

Tube Hydroforming Technology 2013

TUBEHYDRO2013

Proceedings of the 6th International Conference on Tube Hydroforming
August 25-28, 2013, Jeju, Korea

Edited by Heon Young Kim, Daeyong Kim and Ji Hoon Kim

Contents

Keynote Papers..... 1

Progress in Warm Hydroforming and Gas Forming of Light Alloy Tubular Components ...2
Gang Liu, Wenda Zhang, Zhubin He, Shijian Yuan and Kehuan Wang

Hydroforming Research Activities at the APTL in ERC/ITAF12
Young Hoon Moon

A Study on Work-Hardening Property of Sheet Metal in the Tube Manufacturing Process
.....27
Fuh-Kuo Chen and Jheng-Kai Ciou Huang

Evolution of Material and Forming Technologies for Vehicle Light Weight Solution36
Yukihisa Kuriyama

Technical Papers..... 46

Tube hydroforming..... 47

Mechanism of Formability Improvement of Austenitic Stainless Steel by Pulsating Load 47
Shi-Hong Zhang, Yong Xu, Ming Cheng and Hong-Wu Song

Effect of Bright Annealing on Formability of SS304 in Tube Hydroforming56
Purit Thanakijkasem, Vitoon Uthaisangasuk, Sasawat Mahabunphachai and Atirat Pattarangkun

Effect of Initial Thickness on Cross-Shaped Tube Hydroforming of Small Diameter Tubing
.....64
Atsushi Shirayori, Takatoshi Ando, Masatoshi Usui and Michiharu Narazaki

Weight Reduction of Axle-housings Using High-expansion-ratio Hydroforming Technology68
Manabu Wada, Keinosuke Iguchi, Masaaki Mizumura and Hiromitsu Kaneda

Springback of Hydro Bending of Carbon Steel/Al-alloy Bi-layered Tubes73
Bugang Teng, Gang Liu and Shijian Yuan

<i>Design of Forming Process for Control Arm Using Extruded Aluminum Tube</i>	79
Young Choi, Bong Yong Kang, Joon Hong Park, Hong Tae Yeo, Jae Hun Kim and Sang Woo Park	
<i>Sensitivity Analysis of Tube Hydro-forming Process Using Finite Element Method</i>	86
J.Y Oh, J.B Yang, T. Hanes, R. Shankar, W.T. Wu and K. Lee	
<i>The Application Study of ERW Tube for High Strength Hydroformed Parts</i>	95
Sung-Pill Park, Dong-Hak Kim and Yong-Jai Kwon	
<i>Study on Plunger Shape Design for Hydroforming of Triangular Shaped Tubes</i>	103
Young-Chul Shin, Seong-Joo Lim, Ho-Joon Choi and Duk-Jae Yoon	
<i>Reliability Analysis of the Corner Filling Test in the Tube Hydroforming Process</i>	111
Chen Yang, Yushen Hu, Lixia Fan and Wenxiu Xin	
<i>Study on the Load-Carrying Capability of the Tubular Part Hydroformed through the Useful Wrinkles</i>	119
Yu Shen Hu, Chen Yang and Lixia Fan	
<i>Development of Tube Hydroforming Process Guidelines for a Pear-Shaped Die with a Flat Surface</i>	126
Duk-Jae Yoon, Youong-Chul Shin, Dong-Ju Kim and Myeong Han Lee	
<i>The Development of a Special Cross Section Tube by Hydroforming Process</i>	131
Y.C. Chen, C.Y. Chuang and M.F. Li	
<i>Hydroforming Process Development for Long Tapered Tubes</i>	137
Chih Yu Chuang and Ping Kuo Cheng	
<i>Strain Analysis of Shear Hydro-bending of Rectangular Tube</i>	144
Cong Han, Yong Wang, Chao Zang and Shijian Yuan	
<i>Feasible Pressure and Axial Feeding Path Determination of Fuel Filler by Genetic Algorithm (GA)</i>	148
Ramil Kesvarakul, Thanasan Intarakumthornchai, Suwat Jirathearanat and Yingyot Aue-U-Lan	

<i>Temperature-supported Gas Forming of Ferritic Stainless Steel Tubes</i>	156
Frank Schieck, Welf-Guntram Drossel and Andre Albert	
<i>Influence of External Pressure on Double-sided Hydroforming of 5A02 Aluminum Alloy Tube in a Square Die</i>	164
Xiao-song Wang, Xiao-lei Cui, Shijian Yuan and Zheng Qu	
<i>Analysis of Hydropiercing Process on Automobile Parts</i>	171
Lei Wu, Haomin Jiang, Haibo Su and Xinping Chen	
<i>Comprehensive Process Evaluation in Tube Hydroforming from Concept Design until Robust Manufacturing</i>	179
Giampaolo Moncelsi, Werner Teufel and Friedhelm Kersting	
<i>The Study on Development of A-Pillar with 780Mpa Grade by Hydroforming</i>	187
Kwangsoon Kim and Donghak Kim	
<i>Adaptive Simulations in T-Shape Tube Hydroforming with Different Outlet Diameters</i> ..	194
Yeong-Maw Hwang, Nai-Shin Kang and Kuo-Hsing Wang	
<i>Experimental Validation of Fuzzy Process Control of Y-shape Hydroforming for AZ61 Magnesium Alloy Tube</i>	199
Ken-ichi Manabe, Dai Kobayashi, Xu Chen, Yeong-Maw Hwang and Kuo-Hsing Wang	
<i>In-process Fuzzy Control Algorithm for T- and Y- Shapes Tube Hydroforming</i>	204
Ken-ichi Manabe, Xu Chen and Dai Kobayashi	
<i>Fracture Evaluation of A1070 Aluminium Microtubes Using Bulge Forming</i>	209
Yoshihiro Amikura, Shoichiro Yoshihara, Emmet Galvin and Bryan J. Mac Donald	
<i>Formability Evaluation of Titanium Alloy (Ti-3Al-2.5V) in Cold Tube Hydroforming</i>	215
Dong-Ju Kim, Young-Chul Shin, Seong-Hwan Bae, Seong-Joo Lim and Duk-Jae Yoon	
<i>Stress-triaxiality Effects in the Modeling of Tube Hydroforming</i>	221
Yannis P. Korkolis and Stelios Kyriakides	

<i>Forming Optimization of Titanium Alloys (Ti-3Al-2.5V) in Cold Tube Hydroforming Using Finite Elements Methods</i>	228
Duk-Jae Yoon, Dong-Ju Kim , Young Chul Shin and Seong-Sik Lim	
<i>Comparative Study of Finite Element Analysis in SS304 Tube Hydroforming</i>	235
Atirat Pattarangkun, Purit Thanakijkasem, Sasawat Mahabunphachai, Vitoon Uthaisangsuk and Surachate Chutima	
<i>Numerical Prediction of the Fracture Using Triaxial Forming Limit in Tube Hydro Forming</i>	243
Hong-lae Kim, Albert Forgas, Jungsun Kim, Soontak Kho and Hotaek Kwak	
<i>Hydroformability Assessment of AA6063 Tubes Using the Polar Effective Plastic Strain (PEPS) Diagram</i>	250
Ngoc-Trung Nguyen, Eun-Guk Lee, Myoung-Gyu Lee, Hyung Jong Kim and Heon Young Kim	
<i>Investigation on the Thickness Distribution and Maximum Thinning of the Hydroformed 316L SS/Al Clad T-branch</i>	254
Xunzhong Guo, Wentao Wang, Huaguan Li and Jie Tao	
Tube forming	262
<i>Optimization Design of Three-hole Extrusion Forming of Aluminum Alloy Bicycle Seat Tube</i>	262
Dyi-Cheng Chen and Ming-Wei Guo	
<i>Convolution Formation Behavior of Semi-dieless Bellows Forming Process for Metal Tubes</i>	268
Tsuyoshi Furushima, Yuta Suzuki, Ken-ichi Manabe and Osamu Sasaki	
<i>Development of Dieless Bellows Forming Process with Local Heating Technique</i>	275
Zicheng Zhang, Tsuyoshi Furushima, Ken-ichi Manabe, Kazuo Tada and Osamu Sasaki	
<i>Tube Bulge Forming to One-piece Fabrication of the Multi Joint Head Tube for Ti-alloy-body Bicycle</i>	280
Youngseon Lee, Jeongsuk Lim, Yonghyun Song, Yong-Nam Kwon and Younghoon Moon	

FE Analysis of Cold Pilgering Process of Zr-alloy Tube for Nuclear Power Plant287
Sehwan Chun, Jeongsuk Lim, Kibum Park, Inkyu Kim and Younghoon Moon

Mechanical Characteristics Analysis of Bent Pipe Fabricated by Local Induction Heating with Small Bending Radii293
Jeongsuk Lim, Taeho Kim, Youngseon Lee, Younghoon Moon, Yangho Woo, Changsoo Woo and Giho Sung

Sheet hydroforming..... 300

Simulation and Experiment of Sheet Hydroforming for Making an Aluminum Fuel Tank300
Huiwen Hu, Jin-Fu Wang, Kai-Di Fan, Ting-Yu Chen, Sheng-Yuan Wang and Tien-Yo Ho

Study on Stretch Flanging in Double Sheet Hydroforming309
Masahiko Sato, Atsushi Tomizawa and Tohru Yoshida

Effect of Fluid Pressure in Micro Hydromechanical Deep Drawing313
Hideki Sato, Ken-ichi Manabe, Dongbin Wei and Zhengyi Jiang

Hydromechanical Deep Drawing of Micro Tapered Cups318
Ken-ichi Manabe, Daiki Kondo, Hideki Sato, Dongbin Wei and Zhengyi Jiang

Sheet forming..... 323

On Formability of Tailor Welded Blank of Boron Steel at Elevated Temperature323
Hong-Seok Choi, Pan-Ki Seo, Seung-Hun Cha, Dae-Cheol Ko and Byung-Min Kim

Empirical Study for Quality of High Strength Steel Sheet Sheared Edge329
Soo Sik Han and Ji Ho Lim

Improvement of Weldment Properties by the Hot Forming Quenching for the Friction Stir Welded TWB sheet333
Dae-Hoon Ko, Jae-Hong Kim, Dae-Cheol Ko and Byung-Min Kim

Experimental Investigation on the Springback Behavior of DP780 Steel Sheets with Various Process Parameters341
Min Kuk Choi and Hoon Huh

<i>Development of High-strength Components Using Hot Press Forming Technology</i>	348
Dongwoo Kim, Donghak Kim, Kwangsun Kim, Kyungjin Sung and Yungyu Kim	
<i>Research on the High Pressure Liquid Jet Incremental Forming</i>	353
Qi Zhang, Tongtong Zhang, Lei Lei, Minqiang Dai and Sheng-dun Zhao	
<i>Laser Irradiated Bending Characteristics of the Ultra-High Strength Steels Sheet</i>	362
J. H. Song, G. A. Lee, Y.B. Kim, S. Lee, S. M. Park and S. J. Park	
<i>Comparison of Forming Behaviors of Automotive Aluminum Alloy Sheet in Electromagnetic Pressure and Conventional Press Forming Processes</i>	367
Daeyong Kim, Ji Hoon Kim, Myoung-Gyu Lee, Youngseon Lee and Guen An Lee	
<i>Optimal Profile Design Method for Flexible Roll Forming Process</i>	371
ByeongDon Joo, SangWook Han, SeGyeRo Shin, CheolHwan Lee and Young Hoon Moon	
<i>Characterization of Dynamic Strain Hardening Behavior Using the Virtual Fields Method</i>	377
Jin-Hwan Kim, Myoung-Gyu Lee, Ji Hoon Kim and Daeyong Kim	
<i>Experimental Tests for Behaviors of Material Properties According to Temperature Changes as Hot-Stamping Process</i>	383
Young-Moo Heo, Kwang-Ho Shin and Yong-Jun Jeon	
<i>Study on the Changes in Material Strength According to Changes in Material Cooling Rate in Hot-Stamping Process</i>	390
Yong-Jun Jeon, Heung-Kyu Kim and Baeg-Soon Cha	
<i>Durability Evaluation of Hot-Stamping Die Considering Thermal Stress Effect</i>	397
Heung-Kyu Kim and Heon Young Kim	
<i>The Effect of Press Hardening on the Material Properties of Hot-Stamped Parts</i>	401
Hyung Jong Kim, Myung-Bo Shim and Heung-Kyu Kim	
<i>Laser Tailor-welded Blanks for Hot Press Forming Steel with Arc Pre-treating</i>	405
Minjung Kang and Cheolhee Kim	
<i>Microstructure and Plastic Deformation Behavior of Modified AA7075-T6 Aluminum Alloy</i>	408
Kyu-Sik Kim, Gwan-Yeung Kim, Si-Young Sung, Bum-Suck Han, Yong-Nam Kwon and Kee-Ahn Lee	

Fracture Criteria of Mg Alloy Plates at Elevated Temperature414
Dong-Yoon Seok, Daeyong Kim, Sang-Woo Kim, Taejoon Park, Jeonghwan Bak, Ji Hoon Kim, Youngseon Lee and Kwansoo Chung

Anisotropy Effect on the Fracture Model of DP980 Sheets Considering the Change of Loading Path419
Namsu Park, Kwanghyun Ahn, Sung Jun Lim and Hoon Huh

Forming Performance of a New Quenching 2060 Aluminum-lithium Alloy427
Huaguan Li, Xunzhong Guo, Zhonggang Sun, Hongbing Liu, Wei Wang and Jie Tao

General forming processes 435

Crash Design and Simulation of Automotive Bumper Impact Beam for Weight Reduction435
Kee Joo Kim, Jun-Hyub Park, Jae-Woong Lee, Chang-Pyung Han and Young-Cheol Lee

Study on Hot Press Molding of Metal to Cap with Aspherics Glass Lens440
Soon Sub Park, Myeong Jin Ko, Jae Young Joo and Seung Jun Baek

Method Considering Mean Stress at Fatigue Strength Assessment for Design of Thin Film Structure under Dynamic Loading447
Jun-Hyub Park, Myung-Soo Shin and Kee Joo Kim

Light Weight Design of Automotive Suspension Link Based on Design of Experiment ...451
Jun-Hyub Park and Kee Joo Kim

Development of the New Technology for TWB and Hot Stamping Hybrid Process456
Min-Seok Kwon, Yun-Gyu Kim, Man-Bin Moon, Jong-Pan Kong and Chung-Yun Kang

Effect of Clearance between Roller and Chuck on Formability in Tube Spinning without Mandrel for Convex Shape465
Youn-Jeong Hong, Takahiro Makiyama, Toshiya Teramae, Yuki Murasato, Yoshitaka Ochiai and Kenichiro Hirano

The Semiconductor Die Structure Optimization for an Anisotropic Lead Frame by CAE Technology470
Yong Bae Kim, Jae Hyuk Byun and Chang Heon Yi

A Study on Conformal Cooling of an Injection Molding Manufactured by Laser Aided Direct Metal Tooling (DMT) Technology478
Ji Hyun Sung, Yang Gon Kim, Sang-Kon Lee, Myeong-Sik Jeong, Yong Je Cho, Da Hye Kim, Kang-Eun Kim, Jong Won Lee and Hoon Jae Park

A Study on Hot Forging Process of Magnesium Engine Mount Bracket with U Shape ..485
Chang Hee Suh, Sang Kyun Oh, Tae Ha Kwon, Ji Hyun Sung, Ick Jae Shin and Young Suk Kim