Re-Aging Treatment (RRA)	295
N. Jaburek and M. Merklein	
Study on Formability Characteristics of the Weld Seam of Aluminum Steel Tailored Hybrid Blanks	302
O. Singar and M. Merklein	
Mechanical Response of Ti-6Al-4V Alloy on Deformation at Moderate Temperatures	311
M. Merklein, H. Hagenah, M. Kaupper and A. Schaub	

Numerical Optimisation of a Shear Specimen Geometry According to ASTM	317
M. Merklein, M. Johannes, M. Biasutti and M. Lechner	
Effectiveness of Stamping Lubricants in Erichsen Test	325
B. Sener and E.S. Kayali	
FEM - Modeling of Bendability of Ultra-High Strength Steel	333
A.M. Arola, K. Mäntyjärvi and J.A. Karjalainen	
Integration of High Strength Steel (HSS) Elements in Automotive Industry	340
E. Cañibano Álvarez, J.C.M. Senovilla, J.R. García, C.M. Martín and J.S. López	
Experimental Study of the Formability of H240LA Steel Sheets under Stretch-Bending Conditions	349
L.H. Martínez-Palmeth, A.J. Martínez-Donaire, C. Vallellano, G. Centeno and F.J. García-Lomas	
Formability Characteristics of AA5083 Sheets under Hot Forming Conditions	356
S. Bruschi, A. Ghiotti and F. Michieletto	
A Microstructural Investigation of Roll Formed Austenitic Stainless Steel	364
K. Yvell, M. Lindgren and U. Bexell	
Deformation Mechanisms of Ti6Al4V Sheet Material during the Incremental Sheet Forming with Laser Heating	372
L. Mosecker, A. Göttmann, A. Saeed-Akbari, W. Bleck, M. Bambach and G. Hirt	
Effects of Surface Roughness on Frictional Behaviour of Solid Organic Lubricants for Sheet Metal Forming Processes	381
F. Sgarabotto, A. Ghiotti and S. Bruschi	
Optimized Yield Curve Determination Using Bulge Test Combined with Optical Measurement and Material Thickness Compensation	389
H. Friebe, M. Klein, I. Heinle and A. Lipp	
Time Dependent FLC Determination Comparison of Different Algorithms to Detect the Onset of Unstable Necking before Fracture	397
W. Hotz, M. Merklein, A. Kuppert, H. Friebe and M. Klein	

Chapter 6: Modelling Techniques

Numerical Simulation of Welding Thin Titanium Sheets	407
P. Lacki and K. Adamus	
Determination of Friction in Sheet Metal Forming by Means of Simulative Tribo-Tests	415
E. Ceron and N. Bay	
The THF Compression Test for Friction Estimation: Study on the Influence of the Tube Material	423
A. Fiorentino, E. Ceretti and C. Giardini	
Numerical Modeling of Electromagnetic Tube Expansion and Formability Assessment	429
I. Oliveira, P. Teixeira, G. Lobo and A. Reis	
Simulation of a Thick Plate Forming Benchmark Using a Multi Scale Texture Evolution and Anisotropic Plasticity Model	436
D. Shore, J. Gawad, S. Cooreman, P. Lava, D. Debruyne, D. Roose, J. Antonissen, A. van Bael and P. van Houtte	
FEM Analysis of Mecano-Welding Process for Manufacturing Cylinders	444
Z.K. Feng and H. Champliaud	
Modelling Aspects in Accumulative Roll Bonding Process by Explicit Finite Element Analysis	452
L. Fratini, M. Merklein, W. Böhm and D. Campanella	

Chapter 7: Cutting and Joining

Predicting Dimensional Accuracy of Laser Welded Aluminum Add-On Body Parts	463
R. Neugebauer, O.E. Bernhardi, M. Wahl, F. Schulz, R. Mauermann, W. Schützle and S. Werner	
The Influence of the Shielding Gas to the Static and Dynamic Strength Properties of Laser Welded Workhardened Nitrogen Alloyed Austenitic Stainless Steel	471
M. Keskitalo and K. Mäntyjärvi	

Friction Stir Spot Welding (FSSW) of Aluminum Sheets: Experimental and Simulative Analysis	
G. D'Urso, M. Longo and C. Giardini	477
On the Field Variables Influence on Bonding Phenomena during FSW Processes: Experimental and Numerical Study	
G. Buffa, L. Fratini, S. Pellegrino and F. Micari	484
Friction Stir Welding of Tailored Blanks of Aluminum and Magnesium Alloys	
J.P. Bergmann, R. Schürer and K. Ritter	492

Chapter 8: Micro Technologies

The Downsizing Effects in EDM Drilling of Micro Holes	
G. D'Urso, G. Maccarini and C. Merla	503
Wear Behavior of a DLC-Coated Blanking and Deep Drawing Tool Combination	
H. Flosky and F. Vollertsen	511

Chapter 9: Quality and Reliability

Characterizing Influence Parameters in Pulsed Phase Thermography for Defect Detection in Sheet Metal Parts	
Q. Braun, D. Hortig and M. Merklein	521
Quality Assurance of Laser Welded Axisymmetric Sandwich Structure	
K. Illikainen, K. Holappa and K. Mäntyjärvi	529

Chapter 10: Manufacturing Systems

Extension of the Value Stream Mapping Approach to the Comprehensive Design of a Lean Sheet Metal Manufacturing System: An Industrial Case Study	
D.T. Matt	537

Chapter 11: Energy and Resource Efficiency

Electric Energy Consumption Analysis of SPIF Processes	
G. Ingara, K. Kellens, A.K. Behera, H. Vanhove, G. Ambrogio and J.R. Duflou	547

Chapter 12: Condition Monitoring and Diagnostics

Advances in Monitoring Die Condition during Superplastic Forming	
R.C. Zante and C. Knowles	557